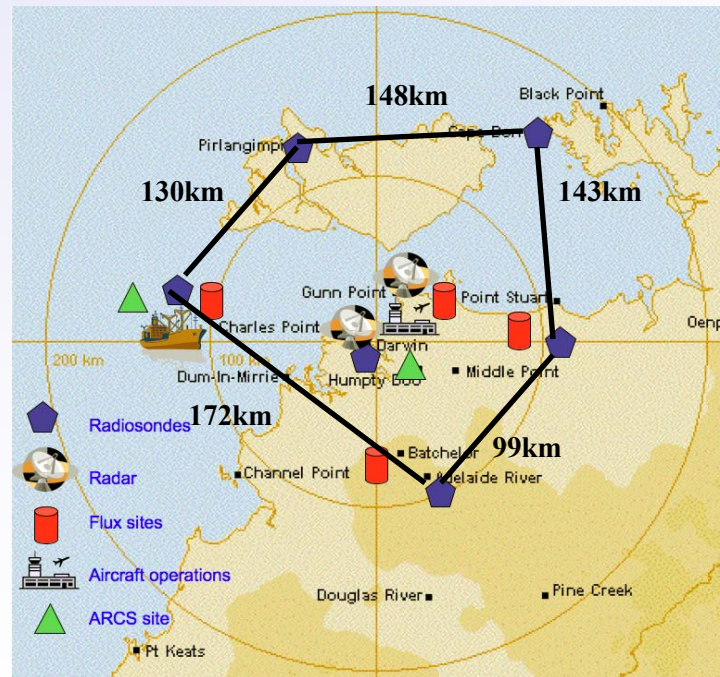


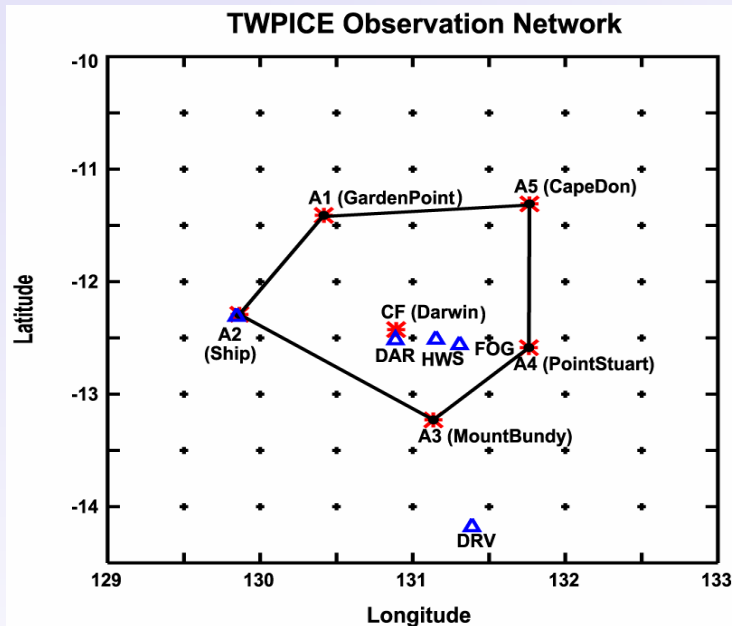
Update on the Variational Analysis of Tropical Warm Pool International Cloud Experiment (TWP_ICE) Data (01/22/2006 – 2/13/2006)

*A joint effort between LLNL (Xie, McCoy, Klein), BMRC (Hume, Jakob),
SUNYSB (Zhang), and other TWPICE participants*



The TWP_ICE Workshop , NASA/GISS, New York, NY, 13-15 November, 2006

A Quick Update



Done!

- ✓ 3-hourly radiosondes (6 stations)
- ✓ Background field from the ECMWF analysis
- ✓ Radar precipitation
- ✓ Surface turbulence fluxes from Monash University (Darwin Harbour, Howard Spring, Fogg Dam, and Daly River)
- ✓ ARM Surface radiative fluxes (Darwin, Cape Don, and Garden Point)
- ✓ Surface pressure, temperature, relative humidity, and winds (from sounding data)

Working on

TOA radiative fluxes (Japan's Multi-functional Transport Satellite- MTSAT)

Surface radiative fluxes from Monash university

MWR measured cloud liquid path

Surface fluxes from the Ship

Aircraft measured surface turbulence fluxes

Surface meteorological data from local surface mesonet

Issue #1: Daytime Dry Bias in the RS-92 Sondes

A radiation heating dry bias is found in the middle/upper troposphere in the RS-92 sondes

Comparison of humidity from RS92
And Cryogenic Frostpoint Hygrometer.

