1 CCPP variables provided by model FV3 vs requested by pool of physics

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1.2 Description of variables

FV3-GFS_Cldprop_type
```
    long_name    derived type GFS_cldprop_type in FV3
    units        DDT
    rank         0
    type         GFS_cldprop_type
    kind
    source       MODULE GFS_typedefs
    local_name   IPD_Data(nb)%Cldprop
    requested    GFS_diagtoscreen_run
                 GFS_interstitialtoscreen_run
                 GFS_phys_time_vary_2_run
                 GFS_rrtmg_pre_run
                 GFS_stochastics_run
```

FV3-GFS_Control_type
```
    long_name    derived type GFS_control_type in FV3
    units        DDT
    rank         0
    type         GFS_control_type
    kind
    source       MODULE GFS_typedefs
    local_name   IPD_Control
    requested    GFS_DCNV_generic_post_run
                 GFS_DCNV_generic_pre_run
                 GFS_PBL_generic_post_run
                 GFS_SCNV_generic_post_run
                 GFS_SCNV_generic_pre_run
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                 GFS_barrier_run
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                 GFS_interstitialtoscreen_run
                 GFS_phys_time_vary_1_run
                 GFS_phys_time_vary_2_run
                 GFS_rad_time_vary_run
                 GFS_rrtmg_post_run
                 GFS_rrtmg_pre_run
                 GFS_stochastics_run
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                 GFS_suite_interstitial_2_run
                 GFS_suite_interstitial_3_run
                 GFS_suite_update_stateout_run
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                 GFS_surface_generic_pre_run
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                 rrtmg_lw_pre_run
                 rrtmg_sw_post_run
                 rrtmg_sw_pre_run
                 sasas_shal_post_run
```

FV3-GFS_Coupling_type

long_name	derived type GFS_coupling_type in FV3
units	DDT
rank	0
type	GFS_coupling_type
kind	
source	MODULE GFS_typedefs
local_name	IPD_Data(nb)%Coupling
requested	GFS_diagtoscreen_run
	GFS_interstitialtoscreen_run
	GFS_rrtmg_post_run
	GFS_stochastics_run
	rrtmg_lw_post_run
	rrtmg_sw_post_run

FV3-GFS_Diag_type

long_name	derived type GFS_diag_type in FV3
units	DDT
rank	0
type	GFS_diag_type
kind	
source	MODULE GFS_typedefs
local_name	IPD_Data(nb)%Intdiag
requested	GFS_DCNV_generic_post_run
	GFS_PBL_generic_post_run
	GFS_SCNV_generic_post_run
	GFS_diagtoscreen_run
	GFS_interstitialtoscreen_run
	GFS_phys_time_vary_2_run
	GFS_rrtmg_post_run
	GFS_stochastics_run
	GFS_suite_interstitial_1_run
	GFS_suite_interstitial_2_run
	GFS_surface_generic_post_run
	GFS_surface_generic_pre_run
	dcyc2t3_post_run
	ozphys_post_run
	rrtmg_sw_post_run
	sasas_shal_post_run

FV3-GFS_Grid_type

long_name	derived type GFS_grid_type in FV3
units	DDT
rank	0
type	GFS_grid_type
kind	
source	MODULE GFS_typedefs
local_name	IPD_Data(nb)%Grid
requested	GFS_DCNV_generic_post_run
	GFS_DCNV_generic_pre_run
	GFS_PBL_generic_post_run
	GFS_SCNV_generic_post_run
	GFS_SCNV_generic_pre_run
	GFS_diagtoscreen_run
	GFS_interstitialtoscreen_run
	GFS_phys_time_vary_2_run
	GFS_rrtmg_post_run
	GFS_rrtmg_pre_run
	GFS_stochastics_run
	GFS_suite_interstitial_1_run
	GFS_suite_interstitial_2_run
	GFS_suite_interstitial_3_run
	GFS_suite_update_stateout_run
	GFS_surface_generic_post_run
	GFS_surface_generic_pre_run
	rrtmg_lw_post_run
	rrtmg_lw_pre_run
	rrtmg_sw_post_run
	rrtmg_sw_pre_run
	sasas_shal_post_run

FV3-GFS_Interstitial_type

long_name	derived type GFS_interstitial_type in FV3
units	DDT
rank	0
type	GFS_interstitial_type
kind	
source	MODULE GFS_typedefs
local_name	IPD_Interstitial(nt)
requested	GFS_diagtoscreen_run
	GFS_interstitialtoscreen_run
	GFS_suite_interstitial_phys_reset_run
	GFS_suite_interstitial_rad_reset_run

FV3-GFS_Radtend_type

```
long_name    derived type GFS_radtend_type in FV3
units        DDT
rank         0
type         GFS_radtend_type
kind
source       MODULE GFS_typedefs
local_name   IPD_Data(nb)%Radtend
requested    GFS_PBL_generic_post_run
             GFS_diagtoscreen_run
             GFS_interstitialtoscreen_run
             GFS_rrtmg_post_run
             GFS_rrtmg_pre_run
             GFS_stochastics_run
             GFS_suite_interstitial_2_run
             GFS_surface_generic_pre_run
             rrtmg_lw_post_run
             rrtmg_lw_pre_run
             rrtmg_sw_post_run
             rrtmg_sw_pre_run
```

FV3-GFS_Sfccycle_type

```
long_name    derived type GFS_sfccycle_type in FV3
units        DDT
rank         0
type         GFS_sfccycle_type
kind
source       MODULE GFS_typedefs
local_name   IPD_Data(nb)%Sfccycle
requested    GFS_phys_time_vary_2_run
```

FV3-GFS_Sfcprop_type

```
long_name    derived type GFS_sfcprop_type in FV3
units        DDT
rank         0
type         GFS_sfcprop_type
kind
source       MODULE GFS_typedefs
local_name   IPD_Data(nb)%Sfcprop
requested    GFS_diagtoscreen_run
             GFS_interstitialtoscreen_run
             GFS_phys_time_vary_2_run
             GFS_rrtmg_pre_run
             GFS_stochastics_run
             GFS_suite_interstitial_1_run
             GFS_surface_generic_post_run
             GFS_surface_generic_pre_run
             rrtmg_lw_pre_run
             rrtmg_sw_pre_run
```

FV3-GFS_Statein_type

```
long_name    derived type GFS_statein_type in FV3
units        DDT
rank         0
type         GFS_statein_type
kind
source       MODULE GFS_typedefs
local_name   IPD_Data(nb)%Statein
requested    GFS_diagtoscreen_run
             GFS_interstitialtoscreen_run
             GFS_rad_time_vary_run
             GFS_rrtmg_post_run
             GFS_rrtmg_pre_run
             GFS_stochastics_run
             GFS_suite_interstitial_1_run
             GFS_suite_interstitial_2_run
             GFS_suite_interstitial_3_run
             GFS_suite_update_stateout_run
             GFS_surface_generic_pre_run
```

FV3-GFS_Stateout_type

```
long_name    derived type GFS_stateout_type in FV3
units        DDT
rank         0
type         GFS_stateout_type
kind
source       MODULE GFS_typedefs
local_name   IPD_Data(nb)%Stateout
requested    GFS_DCNV_generic_post_run
             GFS_DCNV_generic_pre_run
             GFS_SCNV_generic_post_run
             GFS_SCNV_generic_pre_run
             GFS_diagtoscreen_run
             GFS_interstitialtoscreen_run
             GFS_stochastics_run
             GFS_suite_update_stateout_run
```

FV3-GFS_Tbd_type

```
long_name    derived type GFS_tbd_type in FV3
units        DDT
rank         0
type         GFS_tbd_type
kind
source       MODULE GFS_typedefs
local_name   IPD_Data(nb)%Tbd
requested    GFS_DCNV_generic_post_run
             GFS_diagtoscreen_run
             GFS_interstitialtoscreen_run
             GFS_phys_time_vary_1_run
             GFS_phys_time_vary_2_run
             GFS_rad_time_vary_run
             GFS_rrtmg_pre_run
             GFS_stochastics_run
             sasas_shal_post_run
```

Monin-Obukhov_similarity_function_for_heat

```
long_name    Monin-Obukhov similarity function for heat
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%ffhh
requested    edmf_run
             sfc_diag_run
             sfc_ex_coef_run
```

Monin-Obukhov_similarity_function_for_heat_at_2m

```
long_name    Monin-Obukhov similarity parameter for heat at 2m
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%fh2
requested    sfc_diag_run
             sfc_ex_coef_run
```

Monin-Obukhov_similarity_function_for_momentum

```
long_name    Monin-Obukhov similarity function for momentum
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%ffmm
requested    edmf_run
             sfc_diag_run
             sfc_ex_coef_run
```

Monin-Obukhov_similarity_function_for_momentum_at_10m
```
     long_name    Monin-Obukhov similarity parameter for momentum at 10m
     units        none
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_interstitial_type
     local_name   IPD_Interstitial(nt)%fm10
     requested    sfc_diag_run
                  sfc_ex_coef_run
```

accumulated_lwe_thickness_of_convective_precipitation_amount_cnvc90
```
     long_name    accumulated convective rainfall amount for cnvc90 only
     units        m
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_tbd_type
     local_name   IPD_Data(nb)%Tbd%acv
     requested    cnvc90_run
```

accumulated_lwe_thickness_of_precipitation_amount
```
     long_name    accumulated total precipitation
     units        m
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_diag_type
     local_name   IPD_Data(nb)%Intdiag%totprcp
     requested    GFS_MP_generic_post_run
```

adjusted_vertical_layer_dimension_for_radiation
```
     long_name    adjusted number of vertical layers for radiation
     units        count
     rank         0
     type         integer
     kind
     source       MODULE GFS_typedefs TYPE GFS_interstitial_type
     local_name   IPD_Interstitial(nt)%lmk
     requested    GFS_rrtmg_pre_run
                  rrtmg_lw_run
                  rrtmg_sw_run
```

adjusted_vertical_level_dimension_for_radiation

```
long_name     adjusted number of vertical levels for radiation
units         count
rank          0
type          integer
kind
source        MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name    IPD_Interstitial(nt)%lmp
requested     GFS_rrtmg_pre_run
              rrtmg_lw_run
              rrtmg_sw_run
```

aerosol_asymmetry_parameter_for_longwave_bands_01-16

```
long_name     aerosol asymmetry parameter for longwave bands 01-16
units         none
rank          3
type          real
kind          kind_phys
source        MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name    IPD_Interstitial(nt)%faerlw(:,:,:,3)
requested     GFS_rrtmg_pre_run
```

aerosol_asymmetry_parameter_for_shortwave_bands_01-16

```
long_name     aerosol asymmetry parameter for shortwave bands 01-16
units         none
rank          3
type          real
kind          kind_phys
source        MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name    IPD_Interstitial(nt)%faersw(:,:,:,3)
requested     GFS_rrtmg_pre_run
              rrtmg_sw_run
```

aerosol_optical_depth_for_longwave_bands_01-16

```
long_name     aerosol optical depth for longwave bands 01-16
units         none
rank          3
type          real
kind          kind_phys
source        MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name    IPD_Interstitial(nt)%faerlw(:,:,:,1)
requested     GFS_rrtmg_pre_run
              rrtmg_lw_run
```

aerosol_optical_depth_for_shortwave_bands_01-16

```
long_name    aerosol optical depth for shortwave bands 01-16
units        none
rank         3
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%faersw(:,:,:,1)
requested    GFS_rrtmg_pre_run
             rrtmg_sw_run
```

aerosol_single_scattering_albedo_for_longwave_bands_01-16

```
long_name    aerosol single scattering albedo for longwave bands 01-16
units        frac
rank         3
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%faerlw(:,:,:,2)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
```

aerosol_single_scattering_albedo_for_shortwave_bands_01-16

```
long_name    aerosol single scattering albedo for shortwave bands 01-16
units        frac
rank         3
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%faersw(:,:,:,2)
requested    GFS_rrtmg_pre_run
             rrtmg_sw_run
```

air_pressure

```
long_name    mean layer pressure
units        Pa
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%prsl
requested    GFS_calpreciptype_run
             edmf_run
             gwdc_run
             gwdps_run
             ozphys_run
             rayleigh_damp_run
             sasas_deep_run
             sasas_shal_run
             zhaocarr_gscond_run
             zhaocarr_precpd_run
```

air_pressure_at_interface
```
long_name    air pressure at model layer interfaces
units        Pa
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%prsi
requested    GFS_calpreciptype_run
             cnvc90_run
             edmf_run
             get_prs_fv3_run
             gwdc_run
             gwdps_run
```

