

Clouds, Aerosol, Monsoon Processes Philippines (CAMP²Ex): 2019 Update

Jeffrey S. Reid
US Naval Research Laboratory, Monterey CA

Gemma Teresa T. Narisma
Manila Observatory, Quezon City, Philippines

Hal B. Maring
NASA HQ, Washington DC

James B. Simpas
Manila Observatory, Quezon City, Philippines

Jhony Zevaleta
NASA ESPO, Ames Research Center





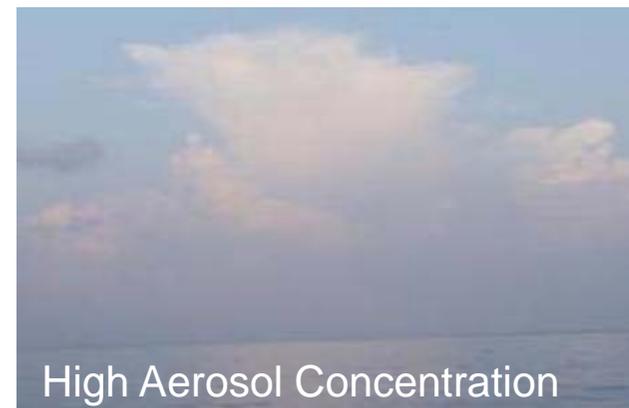
CAMP²Ex: Who's, What's, & Why's



- **NASA, Manila Observatory, & NRL in conjunction with numerous US and Philippine partners will conduct an airborne P3 and Lear 35 campaign in the Philippines with research flights pushed to Aug 25-Oct 5th, 2019**
- Overall research will focus on these questions:
 - How do aerosol particles (e.g., pollution, smoke, salt) influence tropical precipitation?
 - Do aerosol induced changes in clouds and precipitation feedback into aerosol lifecycle?
 - How do aerosol particles and clouds influence or feedback into the energy budget?
- Philippines is taking a lead on :
 - Investigating regional differences in air quality
 - How land use/urban environments affects clouds and precipitation
- ~100 scientists, including ~20 Philippine scientists will conduct ~17 7.5-hour P3 and 8 5-hour Lear 35 flights to measure the cloud and pollution environment around the Philippines.
- Outreach
 - professional
 - university
 - high school



Low Aerosol Concentration



High Aerosol Concentration



Cloud droplet size-The canary in the coal mine.

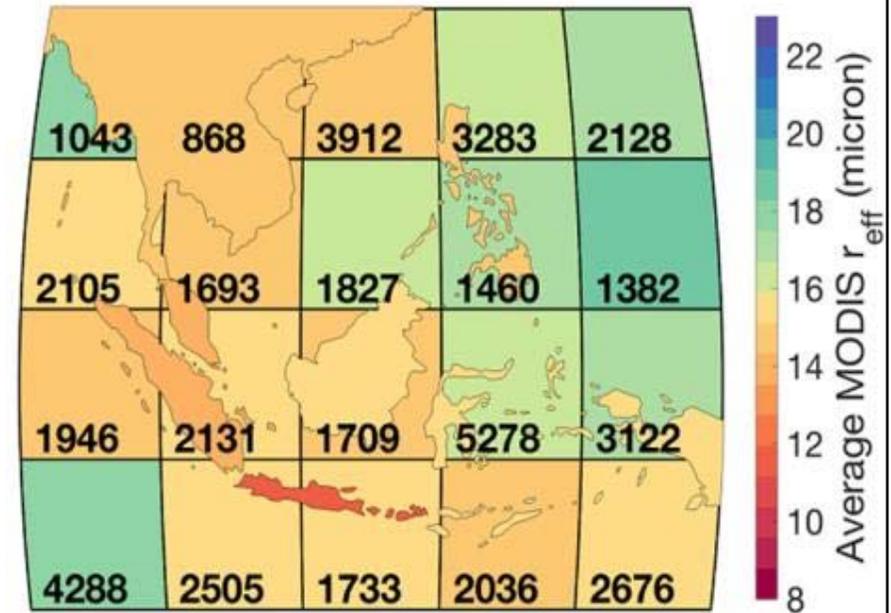
Ross et al, 2018 ACP 2018

The periphery of the SE Asian domain have the highest sensitivity to perturbations in particle concentrations.

