# Cloud-Aerosol-Monsoon Philippines Experiment (CAMPEx)

An Airborne Field Campaign Planned for August and September 2018

Hal Maring
NASA Headquarters
with Manila Observatory

YMC Meeting
January 2015

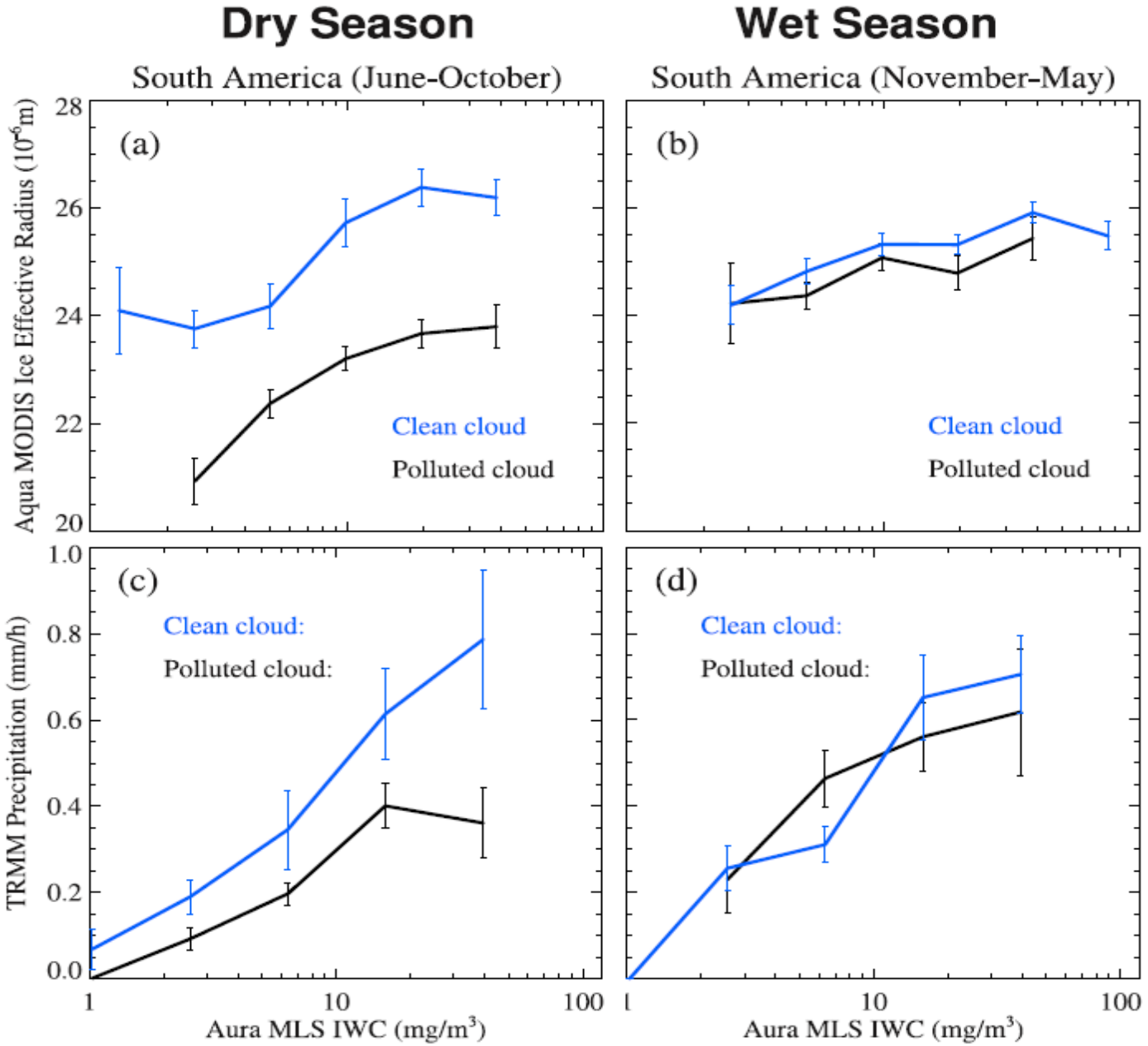
# The Philippine Situation

- Because of ubiquitous cloud cover and strong diurnal cycle of convection, remote sensing systems (especially satellites in low earth orbit) have great difficulty with the entire SE Asian region.