air_pressure_at_interface_for_radiation_in_hPa
```
long_name    air pressure at vertical interface for radiation calculation
units        hPa
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%plvl
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

air_pressure_at_layer_for_radiation_in_hPa
```
long_name    air pressure at vertical layer for radiation calculation
units        hPa
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%plyr
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

air_pressure_at_lowest_model_layer
```
long_name    mean pressure at lowest model layer
units        Pa
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%prsl(:,1)
requested    lsm_noah_run
             sfc_ex_coef_run
             sfc_nst_run
             sfc_sice_run
```

air_pressure_difference_between_midlayers

    long_name   air pressure difference between midlayers
    units   Pa
    rank   2
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%del
    requested   GFS_MP_generic_post_run
                 edmf_run
                 get_prs_fv3_run
                 gwdc_pre_run
                 gwdc_run
                 gwdps_run
                 ozphys_run
                 sasas_deep_run
                 sasas_shal_run
                 zhaocarr_precpd_run

air_temperature

    long_name   model layer mean temperature
    units   K
    rank   2
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_statein_type
    local_name   IPD_Data(nb)%Statein%tgrs
    requested   edmf_run
                 get_prs_fv3_run
                 gwdc_run
                 gwdps_run

air_temperature_at_interface_for_radiation

    long_name   air temperature at vertical interface for radiation calculation
    units   K
    rank   2
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%tlvl
    requested   GFS_rrtmg_pre_run
                 rrtmg_lw_run
                 rrtmg_sw_run

air_temperature_at_layer_for_radiation
```
long_name    air temperature at vertical layer for radiation calculation
units        K
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%tlyr
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

air_temperature_at_lowest_model_layer
```
long_name    mean temperature at lowest model layer
units        K
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%tgrs(:,1)
requested    dcyc2t3_run
             lsm_noah_run
             sfc_diag_run
             sfc_ex_coef_run
             sfc_nst_run
             sfc_sice_run
```

air_temperature_at_previous_time_step
```
long_name    air temperature at previous time step
units        K
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_tbd_type
local_name   IPD_Data(nb)%Tbd%phy_f3d(:,:,3)
requested    GFS_calpreciptype_run
             zhaocarr_gscond_run
```

air_temperature_save
```
long_name    air temperature before entering a physics scheme
units        K
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%save_t
requested    GFS_DCNV_generic_post_run
             GFS_DCNV_generic_pre_run
             GFS_MP_generic_post_run
             GFS_MP_generic_pre_run
             GFS_SCNV_generic_post_run
             GFS_SCNV_generic_pre_run
             gwdc_pre_run
```

air_temperature_two_time_steps_back
```
long_name    air temperature two time steps back
units        K
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_tbd_type
local_name   IPD_Data(nb)%Tbd%phy_f3d(:,:,1)
requested    zhaocarr_gscond_run
```

air_temperature_updated_by_physics
```
long_name    temperature updated by physics
units        K
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_stateout_type
local_name   IPD_Data(nb)%Stateout%gt0
requested    GFS_MP_generic_post_run
             GFS_MP_generic_pre_run
             GFS_calpreciptype_run
             get_phi_fv3_run
             gwdc_post_run
             gwdc_pre_run
             ozphys_run
             sasas_deep_run
             sasas_shal_run
             zhaocarr_gscond_run
             zhaocarr_precpd_run
```

angle_from_east_of_maximum_subgrid_orographic_variations

```
long_name    angle with_respect to east of maximum subgrid orographic variations
units        degrees
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%theta
requested    gwdps_pre_run
             gwdps_run
```

anisotropy_of_subgrid_orography

```
long_name    anisotropy of subgrid orography
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gamma
requested    gwdps_pre_run
             gwdps_run
```

array_dimension_of_microphysics

```
long_name    number of 3D arrays needed for microphysics
units        count
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%num_p3d
requested    GFS_MP_generic_pre_run
             GFS_calpreciptype_run
```

array_dimension_of_random_number

```
long_name    second dimension of random number stream for RAS
units        count
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%nrcm
requested    GFS_calpreciptype_run
```

asymmetry_of_subgrid_orography

```
long_name    asymmetry of subgrid orography
units        none
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%oa4
requested    gwdps_pre_run
             gwdps_run
```

atmosphere_boundary_layer_thickness

```
long_name    pbl height
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%hpbl
requested    edmf_run
             sasas_shal_run
```

atmosphere_heat_diffusivity

```
long_name    diffusivity for heat
units        m2 s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%dkt
requested    edmf_run
```

atmosphere_heat_diffusivity_background

```
long_name    background vertical diffusion for heat q
units        m2 s-1
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%xkzm_h
requested    edmf_run
```

atmosphere_momentum_diffusivity_background

```
long_name    background vertical diffusion for momentum
units        m2 s-1
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%xkzm_m
requested    edmf_run
```

atmosphere_optical_thickness_due_to_ambient_aerosol_particles

```
long_name    vertical integrated optical depth for various aerosol species
units        none
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%aerodp
requested    GFS_rrtmg_post_run
             GFS_rrtmg_pre_run
```

block_number
```
long_name    for explicit data blocking:  block number of this block
units        index
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_tbd_type
local_name   IPD_Data(nb)%Tbd%blkno
requested    NOT REQUESTED
```

bulk_richardson_number_at_lowest_model_level
```
long_name    bulk Richardson number at the surface
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%rb
requested    edmf_run
             sfc_ex_coef_run
```

canopy_upward_latent_heat_flux
```
long_name    canopy upward latent heat flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%evcw
requested    GFS_surface_generic_post_run
             lsm_noah_pre_run
             lsm_noah_run
```

canopy_water_amount
```
long_name    canopy water amount
units        kg m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%canopy
requested    lsm_noah_run
```

cell_area
```
long_name    area of the grid cell
units        m2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_grid_type
local_name   IPD_Data(nb)%Grid%area
requested    sasas_deep_run
             sasas_shal_run
```

cell_size
```
    long_name    size of the grid cell
    units        m
    rank         1
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_grid_type
    local_name   IPD_Data(nb)%Grid%dx
    requested    gwdc_pre_run
```

cell_soil_type
```
    long_name    soil type at each grid cell
    units        index
    rank         1
    type         integer
    kind
    source       MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%soiltype
    requested    GFS_surface_generic_pre_run
                 lsm_noah_run
```

cell_vegetation_type
```
    long_name    vegetation type at each grid cell
    units        index
    rank         1
    type         integer
    kind
    source       MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%vegtype
    requested    GFS_surface_generic_pre_run
                 lsm_noah_run
                 sfc_ex_coef_run
```

change_in_ozone_concentration
```
    long_name    change in ozone concentration
    units        kg kg-1
    rank         3
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%dq3dt_loc(:,:,6:6+IPD_Interstitial(nt)%oz_coeff-1)
    requested    ozphys_post_run
                 ozphys_run
```

characteristic_grid_length_scale
```
long_name    representative horizontal length scale of grid box
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%dlength
requested    gwdc_pre_run
             gwdc_run
```

cloud_area_fraction
```
long_name    fraction of grid box area in which updrafts occur
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%cldf
requested    gwdc_pre_run
             gwdc_run
```

cloud_area_fraction_for_radiation
```
long_name    fraction of clouds for low, middle, high, total and BL
units        frac
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%cldsa
requested    GFS_rrtmg_post_run
             GFS_rrtmg_pre_run
```

cloud_condensed_water_conversion_threshold
```
long_name    water and ice minimum threshold for Zhao
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%wminco
requested    zhaocarr_precpd_run
```

cloud_condensed_water_specific_humidity_save
```
long_name    cloud condensed water specific humidity before entering a physics scheme
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%save_qcw
requested    GFS_DCNV_generic_pre_run
             GFS_MP_generic_pre_run
```

cloud_condensed_water_specific_humidity_updated_by_physics

```
long_name    cloud condensed water specific humidity updated by physics
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_stateout_type
local_name   IPD_Data(nb)%Stateout%gq0(:,:,IPD_Control%ntcw)
requested    GFS_MP_generic_post_run
             GFS_zhao_carr_pre_run
             zhaocarr_gscond_run
             zhaocarr_precpd_run
```

cloud_ice_specific_humidity

```
long_name    cloud ice specific humidity
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%clw(:,:,1)
requested    GFS_MP_generic_pre_run
             GFS_zhao_carr_pre_run
             sasas_deep_run
             sasas_shal_run
             zhaocarr_gscond_run
```

cloud_ice_water_path

```
long_name    layer cloud ice water path
units        g m-2
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%clouds(:,:,4)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

cloud_liquid_water_path

```
long_name    layer cloud liquid water path
units        g m-2
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%clouds(:,:,2)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

cloud_liquid_water_specific_humidity

```
long_name    cloud water specific humidity
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%clw(:,:,2)
requested    GFS_MP_generic_pre_run
             sasas_deep_run
             sasas_shal_run
             zhaocarr_gscond_run
```

cloud_rain_water_path

```
long_name    cloud rain water path
units        g m-2
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%clouds(:,:,6)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

cloud_snow_water_path

```
long_name    cloud snow water path
units        g m-2
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%clouds(:,:,8)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

cloud_work_function

```
long_name    cloud work function
units        m2 s-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%cld1d
requested    GFS_DCNV_generic_post_run
             sasas_deep_run
```

coefficient_c_0
```
    long_name    coefficient 1 to calculate d(Tz)/d(Ts)
    units        none
    rank         1
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
    local_name   IPD_Data(nb)%Sfcprop%c_0
    requested    sfc_nst_run
```

coefficient_c_d
```
    long_name    coefficient 2 to calculate d(Tz)/d(Ts)
    units        none
    rank         1
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
    local_name   IPD_Data(nb)%Sfcprop%c_d
    requested    sfc_nst_run
```

coefficient_for_evaporation_of_rainfall
```
    long_name    coeff for evaporation of largescale rain
    units        none
    rank         0
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_control_type
    local_name   IPD_Control%evpco
    requested    zhaocarr_precpd_run
```

coefficient_from_cloud_ice_to_snow
```
    long_name    auto conversion coeff from ice to snow
    units        none
    rank         1
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_control_type
    local_name   IPD_Control%psautco
    requested    zhaocarr_precpd_run
```

coefficient_from_cloud_water_to_rain
```
    long_name    auto conversion coeff from cloud to rain
    units        none
    rank         1
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_control_type
    local_name   IPD_Control%prautco
    requested    zhaocarr_precpd_run
```

coefficient_w_0

long_name	coefficient 3 to calculate d(Tz)/d(Ts)
units	none
rank	1
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name	IPD_Data(nb)%Sfcprop%w_0
requested	sfc_nst_run

coefficient_w_d

long_name	coefficient 4 to calculate d(Tz)/d(Ts)
units	none
rank	1
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name	IPD_Data(nb)%Sfcprop%w_d
requested	sfc_nst_run

column_precipitable_water

long_name	precipitable water
units	kg m-2
rank	1
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_diag_type
local_name	IPD_Data(nb)%Intdiag%pwat
requested	GFS_MP_generic_post_run

components_of_surface_downward_shortwave_fluxes

long_name	derived type for special components of surface downward shortwave fluxes
units	W m-2
rank	1
type	cmpfsw_type
kind	
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%scmpsw
requested	GFS_rrtmg_post_run
	rrtmg_sw_post_run
	rrtmg_sw_run

convective_cloud_cover

long_name	convective cloud cover
units	frac
rank	2
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%cnvc
requested	GFS_DCNV_generic_post_run
	GFS_suite_interstitial_3_run
	sasas_deep_run
	sasas_shal_post_run
	sasas_shal_run

convective_cloud_switch

long_name	index used by cnvc90 (for convective clouds)
units	none
rank	0
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_control_type
local_name	IPD_Control%clstp
requested	cnvc90_run

convective_cloud_water_specific_humidity

long_name	convective cloud water specific humidity
units	kg kg-1
rank	2
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%cnvw
requested	GFS_DCNV_generic_post_run
	GFS_suite_interstitial_3_run
	sasas_deep_run
	sasas_shal_post_run
	sasas_shal_run

convective_transportable_tracers

long_name	array to contain cloud water and other convective trans. tracers
units	kg kg-1
rank	3
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%clw
requested	GFS_SCNV_generic_post_run
	GFS_suite_interstitial_3_run

convexity_of_subgrid_orography
```
long_name    convexity of subgrid orography
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%oc
requested    gwdps_pre_run
             gwdps_run
```

cosine_of_latitude
```
long_name    cosine of the grid latitude
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_grid_type
local_name   IPD_Data(nb)%Grid%coslat
requested    dcyc2t3_run
```

cosine_of_solar_declination_angle
```
long_name    cos of the solar declination angle
units        none
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%cdec
requested    dcyc2t3_run
```

cosine_of_zenith_angle
```
long_name    mean cos of zenith angle over rad call period
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_radtend_type
local_name   IPD_Data(nb)%Radtend%coszen
requested    dcyc2t3_run
             rrtmg_sw_run
```

countergradient_mixing_term_for_temperature
```
long_name    countergradient mixing term for temperature
units        K
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gamt
requested    edmf_run
```

countergradient_mixing_term_for_water_vapor

    long_name   countergradient mixing term for water vapor
    units   kg kg-1
    rank   1
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%gamq
    requested   edmf_run

critical_relative_humidity

    long_name   critical relative humidity
    units   frac
    rank   2
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%rhc
    requested   GFS_suite_interstitial_3_run
                 zhaocarr_gscond_run
                 zhaocarr_precpd_run

critical_relative_humidity_at_PBL_top

    long_name   critical relative humidity at the PBL top
    units   frac
    rank   0
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%rhcpbl
    requested   GFS_suite_interstitial_1_run

critical_relative_humidity_at_surface

    long_name   critical relative humidity at the surface
    units   frac
    rank   0
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%rhcbot
    requested   GFS_suite_interstitial_1_run
                 GFS_suite_interstitial_3_run

critical_relative_humidity_at_top_of_atmosphere

    long_name   critical relative humidity at the top of atmosphere
    units   frac
    rank   0
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%rhctop
    requested   GFS_suite_interstitial_1_run
                 GFS_suite_interstitial_3_run

cumulative_change_in_temperature_due_to_surface_processes

