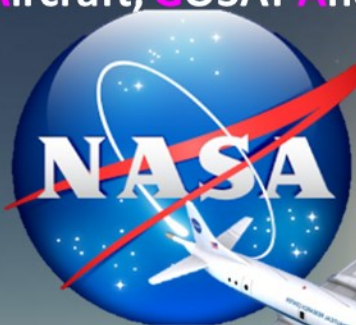


H₂O-vapour and Aerosols over Burgos: Aircraft, GOSAT And TCCON (HABAGAT)

2018: EMerGe-HALO validation of XCO₂ XCH₄ XCO₂



Capability:
GOSAT (H₂O)
GOSAT-2 (H₂O, AOT, PM2.5, BC)



Objective:

Constraints on H₂O, aerosols, & gas-phase chem at the site

H₂O vapour absorption ?

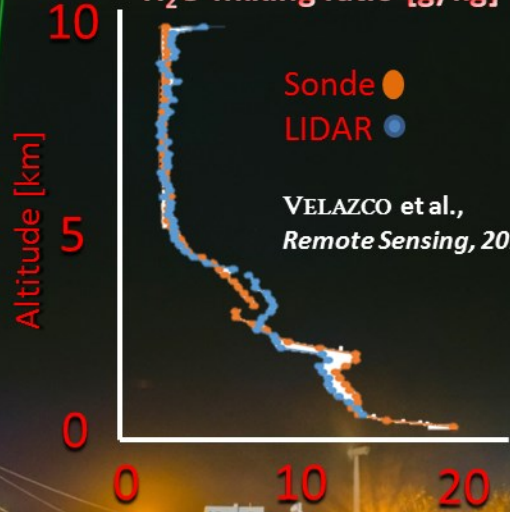
GOSAT Algorithm

? Light Scattering due to Aerosols

Capability:

- Raman LIDAR @60m res:
- H₂O
 - Aerosol backscatter
 - Dep_p
- Obs Constraints:
- 2nights/week till mid-Sep (dependent on travel funds)
 - RPLI sonde data lag

H₂O mixing ratio [g/kg]



HABAGAT Key Inst. Team

- Velazco^{1,2} (HABAGAT PI)
- Morino³ (TCCON, SKYNET)
- Uchino³ (LIDAR)
- Hori³ (TCCON, SKYNET)
- Sakai⁴ (LIDAR)
- Griffith¹ (TCCON)

Contributors

- Nagai⁴
- Deutscher¹
- Bagtasa⁵

Collaborators

- Schwandner⁶
- Wennberg⁷

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²OML Center for Climate Change and Disaster Mgmt. Foundation, Philippines

³National Institute for Environmental Studies, Japan (NIES-JAPAN)

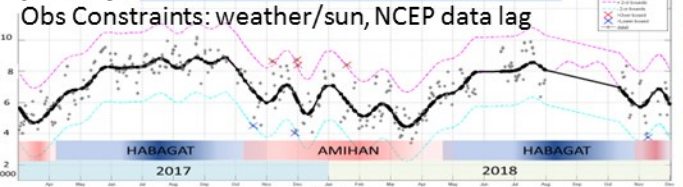
⁴Meteorological Research Institute, Japan