- The Philippines is susceptible to natural hazards and climate change.
- The Philippines is a difficult region for which to nowcast, predict and perform climate projections.
- Little research has been done on regional predictability and observability outside of tropical cyclones.

# Aerosols and Clouds

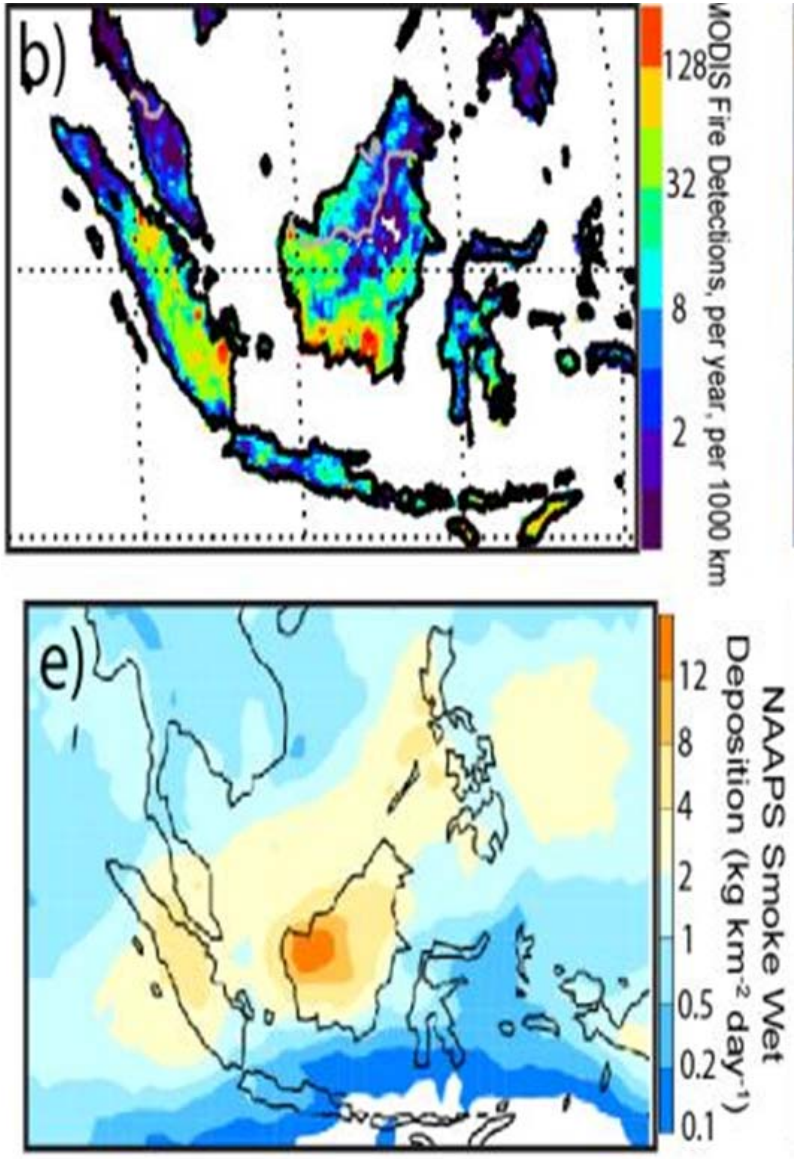
Aerosols can affect the size of cloud droplets