```
long_name    cumulative change in temperature due to surface processes
units        K
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%dt3dt(:,:,2)
requested    gwdps_post_run
```

cumulative_change_in_x_wind_due_to_convective_gravity_wave_drag

```
long_name    cumulative change in x wind due to convective gravity wave drag
units        m s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%du3dt(:,:,4)
requested    gwdc_post_run
```

cumulative_change_in_x_wind_due_to_surface_processes

```
long_name    cumulative change in x wind due to surface processes
units        m s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%du3dt(:,:,2)
requested    gwdps_post_run
```

cumulative_change_in_y_wind_due_to_convective_gravity_wave_drag

```
long_name    cumulative change in y wind due to convective gravity wave drag
units        m s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%dv3dt(:,:,4)
requested    gwdc_post_run
```

cumulative_change_in_y_wind_due_to_surface_processes

```
long_name    cumulative change in y wind due to surface processes
units        m s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%dv3dt(:,:,2)
requested    gwdps_post_run
```

daytime_points

```
long_name    daytime points
units        index
rank         1
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%idxday
requested    rrtmg_sw_pre_run
             rrtmg_sw_run
```

daytime_points_dimension

```
long_name    daytime points dimension
units        count
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%nday
requested    rrtmg_sw_post_run
             rrtmg_sw_pre_run
             rrtmg_sw_run
```

deep_soil_temperature

```
long_name    deep soil temperature
units        K
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%tg3
requested    lsm_noah_run
```

diffusivity_background_sigma_level

```
long_name    sigma threshold for background mom.  diffusion
units        none
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%xkzm_s
requested    edmf_run
```

dimensionless_exner_function_at_lowest_model_interface

```
long_name    dimensionless Exner function at lowest model interface
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%prsik(:,1)
requested    edmf_run
             sfc_sice_pre_run
```

dimensionless_exner_function_at_lowest_model_layer
```
long_name    dimensionless Exner function at lowest model layer
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%prslk(:,1)
requested    sfc_sice_pre_run
```

dimensionless_exner_function_at_model_interfaces
```
long_name    dimensionless Exner function at model layer interfaces
units        none
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%prsik
requested    NOT REQUESTED
```

dimensionless_exner_function_at_model_layers
```
long_name    dimensionless Exner function at model layer centers
units        none
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%prslk
requested    edmf_run
             gwdps_run
```

diurnal_thermocline_layer_heat_content
```
long_name    heat content in diurnal thermocline layer
units        K m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%xt
requested    sfc_nst_post_run
             sfc_nst_run
```

diurnal_thermocline_layer_thickness
```
long_name    diurnal thermocline layer thickness
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%xz
requested    sfc_nst_post_run
             sfc_nst_run
```

diurnal_thermocline_layer_x_current
```
long_name    u-current content in diurnal thermocline layer
units        m2 s-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%xu
requested    sfc_nst_run
```

diurnal_thermocline_layer_y_current
```
long_name    v-current content in diurnal thermocline layer
units        m2 s-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%xv
requested    sfc_nst_run
```

dominant_freezing_rain_type
```
long_name    dominant freezing rain type
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%domzr
requested    GFS_calpreciptype_run
```

dominant_rain_type
```
long_name    dominant rain type
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%domr
requested    GFS_calpreciptype_run
```

dominant_sleet_type
```
long_name    dominant sleet type
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%domip
requested    GFS_calpreciptype_run
```

dominant_snow_type
```
long_name    dominant snow type
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%doms
requested    GFS_calpreciptype_run
```

dynamics_to_physics_timestep_ratio
```
long_name    ratio of dynamics timestep to physics timestep
units        none
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%frain
requested    GFS_DCNV_generic_post_run
             GFS_MP_generic_post_run
             GFS_SCNV_generic_post_run
             GFS_calpreciptype_run
             GFS_suite_interstitial_1_run
             sasas_shal_post_run
```

equation_of_time
```
long_name    equation of time (radian)
units        radians
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%slag
requested    dcyc2t3_run
```

error_flag

long_name	error flag for error handling in CCPP
units	flag
rank	0
type	integer
kind	
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%errflg
requested	GFS_DCNV_generic_post_run
	GFS_DCNV_generic_pre_run
	GFS_MP_generic_post_run
	GFS_MP_generic_pre_run
	GFS_PBL_generic_post_run
	GFS_PBL_generic_pre_run
	GFS_SCNV_generic_post_run
	GFS_SCNV_generic_pre_run
	GFS_abort_run
	GFS_barrier_run
	GFS_calpreciptype_run
	GFS_diagtoscreen_run
	GFS_interstitialtoscreen_run
	GFS_phys_time_vary_1_run
	GFS_phys_time_vary_2_run
	GFS_rad_time_vary_run
	GFS_rrtmg_post_run
	GFS_rrtmg_pre_run
	GFS_stochastics_run
	GFS_suite_interstitial_1_run
	GFS_suite_interstitial_2_run
	GFS_suite_interstitial_3_run
	GFS_suite_interstitial_phys_reset_run
	GFS_suite_interstitial_rad_reset_run
	GFS_suite_update_stateout_run
	GFS_surface_generic_post_run
	GFS_surface_generic_pre_run
	GFS_surface_loop_control_part0_run
	GFS_surface_loop_control_part1_run
	GFS_surface_loop_control_part2_run
	GFS_zhao_carr_pre_run
	cnvc90_run
	dcyc2t3_post_run
	dcyc2t3_run
	edmf_run
	get_phi_fv3_run
	get_prs_fv3_run
	gwdc_post_run
	gwdc_pre_run
	gwdc_run
	gwdps_post_run
	gwdps_pre_run
	gwdps_run
	lsm_noah_post_run
	lsm_noah_pre_run
	lsm_noah_run
	ozphys_post_run
	ozphys_run
	rayleigh_damp_run

error_message

long_name	error message for error handling in CCPP
units	none
rank	0
type	character
kind	len=512
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%errmsg
requested	GFS_DCNV_generic_post_run
	GFS_DCNV_generic_pre_run
	GFS_MP_generic_post_run
	GFS_MP_generic_pre_run
	GFS_PBL_generic_post_run
	GFS_PBL_generic_pre_run
	GFS_SCNV_generic_post_run
	GFS_SCNV_generic_pre_run
	GFS_abort_run
	GFS_barrier_run
	GFS_calpreciptype_run
	GFS_diagtoscreen_run
	GFS_interstitialtoscreen_run
	GFS_phys_time_vary_1_run
	GFS_phys_time_vary_2_run
	GFS_rad_time_vary_run
	GFS_rrtmg_post_run
	GFS_rrtmg_pre_run
	GFS_stochastics_run
	GFS_suite_interstitial_1_run
	GFS_suite_interstitial_2_run
	GFS_suite_interstitial_3_run
	GFS_suite_interstitial_phys_reset_run
	GFS_suite_interstitial_rad_reset_run
	GFS_suite_update_stateout_run
	GFS_surface_generic_post_run
	GFS_surface_generic_pre_run
	GFS_surface_loop_control_part0_run
	GFS_surface_loop_control_part1_run
	GFS_surface_loop_control_part2_run
	GFS_zhao_carr_pre_run
	cnvc90_run
	dcyc2t3_post_run
	dcyc2t3_run
	edmf_run
	get_phi_fv3_run
	get_prs_fv3_run
	gwdc_post_run
	gwdc_pre_run
	gwdc_run
	gwdps_post_run
	gwdps_pre_run
	gwdps_run
	lsm_noah_post_run
	lsm_noah_pre_run
	lsm_noah_run
	ozphys_post_run
	ozphys_run
	rayleigh_damp_run

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extra_top_layer

```
long_name    extra top layer for radiation
units        none
rank         0
type         integer
kind
source       MODULE GFS_typedefs
local_name   LTP
requested    GFS_rrtmg_post_run
             rrtmg_lw_post_run
             rrtmg_sw_post_run
```

flag_TKE_dissipation_heating

```
long_name    flag for tke dissipative heating
units        flag
rank         0
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%dspheat
requested    edmf_run
```

flag_deep_convection

```
long_name    flag indicating whether convection occurs in column (0 or 1)
units        flag
rank         1
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%kcnv
requested    GFS_suite_interstitial_2_run
             gwdc_run
             sasas_deep_run
             sasas_shal_run
```

flag_diagnostics

```
long_name    logical flag for storing diagnostics
units        flag
rank         0
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%lssav
requested    GFS_MP_generic_post_run
             gwdc_post_run
             gwdps_post_run
             lsm_noah_post_run
```

flag_diagnostics_3D

```
long_name    flag for 3d diagnostic fields
units        flag
rank         0
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%ldiag3d
requested    GFS_MP_generic_post_run
             GFS_MP_generic_pre_run
             gwdc_post_run
             gwdps_post_run
             ozphys_post_run
             ozphys_run
```

flag_for_guess_run

```
long_name    flag for guess run
units        flag
rank         1
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%flag_guess
requested    GFS_surface_generic_pre_run
             GFS_surface_loop_control_part1_run
             GFS_surface_loop_control_part2_run
             lsm_noah_run
             sfc_nst_run
```

flag_for_initial_time-date_control

```
long_name    flag for initial conditions and forcing
units        flag
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%ictm
requested    NOT REQUESTED
```

flag_for_iteration

```
long_name    flag for iteration
units        flag
rank         1
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%flag_iter
requested    GFS_surface_generic_pre_run
             GFS_surface_loop_control_part2_run
             lsm_noah_run
             sfc_ex_coef_run
             sfc_nst_run
             sfc_sice_run
```

flag_for_land_surface_scheme

```
long_name    flag for land surface model lsm=1 for noah lsm
units        flag
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%lsm
requested    sfc_sice_run
```

flag_for_mom4_coupling

```
long_name    flag controls mom4 sea ice
units        flag
rank         0
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%mom4ice
requested    sfc_sice_run
```

flag_for_nsstm_run