⁵University of the Philippines

⁶University of California, Los Angeles, USA

⁷California Institute of Technology, USA

Capability: TCCON Water Vapor Column over Burgos

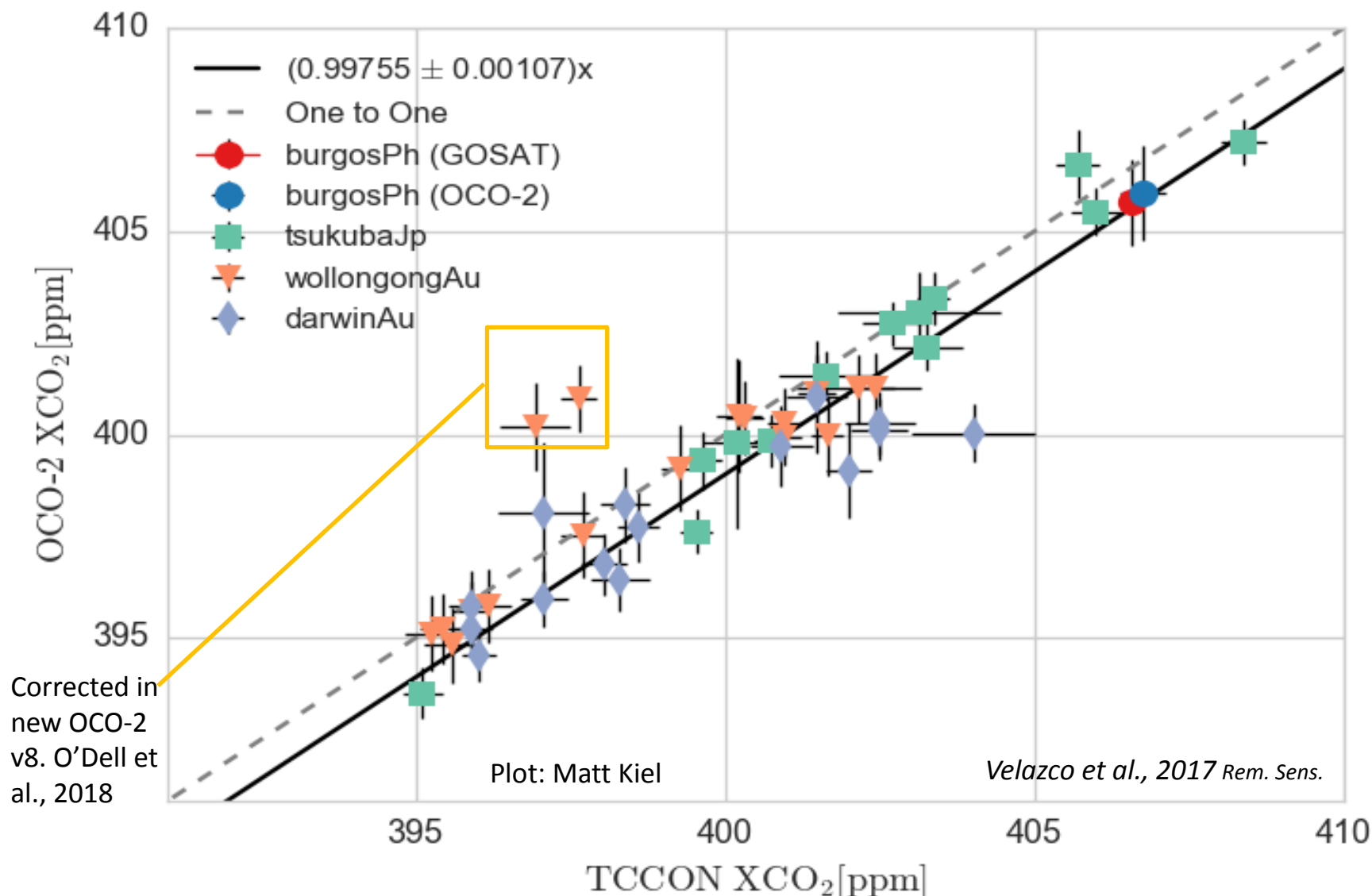


Capability:

SKYNET sky radiometer (AOT, SSA, Ångstrom exp)
Obs Constraint: weather/sun

The Burgos TCCON Satellite Validation Super Site

Burgos TCCON comparison w/ GOSAT and OCO-2 Target mode



Target mode XCO₂ retrievals from the OCO-2 satellite vs. XCO₂ from TCCON stations. Only stations in Tsukuba, Wollongong, Darwin and Burgos (OCO-2 vB7, 2788 target obs.) are shown for clarity. The calibration line (solid black line) is derived from all TCCON sites. The most recent GOSAT sounding (red circle) is also added on this plot, but not included in the calculation of the calibration curve (164 target mode observations at 21 sites). It falls within 0.13 ppm of the OCO-2 calibration line. The two outliers in the OCO-2 measurements over Wollongong (downward triangles) are probably due to bias induced by stratospheric aerosols caused by the eruption of the Calbuco volcano on 22 April 2015.