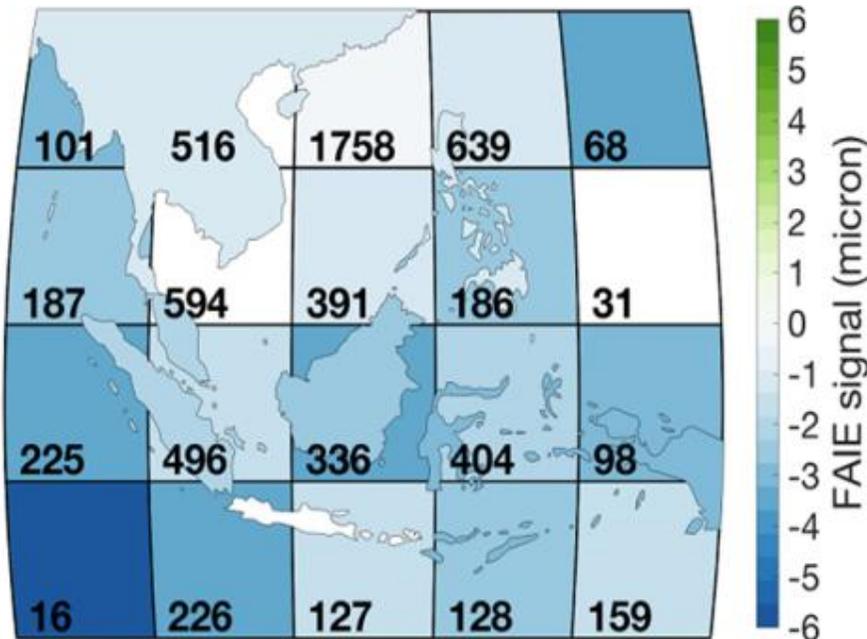
The periphery also has the highest variability in aerosol concentration and meteorology.