```
long_name    NSSTM flag:  off/uncoupled/coupled=0/1/2
units        flag
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%nstf_name(1)
requested    GFS_surface_loop_control_part2_run
             sfc_nst_post_run
             sfc_nst_run
```

flag_for_precipitation_type
```
long_name    snow/rain flag for precipitation
units        flag
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%srflag
requested    GFS_calpreciptype_run
             lsm_noah_run
             sfc_sice_run
```

flag_for_precipitation_type_algorithm
```
long_name    flag controls precip type algorithm
units        flag
rank         0
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%cal_pre
requested    GFS_calpreciptype_run
```

flag_for_reduced_drag_coefficient_over_sea
```
long_name    flag for reduced drag coeff.  over sea
units        flag
rank         0
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%redrag
requested    sfc_ex_coef_run
```

flag_for_solar_constant
```
long_name    use prescribed solar constant
units        flag
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%isol
requested    NOT REQUESTED
```

flag_idealized_physics
```
long_name    flag for idealized physics
units        flag
rank         0
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%lsidea
requested    rayleigh_damp_run
```

flag_print
```
long_name    control flag for diagnostic print out
units        flag
rank         0
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%lprnt
requested    edmf_run
             gwdc_run
             gwdps_run
             rrtmg_lw_run
             rrtmg_sw_run
             sfc_nst_run
             sfc_sice_run
             zhaocarr_gscond_run
             zhaocarr_precpd_run
```

flag_skip_macro
```
long_name    flag to skip cloud macrophysics in Morrison scheme
units        flag
rank         1
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%skip_macro
requested    NOT REQUESTED
```

flag_to_calc_lw
```
long_name    logical flags for lw radiation calls
units        flag
rank         0
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%lslwr
requested    rrtmg_lw_run
```

flag_to_calc_sw
```
long_name    logical flags for sw radiation calls
units        flag
rank         0
type         logical
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%lsswr
requested    rrtmg_sw_run
```

forecast_hour
```
long_name    hour time after 00z at the t-step
units        h
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%solhr
requested    dcyc2t3_run
             sfc_nst_run
```

forecast_time
```
long_name    curent forecast time
units        h
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%fhour
requested    gwdc_run
```

fraction_of_convective_cloud
```
long_name    fraction of convective cloud
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_cldprop_type
local_name   IPD_Data(nb)%Cldprop%cv
requested    cnvc90_run
```

fraction_of_grid_box_with_subgrid_orography_higher_than_critical_height
```
long_name    frac.  of grid box with by subgrid orography higher than critical height
units        frac
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%clx
requested    gwdps_pre_run
             gwdps_run
```

free_convection_layer_thickness
```
long_name    thickness of free convection layer (FCL)
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%d_conv
requested    sfc_nst_run
```

gas_constant_dry_air
```
long_name   ideal gas constant for dry air
units       J kg-1 K-1
rank        0
type        real
kind        kind_phys
source      MODULE physcons
local_name  con_rd
requested   gwdc_run
            gwdps_run
```

gas_constant_water_vapor
```
long_name   ideal gas constant for water vapor
units       J kg-1 K-1
rank        0
type        real
kind        kind_phys
source      MODULE physcons
local_name  con_rv
requested   gwdps_run
```

geopotential
```
long_name   geopotential at model layer centers
units       m2 s-2
rank        2
type        real
kind        kind_phys
source      MODULE GFS_typedefs TYPE GFS_statein_type
local_name  IPD_Data(nb)%Statein%phil
requested   edmf_run
            get_phi_fv3_run
            gwdps_run
            sasas_deep_run
            sasas_shal_run
```

geopotential_at_interface
```
long_name   geopotential at model layer interfaces
units       m2 s-2
rank        2
type        real
kind        kind_phys
source      MODULE GFS_typedefs TYPE GFS_statein_type
local_name  IPD_Data(nb)%Statein%phii
requested   GFS_calpreciptype_run
            edmf_run
            get_phi_fv3_run
            get_prs_fv3_run
            gwdps_run
```

geopotential_difference_between_midlayers_divided_by_midlayer_virtual_temperature

```
long_name    difference between mid-layer geopotentials divided by mid-layer virtual te
units        m2 s-2 K-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%del_gz
requested    get_phi_fv3_run
             get_prs_fv3_run
```

gravitational_acceleration

```
long_name    gravitational acceleration
units        m s-2
rank         0
type         real
kind         kind_phys
source       MODULE physcons
local_name   con_g
requested    gwdc_run
             gwdps_run
```

grid_size_related_coefficient_used_in_scale-sensitive_schemes

```
long_name    grid size related coefficient used in scale-sensitive schemes
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%work1
requested    GFS_suite_interstitial_1_run
             GFS_suite_interstitial_3_run
             gwdc_pre_run
             zhaocarr_precpd_run
```

grid_size_related_coefficient_used_in_scale-sensitive_schemes_complement

```
long_name    complement to work1
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%work2
requested    GFS_suite_interstitial_1_run
             GFS_suite_interstitial_3_run
             gwdc_pre_run
```

height_above_mean_sea_level_at_lowest_model_layer

```
long_name    layer 1 height
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%zlvl
requested    lsm_noah_run
             sfc_ex_coef_run
```

horizontal_block_size

```
long_name    for explicit data blocking:  block sizes of all blocks
units        count
rank         1
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%blksz
requested    NOT REQUESTED
```

horizontal_dimension

```
long_name    horizontal dimension
units        count
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%ix
requested    GFS_MP_generic_post_run
             GFS_MP_generic_pre_run
             GFS_calpreciptype_run
             GFS_zhao_carr_pre_run
             cnvc90_run
             dcyc2t3_run
             edmf_run
             get_phi_fv3_run
             get_prs_fv3_run
             gwdc_run
             gwdps_run
             ozphys_post_run
             ozphys_run
             rayleigh_damp_run
             sasas_deep_run
             sasas_shal_run
             zhaocarr_gscond_run
             zhaocarr_precpd_run
```

horizontal_index_of_printed_column

long_name	horizontal index of printed column
units	index
rank	0
type	integer
kind	
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%ipr
requested	edmf_run
	gwdc_run
	gwdps_run
	sfc_nst_run
	sfc_sice_run
	zhaocarr_gscond_run
	zhaocarr_precpd_run

horizontal_loop_extent

```
long_name    horizontal loop extent
units        count
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%im
requested    GFS_MP_generic_post_run
             GFS_MP_generic_pre_run
             GFS_PBL_generic_pre_run
             GFS_calpreciptype_run
             GFS_rrtmg_post_run
             GFS_rrtmg_pre_run
             GFS_surface_loop_control_part1_run
             GFS_surface_loop_control_part2_run
             GFS_zhao_carr_pre_run
             cnvc90_run
             dcyc2t3_post_run
             dcyc2t3_run
             edmf_run
             gwdc_post_run
             gwdc_pre_run
             gwdc_run
             gwdps_pre_run
             gwdps_run
             lsm_noah_post_run
             lsm_noah_pre_run
             lsm_noah_run
             ozphys_run
             rayleigh_damp_run
             rrtmg_lw_pre_run
             rrtmg_lw_run
             rrtmg_sw_pre_run
             rrtmg_sw_run
             sasas_deep_run
             sasas_shal_run
             sfc_diag_run
             sfc_ex_coef_run
             sfc_nst_post_run
             sfc_nst_pre_run
             sfc_nst_run
             sfc_sice_post_run
             sfc_sice_pre_run
             sfc_sice_run
             zhaocarr_gscond_run
             zhaocarr_precpd_run
```

index_for_liquid_cloud_condensate
```
long_name    tracer index for cloud condensate (or liquid water)
units        index
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%ntcw
requested    GFS_MP_generic_post_run
             GFS_MP_generic_pre_run
             edmf_run
```

index_of_TKE
```
long_name    index of TKE in the tracer array
units        index
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%ntk
requested    NOT REQUESTED
```

index_of_dtlm_start
```
long_name    index to start dtlm run or not
units        index
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%ifd
requested    sfc_nst_run
```

index_of_highest_temperature_inversion
```
long_name    index of highest temperature inversion
units        index
rank         1
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%kinver
requested    GFS_PBL_generic_pre_run
             edmf_run
```

index_of_time_step

    long_name   current forecast iteration
    units   index
    rank   0
    type   integer
    kind
    source   MODULE GFS_typedefs TYPE GFS_control_type
    local_name IPD_Control%kdt
    requested   GFS_calpreciptype_run
               gwdps_run
               sfc_nst_run

instantaneous_atmosphere_detrainment_convective_mass_flux

    long_name   (detrainment mass flux) * delt
    units   kg m-2
    rank   2
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name IPD_Interstitial(nt)%dt_mf
    requested   GFS_DCNV_generic_post_run
               sasas_deep_run
               sasas_shal_run

instantaneous_atmosphere_downdraft_convective_mass_flux

    long_name   (downdraft mass flux) * delt
    units   kg m-2
    rank   2
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name IPD_Interstitial(nt)%dd_mf
    requested   GFS_DCNV_generic_post_run
               sasas_deep_run

instantaneous_atmosphere_updraft_convective_mass_flux

    long_name   (updraft mass flux) * delt
    units   kg m-2
    rank   2
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name IPD_Interstitial(nt)%ud_mf
    requested   GFS_DCNV_generic_post_run
               sasas_deep_run
               sasas_shal_run

instantaneous_cosine_of_zenith_angle
```
long_name    cosine of zenith angle at current time
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%xcosz
requested    GFS_suite_interstitial_2_run
             dcyc2t3_run
             sfc_nst_run
```

instantaneous_surface_upward_latent_heat_flux
```
long_name    surface upward latent heat flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%dqsfc1
requested    GFS_PBL_generic_post_run
             edmf_run
```

instantaneous_surface_upward_sensible_heat_flux
```
long_name    surface upward sensible heat flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%dtsfc1
requested    GFS_PBL_generic_post_run
             edmf_run
```

instantaneous_surface_x_momentum_flux
```
long_name    x momentum flux
units        Pa
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%dusfc1
requested    GFS_PBL_generic_post_run
             edmf_run
```

instantaneous_surface_y_momentum_flux

      long_name   y momentum flux
      units   Pa
      rank   1
      type   real
      kind   kind_phys
      source   MODULE GFS_typedefs TYPE GFS_interstitial_type
      local_name   IPD_Interstitial(nt)%dvsfc1
      requested   GFS_PBL_generic_post_run
                   edmf_run

instantaneous_x_stress_due_to_gravity_wave_drag

      long_name   zonal surface stress due to orographic gravity wave drag
      units   Pa
      rank   1
      type   real
      kind   kind_phys
      source   MODULE GFS_typedefs TYPE GFS_interstitial_type
      local_name   IPD_Interstitial(nt)%dusfcg
      requested   gwdc_post_run
                   gwdc_run
                   gwdps_post_run
                   gwdps_run

instantaneous_y_stress_due_to_gravity_wave_drag

      long_name   meridional surface stress due to orographic gravity wave drag
      units   Pa
      rank   1
      type   real
      kind   kind_phys
      source   MODULE GFS_typedefs TYPE GFS_interstitial_type
      local_name   IPD_Interstitial(nt)%dvsfcg
      requested   gwdc_post_run
                   gwdc_run
                   gwdps_post_run
                   gwdps_run

iteration_number

      long_name   number of iteration
      units   index
      rank   0
      type   integer
      kind
      source   MODULE GFS_typedefs TYPE GFS_interstitial_type
      local_name   IPD_Interstitial(nt)%iter
      requested   GFS_surface_loop_control_part0_run
                   GFS_surface_loop_control_part1_run
                   GFS_surface_loop_control_part2_run

kinematic_surface_upward_latent_heat_flux

```
long_name    kinematic surface upward latent heat flux
units        kg kg-1 m s-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%evap
requested    GFS_suite_interstitial_2_run
             edmf_run
             lsm_noah_run
             sfc_diag_run
             sfc_nst_run
             sfc_sice_run
```

kinematic_surface_upward_sensible_heat_flux

```
long_name    kinematic surface upward sensible heat flux
units        K m s-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%hflx
requested    GFS_suite_interstitial_2_run
             edmf_run
             lsm_noah_run
             sfc_nst_run
             sfc_sice_run
```

large_scale_condensate_heating_rate_at_model_layers

```
long_name    large scale condensate heating rate at model layers
units        K s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%dt3dt(:,:,6)
requested    GFS_MP_generic_post_run
```

large_scale_condensate_moistening_rate_at_model_layers

```
long_name    large scale condensate moistening rate at model layers
units        kg kg-1 s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%dq3dt(:,:,4)
requested    GFS_MP_generic_post_run
```

largest_cloud_top_vertical_index_encountered_thus_far
```
long_name    largest cloud top vertical index encountered thus far
units        index
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_tbd_type
local_name   IPD_Data(nb)%Tbd%acvt
requested    cnvc90_run
```

latitude
```
long_name    grid latitude in radians
units        radians
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_grid_type
local_name   IPD_Data(nb)%Grid%xlat
requested    NOT REQUESTED
```

latitude_index_in_debug_printouts
```
long_name    latitude index in debug printouts
units        index
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%latidxprnt
requested    gwdc_run
```

longitude
```
long_name    grid longitude in radians
units        radians
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_grid_type
local_name   IPD_Data(nb)%Grid%xlon
requested    dcyc2t3_run
             sfc_nst_post_run
             sfc_nst_run
```

lw_fluxes_sfc
```
long_name    lw radiation fluxes at sfc
units        W m-2
rank         1
type         sfcflw_type
kind
source       MODULE GFS_typedefs TYPE GFS_radtend_type
local_name   IPD_Data(nb)%Radtend%sfcflw
requested    rrtmg_lw_run
```

lw_fluxes_top_atmosphere
```
long_name    lw radiation fluxes at top
units        W m-2
rank         1
type         topflw_type
kind
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%topflw
requested    rrtmg_lw_run
```

lwe_thickness_of_convective_precipitation_amount_on_dynamics_timestep
```
long_name    convective rain at this time step
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%rainc
requested    GFS_calpreciptype_run
             cnvc90_run
```

lwe_thickness_of_deep_convective_precipitation_amount
```
long_name    deep convective rainfall amount on physics timestep
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%raincd
requested    GFS_DCNV_generic_post_run
             sasas_deep_run
```

lwe_thickness_of_moist_convective_adj_precipitation_amount
```
long_name    adjusted moist convective rainfall amount on physics timestep
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%rainmcadj
requested    NOT REQUESTED
```

lwe_thickness_of_precipitation_amount_on_dynamics_timestep
```
long_name    total rain at this time step
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%rain
requested    GFS_MP_generic_post_run
             GFS_calpreciptype_run
```

lwe_thickness_of_shallow_convective_precipitation_amount