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NASA, ROSES A.18

Clouds, Aerosol, Monsoon Processes Philippines Experiment (CAMP²Ex) Mission/Instrument PIs

And the ones that gets it done..

Liz Juvera, BAER: Events and logistics, liz.juvera@nasa.gov
Vidal Salazar, ESPO: Deputy mission manager, vidal.salazar@nasa.gov
Marilyn Vasques, ESPO: ESPO director, marilyn.vasques@nasa.gov
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2019



from: Jeff Reid

CAMP²Ex Basics



U.S. NAVAL
RESEARCH
LABORATORY



Rationale: CAMP²Ex is a response to the need to deconvolute the fields of tropical meteorology and aerosol science at the mesoscale to cloud level.

The NASA P3 will be the platform based out of Clark air base in September.



Pristine Conditions

Polluted

CAMP²Ex-HABAGAT (Velazco et al.)

- Using GOSAT, Aircraft & TCCON to study water vapor & aerosols



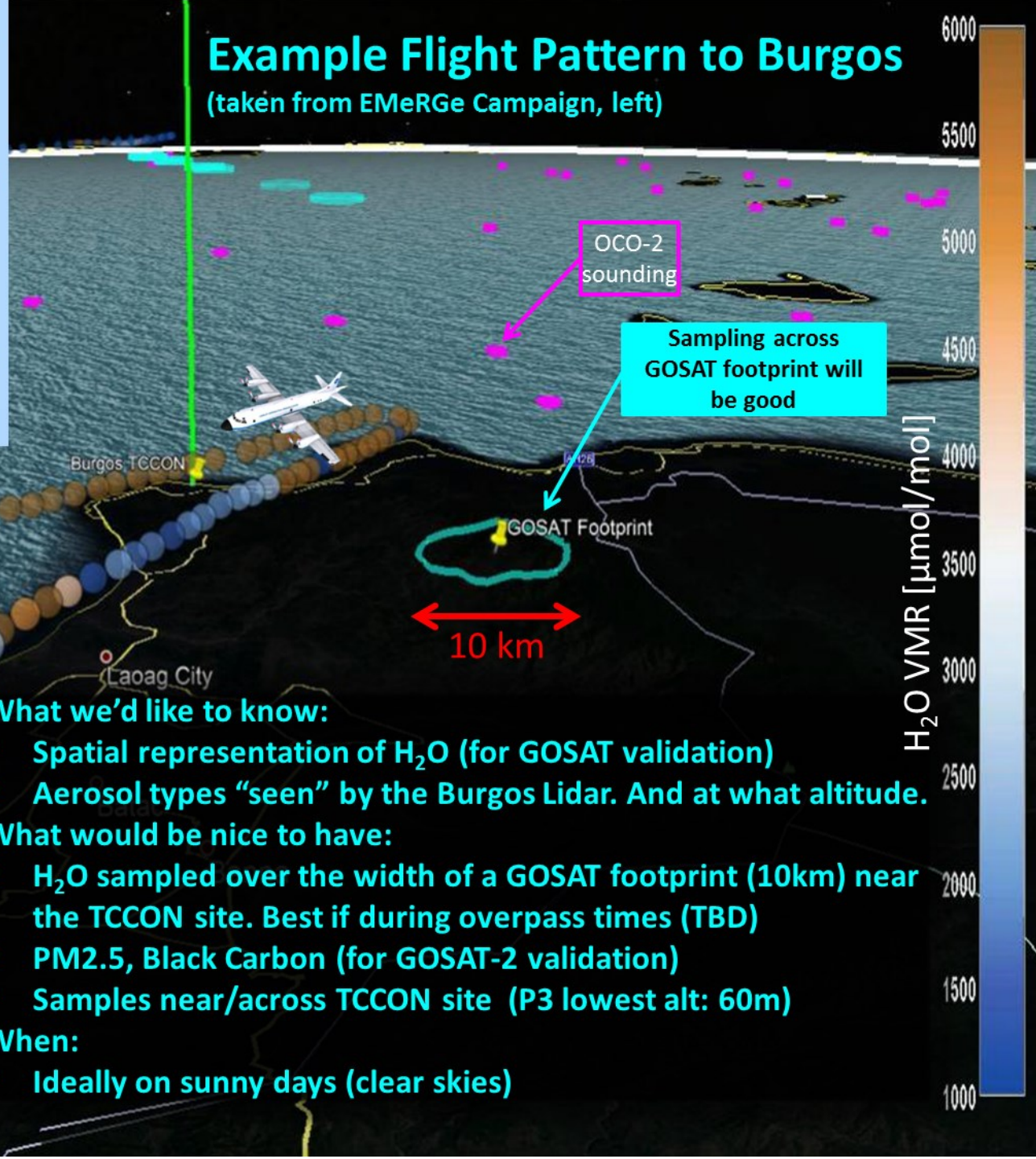
from: Jeff Reid

Instrument	Platforms	Full Name	Contact Person	Type	Measurements
AMPR	NASA P-3	Advanced Microwave Precipitation Radiometer	Anthony Guillory (Mgr)	Microwave Radiometer	Brightness Temperature
APR-3	NASA P-3	Airborne Third Generation Precipitation Radar	Simone Tanelli (PI)	Radar	Radar Reflectivity, Linear Depo. Radar, Doppler Velocity
AVAPS	NASA P-3	Advanced Vertical Atmospheric Profiling System	Gary Wick (PI)	Dropsonde	Pressure, Temperature, Humidity, Wind
BBR	NASA P-3	BroadBand Radiometers	Anthony Bucholtz (PI)	Radiometer	Solar flux
DASH-SP	NASA P-3	Differential Aerosol Sizing and Hygroscopicity Spectrometer Probe	Armin Sorooshian (PI)	Differential mobility, Spectrometer (in situ)	Aerosol Hygroscopicity
DLH	NASA P-3	Diode Laser Hygrometer	Glenn S. Diskin (PI)	Laser absorption	H2O
FIMS	NASA P-3				