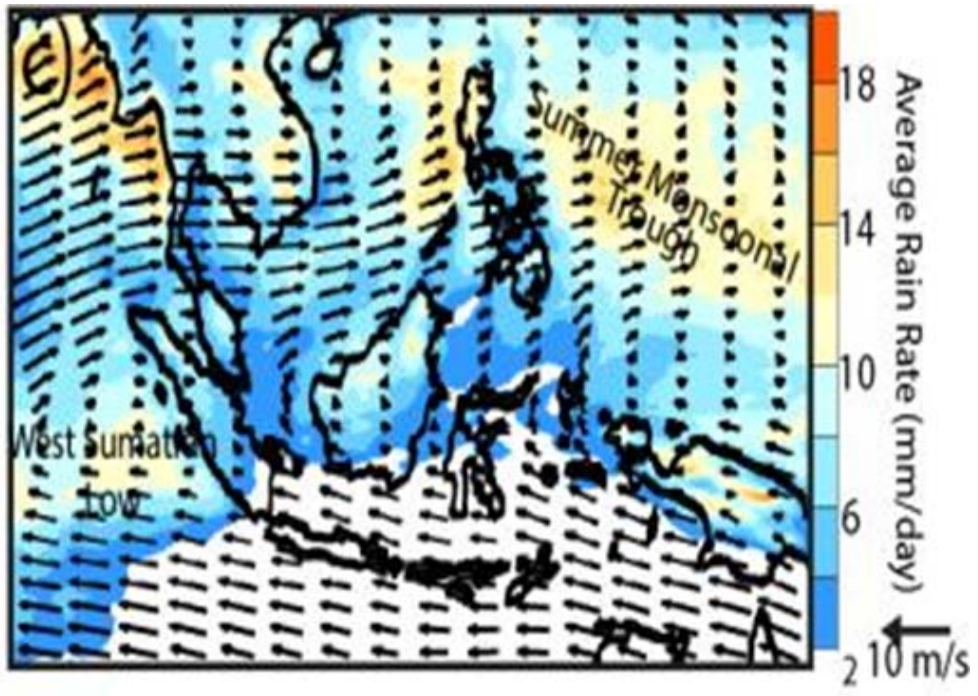
Aerosols can affect precipitation




Jiang et al., GRL, 2008

# Aerosols & Monsoonal Flow




Monsoonal flow can transport aerosols (smoke and pollutants) to the vicinity of the Philippines

# CAMPEx Science Questions

- To what extent are aerosol particles responsible for modulating warm and mixed phase precipitation in tropical environments?
- To what extent do aerosol induced changes in clouds and precipitation feedback into aerosol lifecycle?
- How does the aerosol and cloud influence on radiation co-vary and interact?
- How does land use change factor into cloud and precipitation change?  Is land use change a confounder for aerosol impacts?

High Aerosol Concentration

Low Aerosol Concentration

# CAMPEx Measurements

**Primary (Have to haves):**

- Aerosol in-situ microphysics:
  - size distribution
  - black carbon
  - cloud condensation nuclei
  - dry & ambient aerosol scattering
- Cloud in-situ microphysics
  - droplet size
  - precipitation
- Cloud/precip remote sensing
  - 94 GHz radar
  - 18-27 GHz radar
- Trace Gases
- Aerosol and wind profiles (lidar)
- Radiation: Solar and IR
- State variables:
  - In-situ & profile
  - SST


NASA P-3B

**Secondary (Nice to haves):**

- Aerosol composition
  - filter samples
  - single particle mass spectrometer
- Ice particle probe
- Imager
- Polarimeter
- Hyperspectral flux and nadir radiance.

# CAMPEx Deployment

Minimum mission requirements can all be done in the Manila FIR

We may also request flight clearance to Singapore.

# Connection to Satellite Remote Sensing

Satellite Related Activities:

- Primary science
- Measurement context
- Calibration / Validation

Satellite / Sensors of Interest:

- MODIS
- MISR
- CALIPSO
- CloudSat
- VIIRS
- GPM
- CATS