```
long_name    shallow convective rainfall amount on physics timestep
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%raincs
requested    sasas_shal_post_run
             sasas_shal_run
```

lwe_thickness_of_stratiform_precipitation_amount

```
long_name    stratiform rainfall amount on physics timestep
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%rainst
requested    GFS_calpreciptype_run
             zhaocarr_precpd_run
```

maximum_column_heating_rate

```
long_name    maximum heating rate in column
units        K s-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%cumabs
requested    gwdc_pre_run
             gwdc_run
```

maximum_subgrid_orography

```
long_name    maximum of subgrid orography
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%elvmax
requested    gwdps_pre_run
             gwdps_run
```

maximum_vegetation_area_fraction
```
long_name    max fractional coverage of green vegetation
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%shdmax
requested    lsm_noah_run
             sfc_ex_coef_run
```

mean_change_over_depth_in_sea_water_temperature
```
long_name    mean of dT(z) (zsea1 to zsea2)
units        K
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%dtzm
requested    sfc_nst_post_run
```

mean_effective_radius_for_ice_cloud
```
long_name    mean effective radius for ice cloud
units        micron
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%clouds(:,:,5)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

mean_effective_radius_for_liquid_cloud
```
long_name    mean effective radius for liquid cloud
units        micron
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%clouds(:,:,3)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

mean_effective_radius_for_rain_drop

```
long_name    mean effective radius for rain drop
units        micron
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%clouds(:,:,7)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

mean_effective_radius_for_snow_flake

```
long_name    mean effective radius for snow flake
units        micron
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%clouds(:,:,9)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

minimum_vegetation_area_fraction

```
long_name    min fractional coverage of green vegetation
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%shdmin
requested    lsm_noah_run
```

model_layer_number_at_cloud_base

```
long_name    vertical indices for low, middle and high cloud bases
units        index
rank         2
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%mbota
requested    GFS_rrtmg_post_run
             GFS_rrtmg_pre_run
```

model_layer_number_at_cloud_top

```
long_name    vertical indices for low, middle and high cloud tops
units        index
rank         2
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%mtopa
requested    GFS_rrtmg_post_run
             GFS_rrtmg_pre_run
```

mpi_rank

```
long_name    current MPI-rank
units        index
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%me
requested    gwdps_run
             ozphys_run
```

multiplication_factors_for_convective_gravity_wave_drag

```
long_name    multiplication factor for convective GWD
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%cgwf
requested    gwdc_pre_run
```

multiplication_factors_for_mountain_blocking_and_orographic_gravity_wave_drag

```
long_name    multiplication factors for cdmb and gwd
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%cdmbgwd
requested    gwdps_run
```

natural_log_of_ozone_forcing_data_pressure_levels

```
long_name    natural log of ozone forcing data pressure levels
units        log(Pa)
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%oz_pres
requested    ozphys_run
```

nonnegative_lwe_thickness_of_precipitation_amount_on_dynamics_timestep
```
long_name    total precipitation amount in each time step
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%tprcp
requested    GFS_calpreciptype_run
             lsm_noah_run
             sfc_nst_run
             sfc_sice_run
```

normalized_soil_wetness
```
long_name    normalized soil wetness
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%wet1
requested    lsm_noah_run
```

number_of_coefficients_in_ozone_forcing_data
```
long_name    number of coefficients in ozone forcing data
units        index
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%oz_coeff
requested    ozphys_post_run
             ozphys_run
```

number_of_equatorial_longitude_points
```
long_name    number of global points in x-dir (i) along the equator
units        count
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%lonr
requested    gwdps_run
```

number_of_hydrometeors

    long_name   choice of cloud scheme / number of hydrometeors
    units   count
    rank   0
    type   integer
    kind
    source   MODULE GFS_typedefs TYPE GFS_control_type
    local_name   IPD_Control%ncld
    requested   GFS_MP_generic_post_run
                 GFS_MP_generic_pre_run
                 sasas_deep_run
                 sasas_shal_run

number_of_statistical_measures_of_subgrid_orography

    long_name   number of topographic variables in GWD
    units   count
    rank   0
    type   integer
    kind
    source   MODULE GFS_typedefs TYPE GFS_control_type
    local_name   IPD_Control%nmtvr
    requested   gwdps_pre_run
                 gwdps_run

number_of_total_tracers

    long_name   total number of tracers
    units   count
    rank   0
    type   integer
    kind
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%tracers_total
    requested   NOT REQUESTED

number_of_vertical_diffusion_tracers

    long_name   number of tracers to diffuse vertically
    units   count
    rank   0
    type   integer
    kind
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%nvdiff
    requested   edmf_run

number_of_vertical_layers_for_radiation_calculations

    long_name   number of vertical levels for radiation calculations
    units   count
    rank   0
    type   integer
    kind
    source   MODULE GFS_typedefs TYPE GFS_control_type
    local_name   IPD_Control%levr
    requested   rayleigh_damp_run

number_of_water_tracers
```
    long_name    number of water-related tracers
    units        count
    rank         0
    type         integer
    kind
    source       MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%tracers_water
    requested    NOT REQUESTED
```

ocean_mixed_layer_thickness
```
    long_name    mixed layer thickness
    units        m
    rank         1
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
    local_name   IPD_Data(nb)%Sfcprop%zm
    requested    sfc_nst_run
```

omega
```
    long_name    layer mean vertical velocity
    units        Pa s-1
    rank         2
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_statein_type
    local_name   IPD_Data(nb)%Statein%vvl
    requested    sasas_deep_run
                 sasas_shal_run
```

orography
```
    long_name    orography
    units        m
    rank         1
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
    local_name   IPD_Data(nb)%Sfcprop%oro
    requested    sfc_nst_post_run
                 sfc_nst_pre_run
```

orography_unfiltered
```
    long_name    unfiltered orography
    units        m
    rank         1
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
    local_name   IPD_Data(nb)%Sfcprop%oro_uf
    requested    sfc_nst_post_run
                 sfc_nst_pre_run
```

ozone_concentration_at_layer_for_radiation

```
long_name    ozone concentration layer
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%olyr
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

ozone_concentration_updated_by_physics

```
long_name    ozone concentration updated by physics
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_stateout_type
local_name   IPD_Data(nb)%Stateout%gq0(:,:,IPD_Control%ntoz)
requested    ozphys_run
```

ozone_forcing

```
long_name    ozone forcing data
units        various
rank         3
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_tbd_type
local_name   IPD_Data(nb)%Tbd%ozpl
requested    ozphys_run
```

pi

```
long_name    ratio of a circle's circumference to its diameter
units        radians
rank         0
type         real
kind         kind_phys
source       MODULE physcons
local_name   con_pi
requested    gwdc_run
```

pressure_at_bottom_of_convective_cloud

```
long_name    convective cloud bottom pressure
units        Pa
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_cldprop_type
local_name   IPD_Data(nb)%Cldprop%cvb
requested    cnvc90_run
```

pressure_at_top_of_convective_cloud

```
long_name    convective cloud top pressure
units        Pa
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_cldprop_type
local_name   IPD_Data(nb)%Cldprop%cvt
requested    cnvc90_run
```

pressure_cutoff_for_rayleigh_damping

```
long_name    pressure level from which Rayleigh Damping is applied
units        Pa
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%prslrd0
requested    rayleigh_damp_run
```

random_number_array

```
long_name    random number array (0-1)
units        none
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_tbd_type
local_name   IPD_Data(nb)%Tbd%rann
requested    GFS_calpreciptype_run
```

ratio_of_exner_function_between_midlayer_and_interface_at_lowest_model_layer

```
long_name    Exner function ratio bt midlayer and interface at 1st layer
units        ratio
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%work3
requested    GFS_surface_generic_pre_run
             lsm_noah_run
             sfc_diag_run
             sfc_ex_coef_run
             sfc_nst_run
             sfc_sice_pre_run
             sfc_sice_run
```

ratio_of_snowfall_to_rainfall
```
     long_name    snow ratio:  ratio of snow to total precipitation
     units        frac
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_diag_type
     local_name   IPD_Data(nb)%Intdiag%sr
     requested    GFS_calpreciptype_run
                  zhaocarr_precpd_run
```

ratio_of_vapor_to_dry_air_gas_constants_minus_one
```
     long_name    rv/rd - 1 (rv = ideal gas constant for water vapor)
     units        none
     rank         0
     type         real
     kind         kind_phys
     source       MODULE physcons
     local_name   con_fvirt
     requested    gwdc_run
```

ratio_of_wind_at_lowest_model_layer_and_wind_at_10m
```
     long_name    ratio of sigma level 1 wind and 10m wind
     units        ratio
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
     local_name   IPD_Data(nb)%Sfcprop%f10m
     requested    sfc_diag_run
```

sea_ice_concentration
```
     long_name    ice fraction over open water
     units        frac
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
     local_name   IPD_Data(nb)%Sfcprop%fice
     requested    sfc_sice_post_run
                  sfc_sice_pre_run
```

sea_ice_concentration_for_physics
```
     long_name    sea-ice concentration [0,1]
     units        frac
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_interstitial_type
     local_name   IPD_Interstitial(nt)%cice
     requested    sfc_sice_post_run
                  sfc_sice_pre_run
                  sfc_sice_run
```

sea_ice_temperature
```
     long_name    sea uce surface skin temperature
     units        K
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
     local_name   IPD_Data(nb)%Sfcprop%tisfc
     requested    sfc_sice_post_run
                  sfc_sice_pre_run
```

sea_ice_temperature_for_physics
```
     long_name    sea-ice surface temperature
     units        K
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_interstitial_type
     local_name   IPD_Interstitial(nt)%tice
     requested    sfc_sice_post_run
                  sfc_sice_pre_run
                  sfc_sice_run
```

sea_ice_thickness
```
     long_name    sea ice thickness
     units        m
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
     local_name   IPD_Data(nb)%Sfcprop%hice
     requested    sfc_sice_post_run
                  sfc_sice_pre_run
```

sea_ice_thickness_for_physics
```
     long_name    sea-ice thickness
     units        m
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_interstitial_type
     local_name   IPD_Interstitial(nt)%zice
     requested    sfc_sice_post_run
                  sfc_sice_pre_run
                  sfc_sice_run
```

sea_land_ice_mask
```
long_name    sea/land/ice mask (=0/1/2)
units        flag
rank         1
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%islmsk
requested    GFS_suite_interstitial_1_run
             GFS_surface_generic_pre_run
             GFS_surface_loop_control_part2_run
             lsm_noah_run
             sasas_deep_run
             sasas_shal_run
             sfc_ex_coef_run
             sfc_nst_post_run
             sfc_nst_pre_run
             sfc_nst_run
             sfc_sice_post_run
             sfc_sice_run
```

sea_land_ice_mask_real
```
long_name    landmask:  sea/land/ice=0/1/2
units        flag
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%slmsk
requested    sfc_nst_post_run
```

sea_surface_reference_temperature
```
long_name    sea surface reference temperature
units        K
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%tref
requested    sfc_nst_post_run
             sfc_nst_run
```

sea_water_salinity
```
long_name    salinity content in diurnal thermocline layer
units        ppt m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%xs
requested    sfc_nst_run
```

seconds_elapsed_since_model_initialization
```
long_name    seconds elapsed since model initialization
units        s
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%sec
requested    NOT REQUESTED
```

seed_random_numbers_lw
```
long_name    random seeds for sub-column cloud generators lw
units        none
rank         1
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_tbd_type
local_name   IPD_Data(nb)%Tbd%icsdlw
requested    rrtmg_lw_run
```

seed_random_numbers_sw
```
long_name    random seeds for sub-column cloud generators sw
units        none
rank         1
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_tbd_type
local_name   IPD_Data(nb)%Tbd%icsdsw
requested    rrtmg_sw_run
```

sensible_heat_flux_due_to_rainfall
```
long_name    sensible heat flux due to rainfall
units        W
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%qrain
requested    sfc_nst_run
```