4.5–6 km clouds

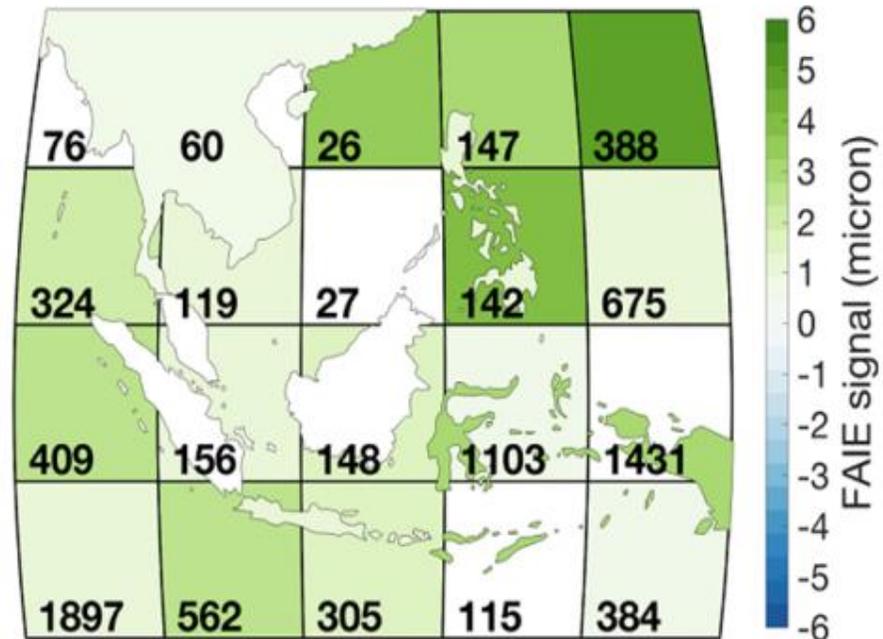
Average r_{eff}



Polluted FAIE



Clean FAIE



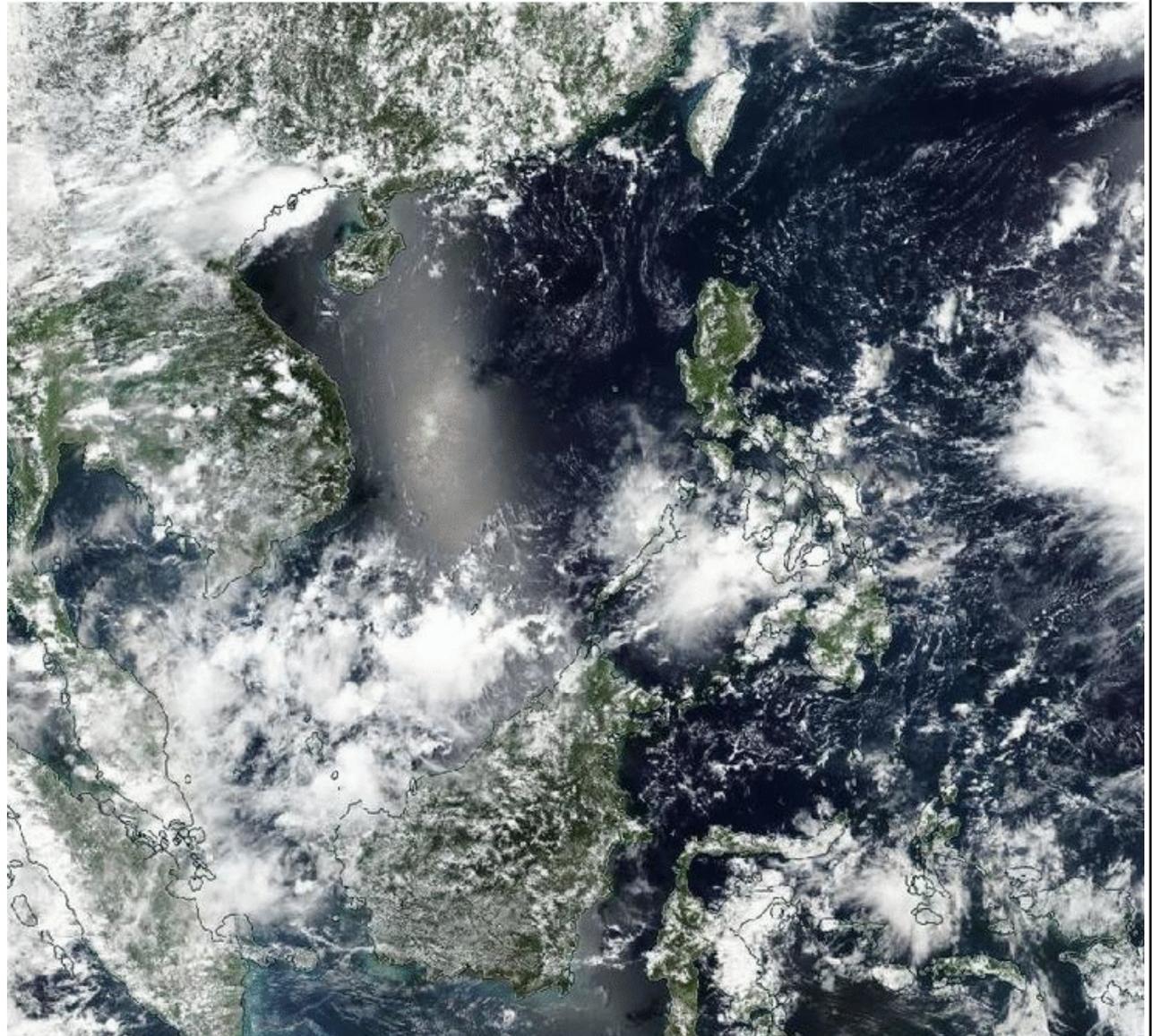


But, we are trying to do aerosol-cloud coupling in the Southwest Monsoon.... A Couple of Weeks, Sept 2017



This is a couple of weeks in the life....

Monsoon enhancement,
twin TC development,
and squall lines
oh my!





CAMP²Ex Leads & Focal Areas



- Program Science: Hal Maring, NASA HQ
- Mission Science: Jeffrey Reid, U.S. Naval Research Lab, Monterey, CA
- Project Manager: Jhony Zavaleta, NASA Ames Research Center
- Philippine PI: Gemma Narisma, Manila Observatory
- Philippine Project manager & ground coordinator: James Simpas, Manila Observatory
- Focus area leads
 - Aerosol and Composition: Luke Ziemba, NASA Langley Research Center
 - Clouds and Precipitation: Jay Mace, University of Utah
 - METOC: Jeffrey Reid, NRL Monterey and PAGASA
 - Models : Sue van den Heever, Colorado State University
 - Radiation: Larry Di Girolamo, University of Illinois
 - Satellite Remote Sensing: Robert Holz (SSEC, UWisc) & Chip Trepte, (LaRC)
- Flight Planner: Richard Ferrare, NASA LaRC
- Forecasting: Ed Fukada and PAGASA
- Data Archivist: Gao Chen, NASA LaRC

NASA P-3B

- **Aerosol in-situ microphysics:**

- Black carbon
- Cloud condensation nuclei
- Composition
- Light scattering
- Size distribution

- **Aerosol profiles (lidar)**

- **Cloud cover/properties**

- Cloud cameras
- Cloud in-situ microphysics
- Droplet/ice particle size
- Polarimeter
- Precipitation

- **Cloud/precip remote sensing**

- 94 GHz radar
- 18-27 GHz radar
- Microwave radiometer



NASA P-3B

- Trace Gases (CO_2 , CO, SO_2 , NO_x)
- Radiative balance: Hyperspectral, Solar, & IR flux
- State variables (temperature, wind humidity):
 - In-situ & profile
 - Sea surface temperature