HSRL2	NASA P-3	High Spectral Resolution Lidar 2	Chris Hostetler (PI)	Lidar	Aerosol Depolarization Ratio, Aerosol Scattering Ratio, Aerosol Backscattering, Aerosol Extinction
LARGE	NASA P-3	Langley Aerosol Research Group Experiment	Edward L. Winstead (Mgr)	CN counter, Nephelometer, Optical particle counter	Aerosol Number Density, Aerosol Size Distribution, Cloud Condensation Nuclei, Black Carbon, Particle Absorption, Particle Extinction, Particle Scattering, Single Scattering Albedo
RSP	NASA P-3	Research Scanning Polarimeter	Brian Cairns (PI)	Spectrometer	Imagery
SPEC Cloud Probes	NASA P-3 SPEC Lear Jet				
SSFR	NASA P-3	Solar Spectral Flux Radiometer	Peter Pilewskie (Co-I)	Radiometer	Solar flux, Irradiance
NRL Cameras	NASA P-3				



Example Flight Pattern to Burgos

(taken from EMeRGe Campaign, left)



OCO-2 sounding

Sampling across GOSAT footprint will be good

10 km

H₂O VMR [μmol/mol]

Added Value to CAMP²Ex

- TCCON Data
- Raman LIDAR Data
- Sky Radiometer

What we'd like to know:

- Spatial representation of H₂O (for GOSAT validation)
- Aerosol types "seen" by the Burgos Lidar. And at what altitude.

What would be nice to have:

- H₂O sampled over the width of a GOSAT footprint (10km) near the TCCON site. Best if during overpass times (TBD)
- PM2.5, Black Carbon (for GOSAT-2 validation)
- Samples near/across TCCON site (P3 lowest alt: 60m)

When:

- Ideally on sunny days (clear skies)

Sinait

Burgos TCCON

Laoag City

GOSAT Footprint

Campaign Readiness

- TCCON, LIDAR, SKYNET all operational
- InSb and MCT Detectors Installed (by Gregor)
- LN2 supplier OK. NDACC measurements possible.

Constraints

- Funding (travel) is very tight (as in none)
- There is space for extra instruments on site: others are welcome to participate too (students, post docs, etc. but instruments/personnel would have to be self sufficient).

Thanks from Burgos....