sensitivity_of_dtl_heat_content_to_surface_temperature
```
long_name    d(xt)/d(ts)
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%xtts
requested    sfc_nst_run
```

sensitivity_of_dtl_thickness_to_surface_temperature
```
     long_name    d(xz)/d(ts)
     units        m K-1
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
     local_name   IPD_Data(nb)%Sfcprop%xzts
     requested    sfc_nst_run
```

sine_of_latitude
```
     long_name    sine of the grid latitude
     units        none
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_grid_type
     local_name   IPD_Data(nb)%Grid%sinlat
     requested    dcyc2t3_run
                  sfc_nst_run
```

sine_of_solar_declination_angle
```
     long_name    sin of the solar declination angle
     units        none
     rank         0
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_control_type
     local_name   IPD_Control%sdec
     requested    dcyc2t3_run
```

slope_of_subgrid_orography
```
     long_name    slope of subgrid orography
     units        none
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_interstitial_type
     local_name   IPD_Interstitial(nt)%sigma
     requested    gwdps_pre_run
                  gwdps_run
```

smallest_cloud_base_vertical_index_encountered_thus_far
```
     long_name    smallest cloud base vertical index encountered thus far
     units        index
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_tbd_type
     local_name   IPD_Data(nb)%Tbd%acvb
     requested    cnvc90_run
```

snow_deposition_sublimation_upward_latent_heat_flux

```
long_name    latent heat flux from snow depo/subl
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%sbsno
requested    GFS_surface_generic_post_run
             lsm_noah_pre_run
             lsm_noah_run
```

snow_freezing_rain_upward_latent_heat_flux

```
long_name    latent heat flux due to snow and frz rain
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%snohf
requested    GFS_surface_generic_post_run
             lsm_noah_pre_run
             lsm_noah_run
```

soil_moisture_content

```
long_name    soil moisture
units        kg m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%soilm
requested    lsm_noah_run
```

soil_temperature

```
long_name    soil temperature
units        K
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%stc
requested    lsm_noah_run
             sfc_sice_run
```

soil_type
```
long_name    soil type classification
units        index
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%isot
requested    lsm_noah_run
```

soil_upward_latent_heat_flux
```
long_name    soil upward latent heat flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%evbs
requested    GFS_surface_generic_post_run
             lsm_noah_pre_run
             lsm_noah_run
```

soil_vertical_dimension
```
long_name    number of soil layers
units        count
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%lsoil
requested    lsm_noah_post_run
             lsm_noah_pre_run
             lsm_noah_run
             sfc_nst_run
             sfc_sice_run
```

solar_constant
```
long_name    solar constant (sun-earth distant adjusted)
units        W m-2
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%solcon
requested    rrtmg_sw_run
```

specific_heat_of_dry_air_at_constant_pressure

```
long_name    specific heat of dry air at constant pressure
units        J kg-1 K-1
rank         0
type         real
kind         kind_phys
source       MODULE physcons
local_name   con_cp
requested    gwdc_post_run
             gwdc_run
             gwdps_run
             rayleigh_damp_run
```

specific_humidity_at_2m

```
long_name    2 meter specific humidity
units        kg kg-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%q2m
requested    sfc_diag_run
```

specific_humidity_at_lowest_model_layer

```
long_name    specific humidity at lowest model layer
units        kg kg-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%qgrs(:,1,1)
requested    lsm_noah_run
             sfc_diag_run
             sfc_ex_coef_run
             sfc_nst_run
             sfc_sice_run
```

standard_deviation_of_subgrid_orography

```
long_name    standard deviation of subgrid orography
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%hprime1
requested    gwdps_pre_run
             gwdps_run
```

start_index_of_other_tracers

    long_name   beginning index of the non-water tracer species
    units   index
    rank   0
    type   integer
    kind
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%tracers_start_index
    requested   NOT REQUESTED

statistical_measures_of_subgrid_orography

    long_name   orographic metrics
    units   various
    rank   2
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_sfcprop_type
    local_name   IPD_Data(nb)%Sfcprop%hprime
    requested   gwdps_pre_run

sub-layer_cooling_amount

    long_name   sub-layer cooling amount
    units   K
    rank   1
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_sfcprop_type
    local_name   IPD_Data(nb)%Sfcprop%dt_cool
    requested   sfc_nst_post_run
                 sfc_nst_run

sub-layer_cooling_thickness

    long_name   sub-layer cooling thickness
    units   m
    rank   1
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_sfcprop_type
    local_name   IPD_Data(nb)%Sfcprop%z_c
    requested   sfc_nst_post_run
                 sfc_nst_run

subsurface_runoff_flux

    long_name   subsurface runoff flux
    units   g m-2 s-1
    rank   1
    type   real
    kind   kind_phys
    source   MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%drain
    requested   lsm_noah_post_run
                 lsm_noah_pre_run
                 lsm_noah_run

surface_air_pressure
```
     long_name    surface pressure
     units        Pa
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_statein_type
     local_name   IPD_Data(nb)%Statein%pgr
     requested    lsm_noah_run
                  rayleigh_damp_run
                  sasas_deep_run
                  sasas_shal_run
                  sfc_diag_run
                  sfc_ex_coef_run
                  sfc_nst_run
                  sfc_sice_run
                  zhaocarr_gscond_run
```

surface_air_pressure_at_previous_time_step
```
     long_name    surface air pressure at previous time step
     units        Pa
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_tbd_type
     local_name   IPD_Data(nb)%Tbd%phy_f2d(:,2)
     requested    zhaocarr_gscond_run
```

surface_air_pressure_two_time_steps_back
```
     long_name    surface air pressure two time steps back
     units        Pa
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_tbd_type
     local_name   IPD_Data(nb)%Tbd%phy_f2d(:,1)
     requested    zhaocarr_gscond_run
```

surface_air_temperature_for_radiation
```
     long_name    lowest model layer air temperature for radiation
     units        K
     rank         1
     type         real
     kind         kind_phys
     source       MODULE GFS_typedefs TYPE GFS_interstitial_type
     local_name   IPD_Interstitial(nt)%tsfa
     requested    GFS_rrtmg_pre_run
                  rrtmg_lw_post_run
                  rrtmg_lw_pre_run
                  rrtmg_sw_pre_run
```

surface_albedo_due_to_UV_and_VIS_diffused

```
long_name    surface albedo due to UV+VIS diffused beam
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%sfcalb(:,4)
requested    rrtmg_sw_post_run
             rrtmg_sw_pre_run
             rrtmg_sw_run
```

surface_albedo_due_to_UV_and_VIS_direct

```
long_name    surface albedo due to UV+VIS direct beam
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%sfcalb(:,3)
requested    rrtmg_sw_post_run
             rrtmg_sw_pre_run
             rrtmg_sw_run
```

surface_albedo_due_to_near_IR_diffused

```
long_name    surface albedo due to near IR diffused beam
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%sfcalb(:,2)
requested    rrtmg_sw_post_run
             rrtmg_sw_pre_run
             rrtmg_sw_run
```

surface_albedo_due_to_near_IR_direct

```
long_name    surface albedo due to near IR direct beam
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%sfcalb(:,1)
requested    rrtmg_sw_post_run
             rrtmg_sw_pre_run
             rrtmg_sw_run
```

surface_diffused_shortwave_albedo
```
long_name    mean surface diffused sw albedo
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_radtend_type
local_name   IPD_Data(nb)%Radtend%sfalb
requested    lsm_noah_run
```

surface_downwelling_diffuse_near_infrared_shortwave_flux
```
long_name    surface downwelling diffuse near-infrared shortwave flux at current time
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%adjnirdfd
requested    dcyc2t3_run
```

surface_downwelling_diffuse_near_infrared_shortwave_flux_on_radiation_time_step
```
long_name    sfc nir diff sw downward flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_coupling_type
local_name   IPD_Data(nb)%Coupling%nirdfdi
requested    dcyc2t3_run
```

surface_downwelling_diffuse_ultraviolet_and_visible_shortwave_flux
```
long_name    surface downwelling diffuse ultraviolet plus visible shortwave flux at cu
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%adjvisdfd
requested    dcyc2t3_run
```

surface_downwelling_diffuse_ultraviolet_and_visible_shortwave_flux_on_radiation_time_step
```
long_name    sfc uv+vis diff sw downward flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_coupling_type
local_name   IPD_Data(nb)%Coupling%visdfdi
requested    dcyc2t3_run
```

surface_downwelling_direct_near_infrared_shortwave_flux

```
long_name    surface downwelling beam near-infrared shortwave flux at current time
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%adjnirbmd
requested    dcyc2t3_run
```

surface_downwelling_direct_near_infrared_shortwave_flux_on_radiation_time_step

```
long_name    sfc nir beam sw downward flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_coupling_type
local_name   IPD_Data(nb)%Coupling%nirbmdi
requested    dcyc2t3_run
```

surface_downwelling_direct_ultraviolet_and_visible_shortwave_flux

```
long_name    surface downwelling beam ultraviolet plus visible shortwave flux at curre
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%adjvisbmd
requested    dcyc2t3_run
```

surface_downwelling_direct_ultraviolet_and_visible_shortwave_flux_on_radiation_time_step

```
long_name    sfc uv+vis beam sw downward flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_coupling_type
local_name   IPD_Data(nb)%Coupling%visbmdi
requested    dcyc2t3_run
```

surface_downwelling_longwave_flux

```
long_name    surface downwelling longwave flux at current time
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%adjsfcdlw
requested    GFS_suite_interstitial_2_run
             GFS_surface_generic_pre_run
             dcyc2t3_post_run
             dcyc2t3_run
```

surface_downwelling_longwave_flux_absorbed_by_ground
```
long_name    total sky surface downward longwave flux absorbed by the ground
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gabsbdlw
requested    GFS_surface_generic_pre_run
             lsm_noah_run
             sfc_nst_run
             sfc_sice_run
```

surface_downwelling_longwave_flux_on_radiation_time_step
```
long_name    total sky sfc downward lw flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_coupling_type
local_name   IPD_Data(nb)%Coupling%sfcdlw
requested    dcyc2t3_run
```

surface_downwelling_shortwave_flux
```
long_name    surface downwelling shortwave flux at current time
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%adjsfcdsw
requested    GFS_suite_interstitial_2_run
             dcyc2t3_post_run
             dcyc2t3_run
             lsm_noah_run
             sfc_sice_run
```

surface_downwelling_shortwave_flux_on_radiation_time_step
```
long_name    total sky sfc downward sw flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_coupling_type
local_name   IPD_Data(nb)%Coupling%sfcdsw
requested    dcyc2t3_run
```

surface_drag_coefficient_for_heat_and_moisture_in_air

```
long_name    surface exchange coeff heat moisture
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%cdq
requested    lsm_noah_run
             sfc_ex_coef_run
             sfc_nst_run
             sfc_sice_run
```

surface_drag_coefficient_for_momentum_in_air

```
long_name    surface exchange coeff for momentum
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%cd
requested    lsm_noah_run
             sfc_ex_coef_run
             sfc_nst_run
             sfc_sice_run
```

surface_drag_mass_flux_for_heat_and_moisture_in_air

```
long_name    thermal exchange coefficient
units        kg m-2 s-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%chh
requested    lsm_noah_run
             sfc_nst_run
             sfc_sice_run
```

surface_drag_wind_speed_for_momentum_in_air

```
long_name    momentum exchange coefficient
units        m s-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%cmm
requested    lsm_noah_run
             sfc_nst_run
             sfc_sice_run
```

surface_friction_velocity

```
long_name    boundary layer parameter
units        m s-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%uustar
requested    sfc_ex_coef_run
```

surface_ground_temperature_for_radiation

```
long_name    surface ground temperature for radiation
units        K
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%tsfg
requested    GFS_rrtmg_pre_run
             rrtmg_lw_pre_run
             rrtmg_lw_run
             rrtmg_sw_pre_run
```

surface_longwave_emissivity

```
long_name    surface lw emissivity in fraction
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_radtend_type
local_name   IPD_Data(nb)%Radtend%semis
requested    dcyc2t3_run
             lsm_noah_run
             rrtmg_lw_run
             sfc_nst_run
             sfc_sice_run
```

surface_midlayer_air_temperature_in_longwave_radiation

```
long_name    surface air temp during lw calculation
units        K
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_radtend_type
local_name   IPD_Data(nb)%Radtend%tsflw
requested    dcyc2t3_run
```

surface_net_downwelling_shortwave_flux

```
long_name     surface net downwelling shortwave flux at current time
units         W m-2
rank          1
type          real
kind          kind_phys
source        MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name    IPD_Interstitial(nt)%adjsfcnsw
requested     dcyc2t3_post_run
              dcyc2t3_run
              lsm_noah_run
              sfc_nst_run
              sfc_sice_run
```