SPEC Lear Jet 35

Aerosol Size

Cloud in-situ microphysics

droplet/ice particle size

precipitation

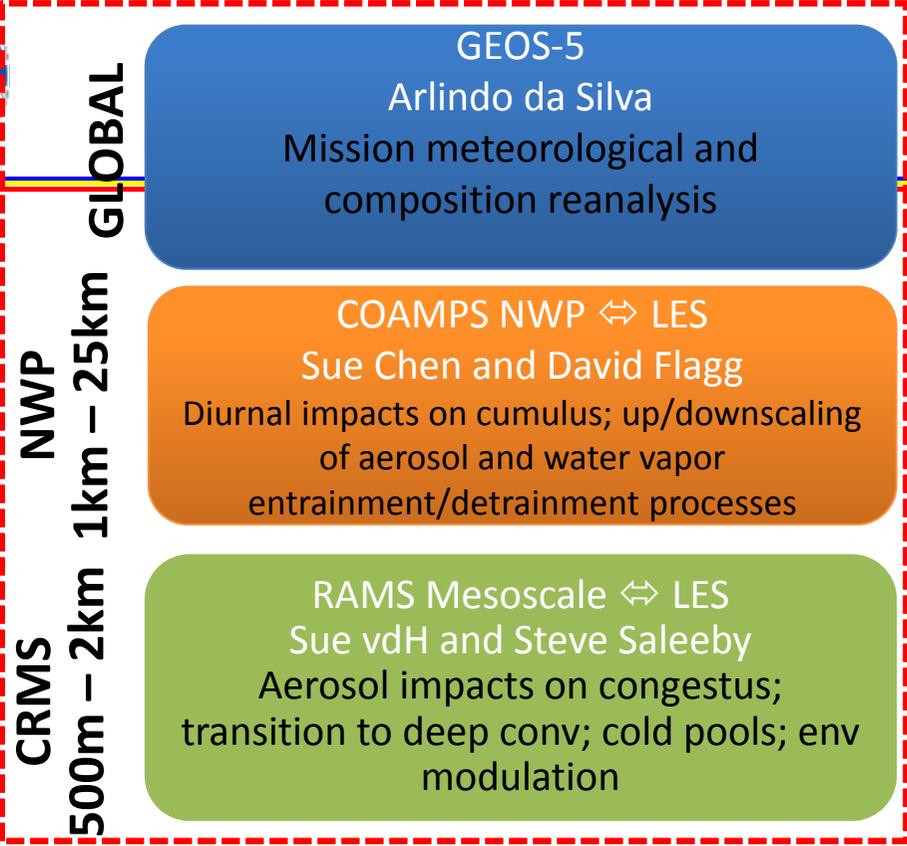


SPEC
Lear 35



Combined Modeling Components

Multi-Scale



CRMS
500m - 2km
NWP
1km - 25km
GLOBAL

GEOS-5
Arlindo da Silva
Mission meteorological and composition reanalysis

NAAPS and ENAAPS
Peng Xian and Juli Rubin
Multi-model and ensemble forecasting; aerosol transport & lifecycle. Aerosol/meteorology co-variability

COAMPS NWP ↔ LES
Sue Chen and David Flagg
Diurnal impacts on cumulus; up/downscaling of aerosol and water vapor entrainment/detrainment processes

RegCM4
Gemma Narisma And Faye Cruz
Regional model performance; cu param; SSTs and diurnal cycle

RAMS Mesoscale ↔ LES
Sue vdH and Steve Saleeby
Aerosol impacts on congestus; transition to deep conv; cold pools; env modulation

WRF
Gemma Narisma and Faye Cruz
Urban land use impacts; microphysical and precipitation processes. Monsoon enactments

DHARMA LES
Van Dienenhoven and Fridlind
Realistic input of clouds for 3D radiative transfer simulations

WRF LES Piggy-Back
Morrison and Graboswki
Rapid ice production processes; entrainment; convective structure

DHARMA LES
Wang and Fridlind
Removal, redistribution and transport of aerosols

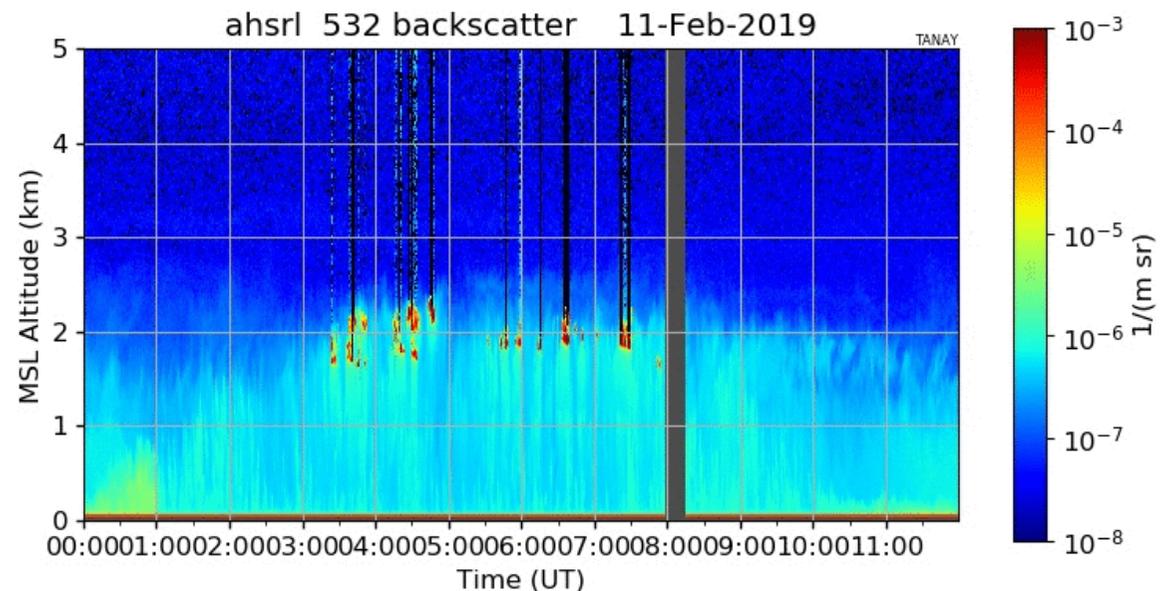
LES
Schmidt and Feingold
Evaluate LES reproduction of irradiance PDFs in the cumulus-embedded-in-aerosol field