From H. Vomel et al., submitted to
J. Atm. Ocean Tech.

*Impact on the derived forcing
fields and SCM/CRM needs to
be examined*

*When will the correct data be
available?*

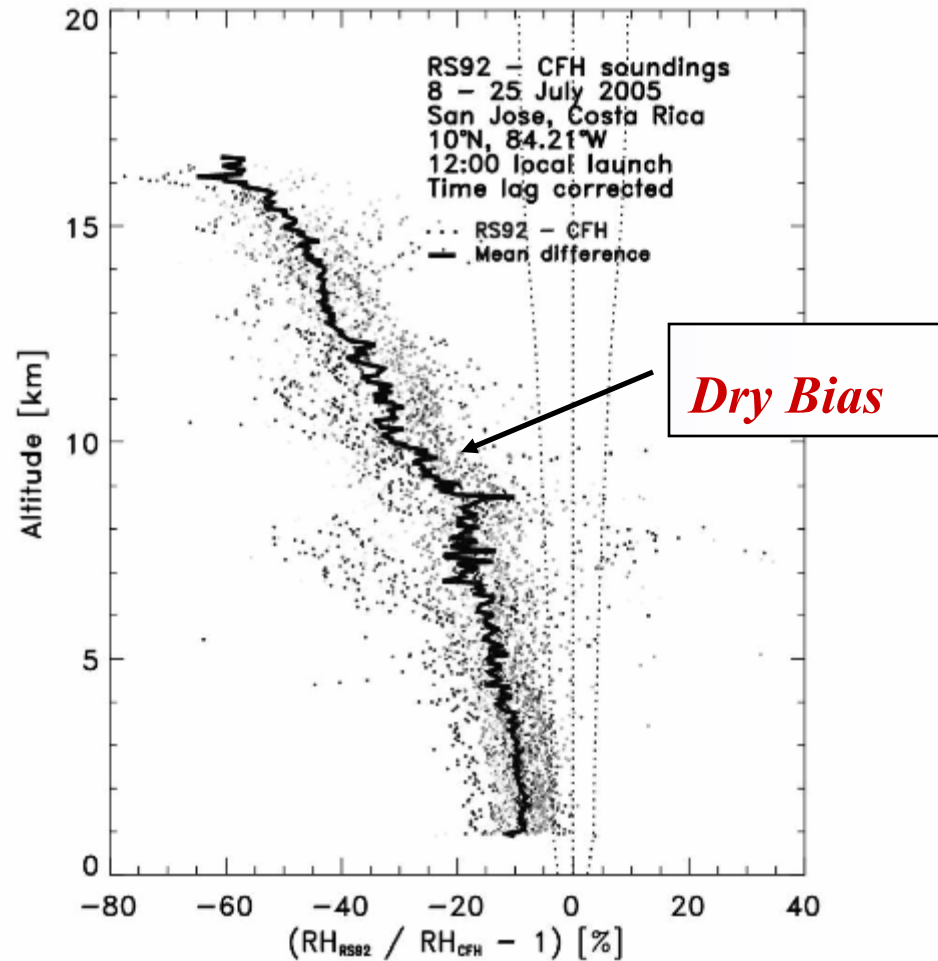
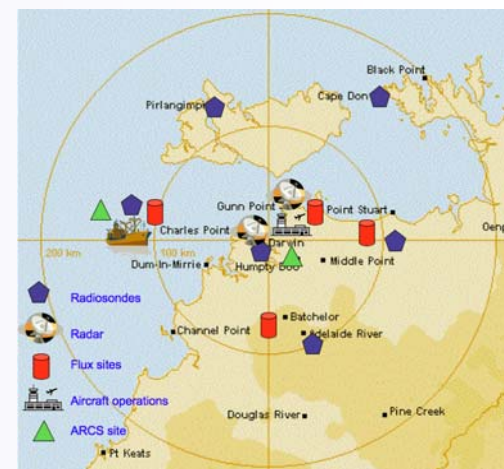
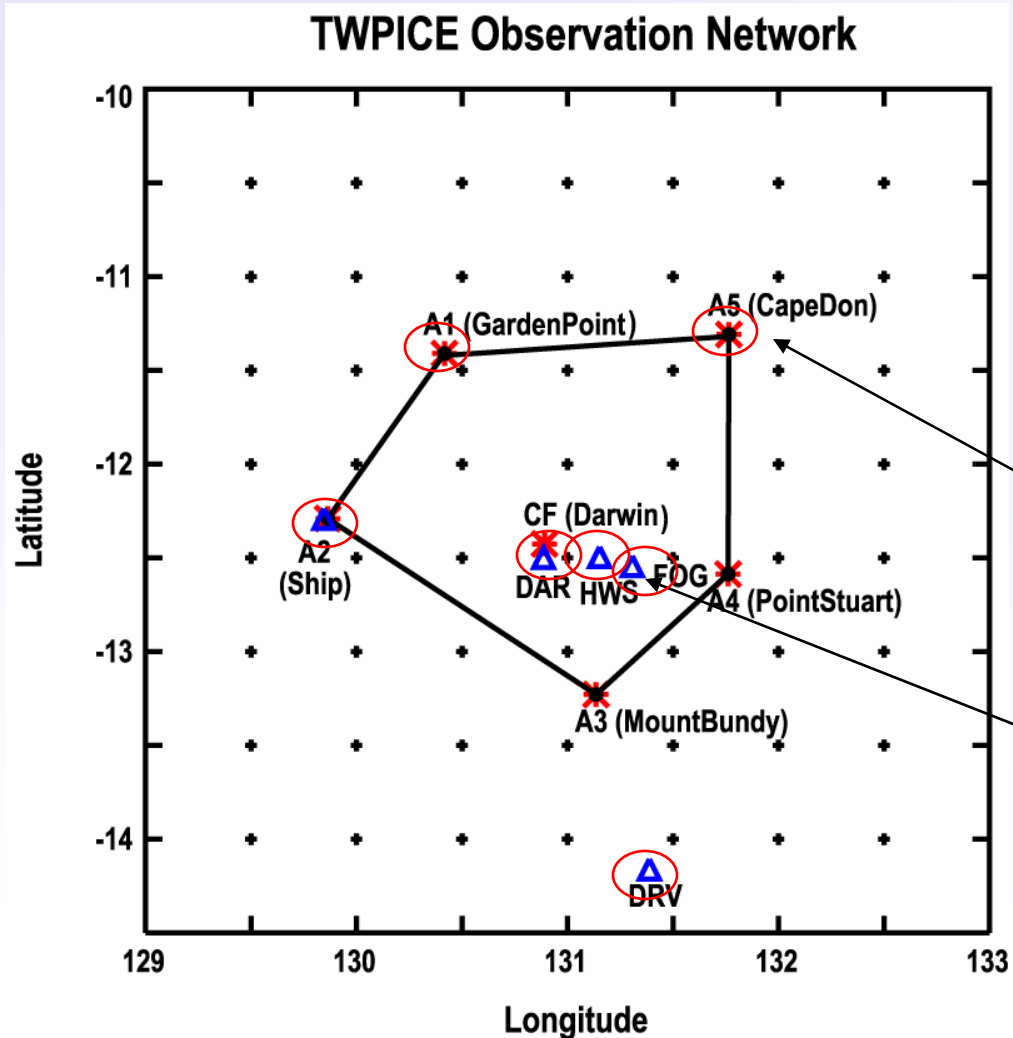