surface_net_downwelling_shortwave_flux_on_radiation_time_step

```
long_name     total sky sfc netsw flx into ground
units         W m-2
rank          1
type          real
kind          kind_phys
source        MODULE GFS_typedefs TYPE GFS_coupling_type
local_name    IPD_Data(nb)%Coupling%sfcnsw
requested     dcyc2t3_run
```

surface_roughness_length

```
long_name     surface roughness length
units         cm
rank          1
type          real
kind          kind_phys
source        MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name    IPD_Data(nb)%Sfcprop%zorl
requested     edmf_run
              lsm_noah_run
              sfc_ex_coef_run
```

surface_runoff

```
long_name     surface water runoff (from lsm)
units         kg m-2
rank          1
type          real
kind          kind_phys
source        MODULE GFS_typedefs TYPE GFS_diag_type
local_name    IPD_Data(nb)%Intdiag%srunoff
requested     lsm_noah_post_run
```

surface_runoff_flux

```
long_name    surface runoff flux
units        g m-2 s-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%runoff
requested    lsm_noah_post_run
             lsm_noah_pre_run
             lsm_noah_run
```

surface_skin_temperature

```
long_name    ocean surface skin temperature
units        K
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%tsfc
requested    GFS_calpreciptype_run
             dcyc2t3_run
             edmf_run
             lsm_noah_run
             sfc_diag_run
             sfc_ex_coef_run
             sfc_nst_post_run
             sfc_nst_pre_run
             sfc_sice_post_run
             sfc_sice_run
```

surface_skin_temperature_after_iteration

```
long_name    surface skin temperature after iteration
units        K
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%tsurf
requested    GFS_surface_generic_pre_run
             lsm_noah_run
             sfc_ex_coef_run
             sfc_nst_post_run
             sfc_nst_pre_run
             sfc_nst_run
```

surface_skin_temperature_for_nsst

```
long_name    ocean surface skin temperature
units        K
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%tseal
requested    sfc_nst_pre_run
             sfc_nst_run
```

surface_slope_classification

```
long_name    class of sfc slope
units        index
rank         1
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%slopetype
requested    GFS_surface_generic_pre_run
             lsm_noah_run
```

surface_snow_area_fraction

```
long_name    surface snow area fraction
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%snowc
requested    GFS_surface_generic_post_run
             lsm_noah_pre_run
             lsm_noah_run
```

surface_snow_area_fraction_for_diagnostics

```
long_name    surface snow area fraction
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%sncovr
requested    lsm_noah_run
```

surface_snow_melt

```
long_name    snow melt during timestep
units        m
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%snowmt
requested    sfc_sice_run
```

surface_snow_thickness_water_equivalent

```
long_name    water equivalent snow depth over land
units        mm
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%snowd
requested    lsm_noah_run
             sfc_ex_coef_run
             sfc_sice_run
```

surface_specific_humidity

```
long_name    surface air saturation specific humidity
units        kg kg-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%qss
requested    lsm_noah_run
             sfc_diag_run
             sfc_nst_run
             sfc_sice_run
```

surface_upward_potential_latent_heat_flux

```
long_name    surface upward potential latent heat flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%ep1d
requested    GFS_surface_generic_post_run
             GFS_surface_generic_pre_run
             lsm_noah_run
             sfc_nst_run
             sfc_sice_run
```

surface_upwelling_diffuse_near_infrared_shortwave_flux

```
long_name    surface upwelling diffuse near-infrared shortwave flux at current time
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%adjnirdfu
requested    dcyc2t3_run
```

surface_upwelling_diffuse_near_infrared_shortwave_flux_on_radiation_time_step

```
long_name    sfc nir diff sw upward flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_coupling_type
local_name   IPD_Data(nb)%Coupling%nirdfui
requested    dcyc2t3_run
```

surface_upwelling_diffuse_ultraviolet_and_visible_shortwave_flux

```
long_name    surface upwelling diffuse ultraviolet plus visible shortwave flux at curr
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%adjvisdfu
requested    dcyc2t3_run
```

surface_upwelling_diffuse_ultraviolet_and_visible_shortwave_flux_on_radiation_time_step

```
long_name    sfc uv+vis diff sw upward flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_coupling_type
local_name   IPD_Data(nb)%Coupling%visdfui
requested    dcyc2t3_run
```

surface_upwelling_direct_near_infrared_shortwave_flux

```
long_name    surface upwelling beam near-infrared shortwave flux at current time
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%adjnirbmu
requested    dcyc2t3_run
```

surface_upwelling_direct_near_infrared_shortwave_flux_on_radiation_time_step

```
long_name    sfc nir beam sw upward flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_coupling_type
local_name   IPD_Data(nb)%Coupling%nirbmui
requested    dcyc2t3_run
```

surface_upwelling_direct_ultraviolet_and_visible_shortwave_flux

```
long_name    surface upwelling beam ultraviolet plus visible shortwave flux at current
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%adjvisbmu
requested    dcyc2t3_run
```

surface_upwelling_direct_ultraviolet_and_visible_shortwave_flux_on_radiation_time_step

```
long_name    sfc uv+vis beam sw upward flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_coupling_type
local_name   IPD_Data(nb)%Coupling%visbmui
requested    dcyc2t3_run
```

surface_upwelling_longwave_flux

```
long_name    surface upwelling longwave flux at current time
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%adjsfculw
requested    GFS_suite_interstitial_2_run
             dcyc2t3_post_run
             dcyc2t3_run
```

surface_wind_enhancement_due_to_convection

```
long_name    surface wind enhancement due to convection
units        m s-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_tbd_type
local_name   IPD_Data(nb)%Tbd%phy_f2d(:,IPD_Control%num_p2d)
requested    lsm_noah_run
             sfc_ex_coef_run
             sfc_nst_run
             sfc_sice_run
```

surface_wind_stress
```
long_name    surface wind stress
units        m2 s-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%stress
requested    edmf_run
             sfc_ex_coef_run
             sfc_nst_run
```

sw_fluxes_sfc
```
long_name    sw radiation fluxes at sfc
units        W m-2
rank         1
type         sfcfsw_type
kind
source       MODULE GFS_typedefs TYPE GFS_radtend_type
local_name   IPD_Data(nb)%Radtend%sfcfsw
requested    rrtmg_sw_run
```

sw_fluxes_top_atmosphere
```
long_name    sw radiation fluxes at toa
units        W m-2
rank         1
type         topfsw_type
kind
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%topfsw
requested    rrtmg_sw_run
```

temperature_at_2m
```
long_name    2 meter temperature
units        K
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%t2m
requested    sfc_diag_run
```

tendency_of_air_temperature_due_to_longwave_heating_assuming_clear_sky_on_radiation_time_st
```
long_name    clear sky heating rate due to longwave radiation
units        K s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_tbd_type
local_name   IPD_Data(nb)%Tbd%htlw0
requested    dcyc2t3_run
             rrtmg_lw_post_run
             rrtmg_lw_run
```

tendency_of_air_temperature_due_to_longwave_heating_assuming_clear_sky_on_radiation_timeste

long_name	clear sky lw heating rates
units	K s-1
rank	2
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_radtend_type
local_name	IPD_Data(nb)%Radtend%lwhc
requested	NOT REQUESTED

tendency_of_air_temperature_due_to_longwave_heating_on_radiation_time_step

long_name	total sky heating rate due to longwave radiation
units	K s-1
rank	2
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_tbd_type
local_name	IPD_Data(nb)%Tbd%htlwc
requested	dcyc2t3_run
	edmf_run
	rrtmg_lw_post_run
	rrtmg_lw_run

tendency_of_air_temperature_due_to_longwave_heating_on_radiation_timestep

long_name	total sky lw heating rate
units	K s-1
rank	2
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_radtend_type
local_name	IPD_Data(nb)%Radtend%htrlw
requested	NOT REQUESTED

tendency_of_air_temperature_due_to_model_physics

long_name	air temperature tendency due to model physics
units	K s-1
rank	2
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%dtdt
requested	GFS_PBL_generic_post_run
	GFS_suite_interstitial_1_run
	GFS_suite_update_stateout_run
	dcyc2t3_run
	edmf_run
	gwdps_post_run
	gwdps_run
	rayleigh_damp_run

tendency_of_air_temperature_due_to_radiative_heating_assuming_clear_sky

long_name	clear sky radiative (shortwave + longwave) heating rate at current time
units	K s-1
rank	2
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%dtdtc
requested	GFS_suite_interstitial_1_run
	dcyc2t3_run

tendency_of_air_temperature_due_to_shortwave_heating_assuming_clear_sky_on_radiation_time_s

long_name	clear sky heating rates due to shortwave radiation
units	K s-1
rank	2
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_tbd_type
local_name	IPD_Data(nb)%Tbd%htsw0
requested	dcyc2t3_run
	rrtmg_sw_post_run
	rrtmg_sw_run

tendency_of_air_temperature_due_to_shortwave_heating_assuming_clear_sky_on_radiation_timest

long_name	clear sky sw heating rates
units	K s-1
rank	2
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_radtend_type
local_name	IPD_Data(nb)%Radtend%swhc
requested	NOT REQUESTED

tendency_of_air_temperature_due_to_shortwave_heating_on_radiation_time_step

long_name	total sky heating rate due to shortwave radiation
units	K s-1
rank	2
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_tbd_type
local_name	IPD_Data(nb)%Tbd%htswc
requested	dcyc2t3_run
	edmf_run
	rrtmg_sw_post_run
	rrtmg_sw_run

tendency_of_air_temperature_due_to_shortwave_heating_on_radiation_timestep

```
long_name    total sky sw heating rate
units        K s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_radtend_type
local_name   IPD_Data(nb)%Radtend%htrsw
requested    NOT REQUESTED
```

tendency_of_rain_water_mixing_ratio_due_to_model_physics

```
long_name    tendency of rain water mixing ratio due to model physics
units        kg kg-1 s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%rainp
requested    zhaocarr_precpd_run
```

tendency_of_tracers_due_to_model_physics

```
long_name    updated tendency of the tracers
units        kg kg-1 s-1
rank         3
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%dqdt
requested    GFS_PBL_generic_post_run
             GFS_suite_interstitial_1_run
             GFS_suite_update_stateout_run
             edmf_run
```

tendency_of_x_wind_due_to_convective_gravity_wave_drag

```
long_name    zonal wind tendency due to convective gravity wave drag
units        m s-2
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gwdcu
requested    gwdc_post_run
             gwdc_run
```

tendency_of_x_wind_due_to_model_physics
```
long_name    zonal wind tendency due to model physics
units        m s-2
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%dudt
requested    GFS_PBL_generic_post_run
             GFS_suite_interstitial_1_run
             GFS_suite_update_stateout_run
             edmf_run
             gwdps_post_run
             gwdps_run
             rayleigh_damp_run
```

tendency_of_y_wind_due_to_convective_gravity_wave_drag
```
long_name    meridional wind tendency due to convective gravity wave drag
units        m s-2
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gwdcv
requested    gwdc_post_run
             gwdc_run
```

tendency_of_y_wind_due_to_model_physics
```
long_name    meridional wind tendency due to model physics
units        m s-2
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%dvdt
requested    GFS_PBL_generic_post_run
             GFS_suite_interstitial_1_run
             GFS_suite_update_stateout_run
             edmf_run
             gwdps_post_run
             gwdps_run
             rayleigh_damp_run
```

threshold_volume_fraction_of_condensed_water_in_soil
```
long_name    soil moisture threshold (volumetric)
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%smcref2
requested    lsm_noah_pre_run
             lsm_noah_run
```

time_integral_of_x_stress_due_to_gravity_wave_drag
```
long_name    vertically integrated u change by OGWD
units        Pa s
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%dugwd
requested    gwdc_post_run
             gwdps_post_run
```

time_integral_of_y_stress_due_to_gravity_wave_drag
```
long_name    vertically integrated v change by OGWD
units        Pa s
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%dvgwd
requested    gwdc_post_run
             gwdps_post_run
```

time_scale_for_rayleigh_damping
```
long_name    time scale for Rayleigh damping in days
units        d
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%ral_ts
requested    rayleigh_damp_run
```

time_step_for_dynamics
```
long_name    dynamics timestep
units        s
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%dtf
requested    GFS_MP_generic_post_run
             gwdc_post_run
             gwdps_post_run
             lsm_noah_post_run
             lsm_noah_run
             sfc_nst_run
             sfc_sice_run
             zhaocarr_gscond_run
```