What do do with a year? CAMP²Ex weathEr and CompoSition Monitoring (CHECSM)



- Virtual Campaign and Monitoring in the CAMP2Ex study region
- Detailed analysis of “animals in the zoo” relative to convective organization in relation to aerosol-cloud interaction.
- Putting models, remote sensing and obs to the test. Do the standard products really make sense
- **Development of MO site**
 - Radiation: Solar, IR and hyperspec radiation, direct/diffuse, all sky camera, sun phmry.
 - HSRL
 - Light absorption
 - PM2.5
 - Detailed aerosol chemistry
 - Weather and precipitation





Where forecasters would have sent the P3 if we had flown in 2018



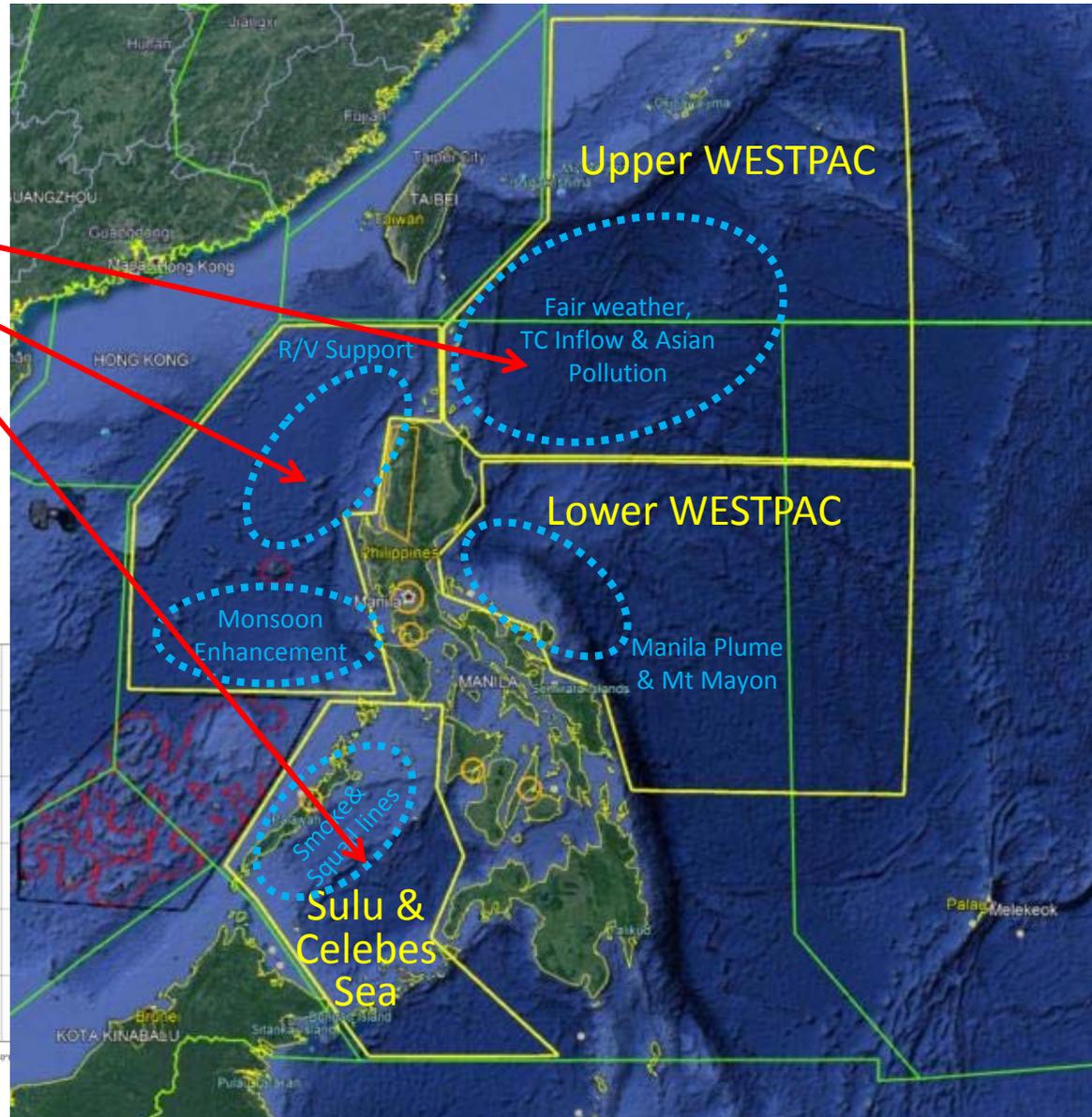
Dates and locations of forecaster flight plans that would have “worked” (not exclusive)

Sep 22, 27, 29

Aug 27; Sep 3, 10, 20, 24, 28

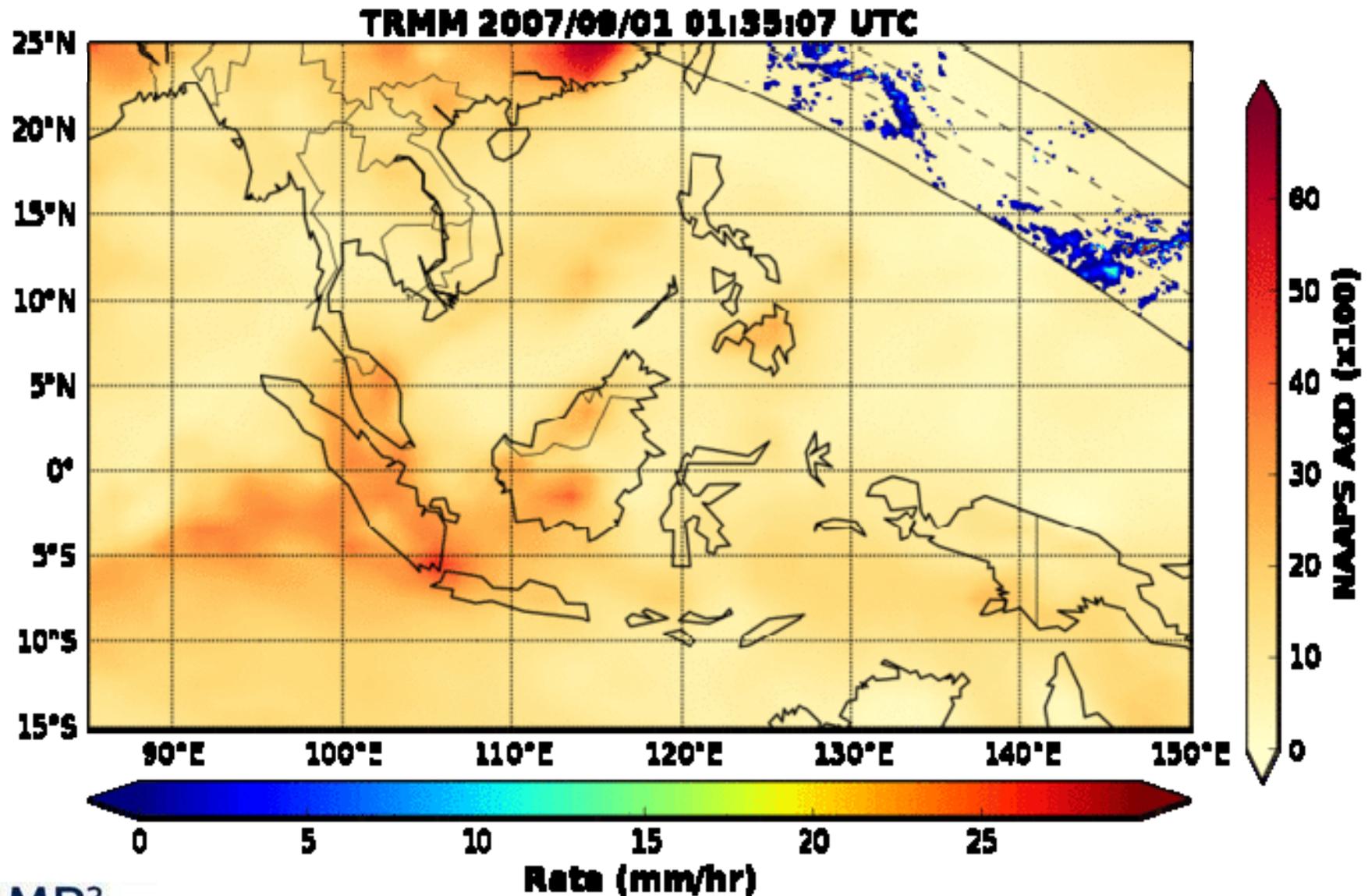
Aug 11, 17, Sep 17, 20, 29

Survey, Aug 29





Combining model with satellite. Tricky... Sampling bias, aliasing, artifacts=>confounding