time_step_for_physics
```
long_name    physics timestep
units        s
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%dtp
requested    edmf_run
             gwdc_post_run
             gwdc_pre_run
             gwdc_run
             gwdps_run
             ozphys_run
             rayleigh_damp_run
             sasas_deep_run
             sasas_shal_run
             zhaocarr_gscond_run
             zhaocarr_precpd_run
```

time_step_for_radiation
```
long_name    radiation time step
units        s
rank         0
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%raddt
requested    GFS_rrtmg_post_run
             GFS_rrtmg_pre_run
```

total_cloud_fraction
```
long_name    layer total cloud fraction
units        frac
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%clouds(:,:,1)
requested    GFS_rrtmg_post_run
             GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

total_runoff
```
long_name    total water runoff
units        kg m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%runoff
requested    lsm_noah_post_run
```

tracer_concentration
```
long_name    model layer mean tracer concentration
units        kg kg-1
rank         3
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%qgrs
requested    edmf_run
```

tracer_concentration_updated_by_physics
```
long_name    tracer concentration updated by physics
units        kg kg-1
rank         3
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_stateout_type
local_name   IPD_Data(nb)%Stateout%gq0
requested    NOT REQUESTED
```

transpiration_flux
```
long_name    total plant transpiration rate
units        kg m-2 s-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%trans
requested    GFS_surface_generic_post_run
             lsm_noah_pre_run
             lsm_noah_run
```

upper_bound_on_max_albedo_over_deep_snow
```
long_name    maximum snow albedo
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%snoalb
requested    lsm_noah_run
```

upward_heat_flux_in_soil
```
long_name    soil heat flux
units        W m-2
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gflx
requested    GFS_surface_generic_post_run
             lsm_noah_run
             sfc_nst_run
             sfc_sice_run
```

vegetation_area_fraction
```
long_name    areal fractional cover of green vegetation
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%sigmaf
requested    GFS_surface_generic_pre_run
             lsm_noah_run
             sfc_ex_coef_run
```

vegetation_type
```
long_name    land use classification
units        index
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%ivegsrc
requested    lsm_noah_run
             sfc_ex_coef_run
```

vertical_dimension

long_name	number of vertical levels
units	count
rank	0
type	integer
kind	
source	MODULE GFS_typedefs TYPE GFS_control_type
local_name	IPD_Control%levs
requested	GFS_MP_generic_post_run
	GFS_MP_generic_pre_run
	GFS_PBL_generic_pre_run
	GFS_calpreciptype_run
	GFS_zhao_carr_pre_run
	cnvc90_run
	dcyc2t3_run
	edmf_run
	get_phi_fv3_run
	get_prs_fv3_run
	gwdc_post_run
	gwdc_pre_run
	gwdc_run
	gwdps_run
	ozphys_post_run
	ozphys_run
	rayleigh_damp_run
	sasas_deep_run
	sasas_shal_run
	zhaocarr_gscond_run
	zhaocarr_precpd_run

vertical_dimension_of_ozone_forcing_data

long_name	number of vertical layers in ozone forcing data
units	count
rank	0
type	integer
kind	
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%levozp
requested	ozphys_run

vertical_index_at_cloud_base

long_name	vertical index at cloud base
units	index
rank	1
type	integer
kind	
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%kbot
requested	GFS_suite_interstitial_3_run
	cnvc90_run
	gwdc_pre_run
	gwdc_run
	sasas_deep_run
	sasas_shal_run

vertical_index_at_cloud_top

long_name	vertical index at cloud top
units	index
rank	1
type	integer
kind	
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%ktop
requested	GFS_suite_interstitial_3_run
	cnvc90_run
	gwdc_pre_run
	gwdc_run
	sasas_deep_run
	sasas_shal_run

vertical_index_at_top_of_atmosphere_boundary_layer

long_name	vertical index at top atmospheric boundary layer
units	index
rank	1
type	integer
kind	
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%kpbl
requested	edmf_run
	gwdps_run

vertical_index_difference_between_inout_and_local

long_name	vertical index difference between in/out and local
units	index
rank	0
type	integer
kind	
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%kd
requested	GFS_rrtmg_post_run
	GFS_rrtmg_pre_run
	rrtmg_lw_post_run
	rrtmg_sw_post_run

vertical_index_difference_between_layer_and_lower_bound

```
long_name    vertical index difference between layer and lower bound
units        index
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%kb
requested    GFS_rrtmg_post_run
             GFS_rrtmg_pre_run
```

vertical_index_difference_between_layer_and_upper_bound

```
long_name    vertical index difference between layer and upper bound
units        index
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%kt
requested    GFS_rrtmg_post_run
             GFS_rrtmg_pre_run
```

vertical_interface_dimension

```
long_name    vertical interface dimension
units        count
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%levi
requested    GFS_calpreciptype_run
```

vertical_layer_dimension_for_radiation

```
long_name    number of vertical layers for radiation
units        count
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%lm
requested    GFS_rrtmg_post_run
             GFS_rrtmg_pre_run
             rrtmg_lw_post_run
             rrtmg_sw_post_run
```

vertical_temperature_average_range_lower_bound

```
long_name    zsea1 in mm
units        mm
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%nstf_name(4)
requested    sfc_nst_post_run
             sfc_nst_run
```

vertical_temperature_average_range_upper_bound

```
long_name    zsea2 in mm
units        mm
rank         0
type         integer
kind
source       MODULE GFS_typedefs TYPE GFS_control_type
local_name   IPD_Control%nstf_name(5)
requested    sfc_nst_post_run
             sfc_nst_run
```

volume_fraction_of_condensed_water_in_soil_at_wilting_point

```
long_name    wilting point (volumetric)
units        frac
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_diag_type
local_name   IPD_Data(nb)%Intdiag%smcwlt2
requested    lsm_noah_pre_run
             lsm_noah_run
```

volume_fraction_of_soil_moisture

```
long_name    total soil moisture
units        frac
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%smc
requested    lsm_noah_run
```

volume_fraction_of_unfrozen_soil_moisture

```
long_name    liquid soil moisture
units        frac
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%slc
requested    lsm_noah_run
```

volume_mixing_ratio_ccl4

```
long_name    volume mixing ratio ccl4
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gasvmr(:,:,9)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

volume_mixing_ratio_cfc11

```
long_name    volume mixing ratio cfc11
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gasvmr(:,:,6)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

volume_mixing_ratio_cfc113

```
long_name    volume mixing ratio cfc113
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gasvmr(:,:,10)
requested    GFS_rrtmg_pre_run
```

volume_mixing_ratio_cfc12

```
long_name    volume mixing ratio cfc12
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gasvmr(:,:,7)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

volume_mixing_ratio_cfc22

```
long_name    volume mixing ratio cfc22
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gasvmr(:,:,8)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

volume_mixing_ratio_ch4

```
long_name    volume mixing ratio ch4
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gasvmr(:,:,3)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

volume_mixing_ratio_co

```
long_name    volume mixing ratio co
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gasvmr(:,:,5)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

volume_mixing_ratio_co2

```
long_name    volume mixing ratio co2
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gasvmr(:,:,1)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

volume_mixing_ratio_n2o

```
long_name    volume mixing ratio no2
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gasvmr(:,:,2)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

volume_mixing_ratio_o2

```
long_name    volume mixing ratio o2
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%gasvmr(:,:,4)
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

water_equivalent_accumulated_snow_depth

```
long_name    water equiv of acc snow depth over land and sea ice
units        mm
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_sfcprop_type
local_name   IPD_Data(nb)%Sfcprop%weasd
requested    lsm_noah_run
             sfc_sice_run
```

water_vapor_specific_humidity

```
long_name    water vapor specific humidity
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%qgrs(:,:,1)
requested    get_prs_fv3_run
             gwdc_run
             gwdps_run
```

water_vapor_specific_humidity_at_layer_for_radiation

```
long_name    specific humidity layer
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%qlyr
requested    GFS_rrtmg_pre_run
             rrtmg_lw_run
             rrtmg_sw_run
```

water_vapor_specific_humidity_at_previous_time_step

```
long_name    water vapor specific humidity at previous time step
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_tbd_type
local_name   IPD_Data(nb)%Tbd%phy_f3d(:,:,4)
requested    zhaocarr_gscond_run
```

water_vapor_specific_humidity_save

```
long_name    water vapor specific humidity before entering a physics scheme
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%save_qv
requested    GFS_DCNV_generic_post_run
             GFS_DCNV_generic_pre_run
             GFS_MP_generic_post_run
             GFS_MP_generic_pre_run
             GFS_SCNV_generic_post_run
             GFS_SCNV_generic_pre_run
```

water_vapor_specific_humidity_two_time_steps_back

```
long_name    water vapor specific humidity two time steps back
units        kg kg-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_tbd_type
local_name   IPD_Data(nb)%Tbd%phy_f3d(:,:,2)
requested    zhaocarr_gscond_run
```

water_vapor_specific_humidity_updated_by_physics

long_name	water vapor specific humidity updated by physics
units	kg kg-1
rank	2
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_stateout_type
local_name	IPD_Data(nb)%Stateout%gq0(:,:,1)
requested	GFS_MP_generic_post_run
	GFS_MP_generic_pre_run
	GFS_calpreciptype_run
	get_phi_fv3_run
	sasas_deep_run
	sasas_shal_run
	zhaocarr_gscond_run
	zhaocarr_precpd_run

wind_speed_at_lowest_model_layer

long_name	wind speed at lowest model level
units	m s-1
rank	1
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name	IPD_Interstitial(nt)%wind
requested	GFS_surface_loop_control_part1_run
	GFS_surface_loop_control_part2_run
	edmf_run
	sfc_ex_coef_run

x_wind

long_name	zonal wind
units	m s-1
rank	2
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_statein_type
local_name	IPD_Data(nb)%Statein%ugrs
requested	edmf_run
	gwdc_run
	gwdps_run
	rayleigh_damp_run

x_wind_at_10m

long_name	10 meter u wind speed
units	m s-1
rank	1
type	real
kind	kind_phys
source	MODULE GFS_typedefs TYPE GFS_diag_type
local_name	IPD_Data(nb)%Intdiag%u10m
requested	edmf_run
	sfc_diag_run

x_wind_at_lowest_model_layer
```
long_name    zonal wind at lowest model layer
units        m s-1
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%ugrs(:,1)
requested    lsm_noah_run
             sfc_diag_run
             sfc_ex_coef_run
             sfc_nst_run
             sfc_sice_run
```

x_wind_save
```
long_name    x-wind before entering a physics scheme
units        m s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%save_u
requested    GFS_DCNV_generic_post_run
             GFS_DCNV_generic_pre_run
```

x_wind_updated_by_physics
```
long_name    zonal wind updated by physics
units        m s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_stateout_type
local_name   IPD_Data(nb)%Stateout%gu0
requested    gwdc_post_run
             sasas_deep_run
             sasas_shal_run
```

y_wind
```
long_name    meridional wind
units        m s-1
rank         2
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_statein_type
local_name   IPD_Data(nb)%Statein%vgrs
requested    edmf_run
             gwdc_run
             gwdps_run
             rayleigh_damp_run
```

y_wind_at_10m
```
    long_name    10 meter v wind speed
    units        m s-1
    rank         1
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_diag_type
    local_name   IPD_Data(nb)%Intdiag%v10m
    requested    edmf_run
                 sfc_diag_run
```

y_wind_at_lowest_model_layer
```
    long_name    meridional wind at lowest model layer
    units        m s-1
    rank         1
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_statein_type
    local_name   IPD_Data(nb)%Statein%vgrs(:,1)
    requested    lsm_noah_run
                 sfc_diag_run
                 sfc_ex_coef_run
                 sfc_nst_run
                 sfc_sice_run
```

y_wind_save
```
    long_name    y-wind before entering a physics scheme
    units        m s-1
    rank         2
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_interstitial_type
    local_name   IPD_Interstitial(nt)%save_v
    requested    GFS_DCNV_generic_post_run
                 GFS_DCNV_generic_pre_run
```

y_wind_updated_by_physics
```
    long_name    meridional wind updated by physics
    units        m s-1
    rank         2
    type         real
    kind         kind_phys
    source       MODULE GFS_typedefs TYPE GFS_stateout_type
    local_name   IPD_Data(nb)%Stateout%gv0
    requested    gwdc_post_run
                 sasas_deep_run
                 sasas_shal_run
```

zenith_angle_temporal_adjustment_factor_for_shortwave_fluxes

```
long_name    zenith angle temporal adjustment factor for shortwave
units        none
rank         1
type         real
kind         kind_phys
source       MODULE GFS_typedefs TYPE GFS_interstitial_type
local_name   IPD_Interstitial(nt)%xmu
requested    GFS_PBL_generic_post_run
             GFS_suite_interstitial_2_run
             dcyc2t3_run
             edmf_run
```