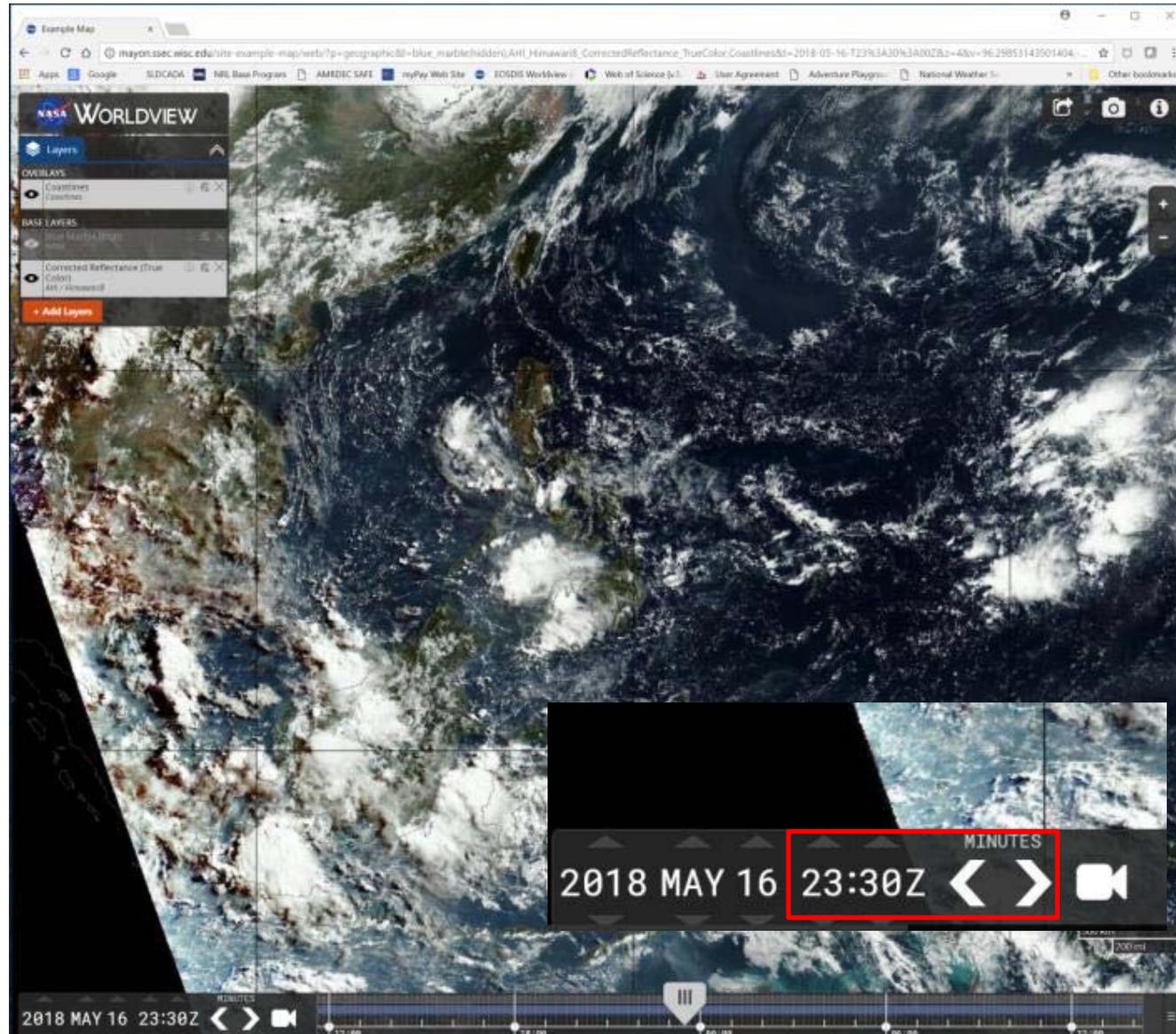
Remote Sensing SSEC/GSFC Worldview



For CAMP²Ex AOI, AHI imagery, and CLAVR-X cloud products will be generated every 10 min, with ~20 min latency.

RBG, 11 um, cloud top height, temperature and phase.

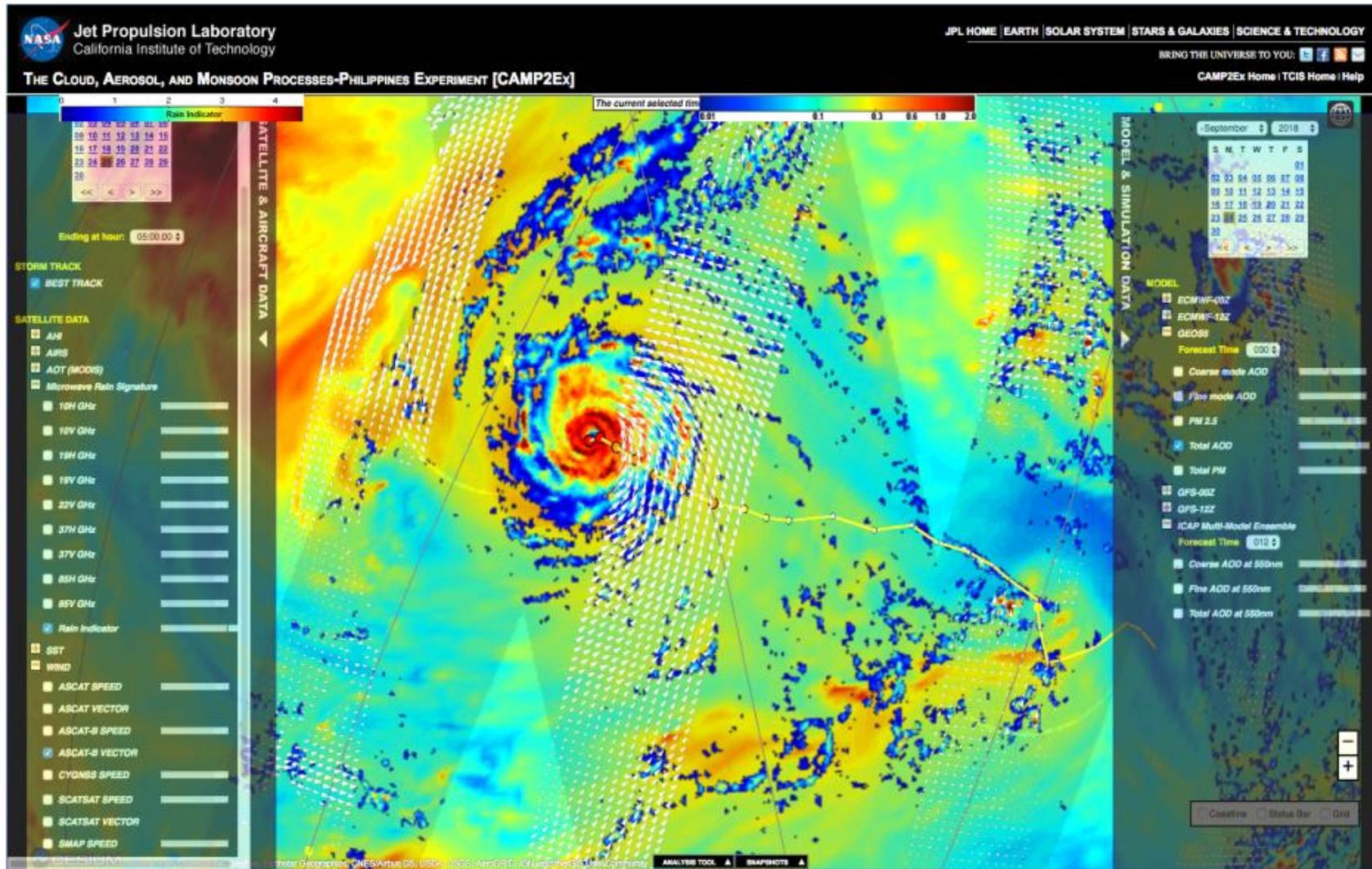
Aerosol product also a strong possibility.





JPL Data Portal: Viewing & netcdf download satellite and model products

<http://camp2ex.jpl.nasa.gov/> firefox works best



lel

CAMP2EX

Site Manager: Svetla M Hristova-Velova

PRIVACY

Webmaster: Quoc Vu (JPL Clearance: CL#08-349)



Where do we go from here?



- CAMP²Ex has a 100+ science team: Observations, models, remote sensing.
- Flight operations ~Aug 25 to Oct 5 2019 ish, but enhanced remote sensing and modeling will cover the region started summer 2018 and going on through 2019.
- Things look good for cooperative work on the second PISTON cruise Sept 2019
- Focus areas: Clouds & Precip, radiation, meteorology, modeling, remote sensing
- Data is applicable not just to CAMP²Ex, but PISTON, YMC, and likely your personal backyard problem....
- Transparency: All data is freely available on the web. Free to join the team, or not, with your own niche.
- Final words of advice:
 - Best to integrate into the team, and the more specific your goals are, the more likely you will get what you need.
 - Know who your customer really is.
 - Be willing to roll up your sleeves and own specific problems