Figure 6: Relative difference between the Vaisala RS92 and CFH daytime RH.

Issue #2: Surface and TOA Constraints

Can the limited number of surface stations represent well the spatial variations of the surface fluxes?

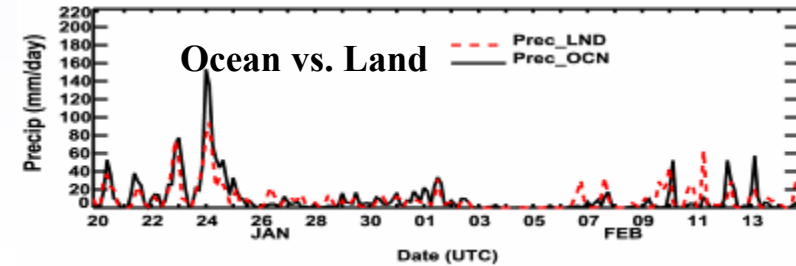
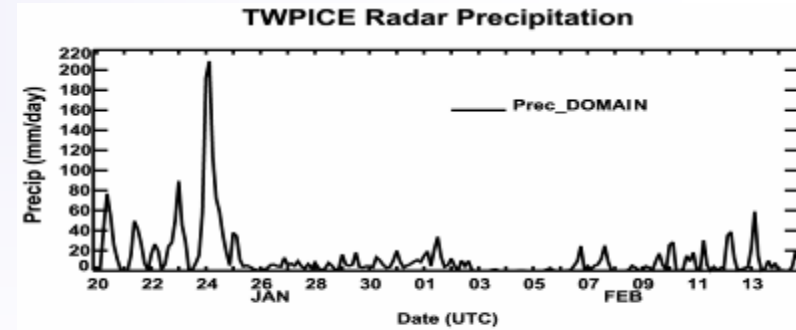
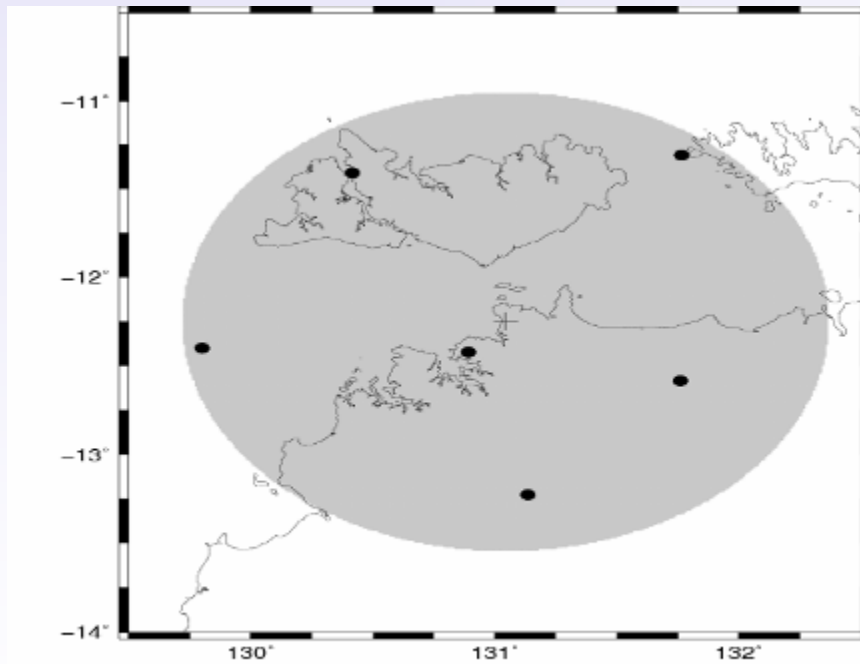


Radiative Flux Stations

Turbulence Flux Stations

The BOM Precipitation Radar Well Covered the Region

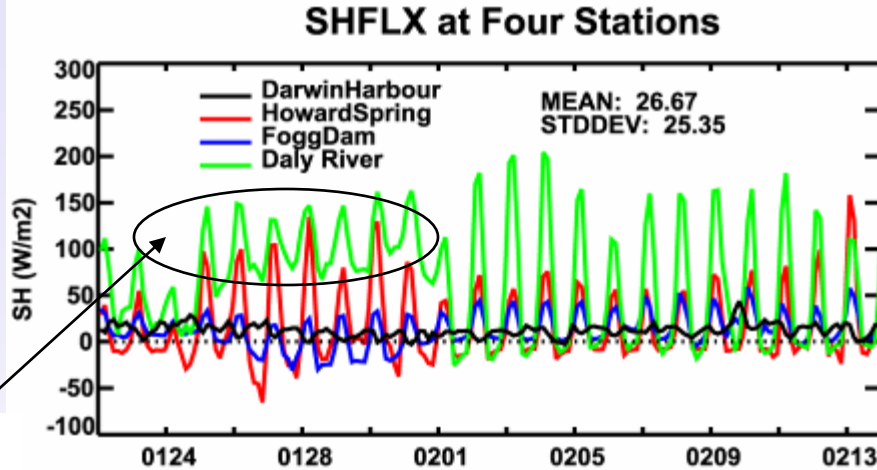
BOM Precipitation Radar Coverage



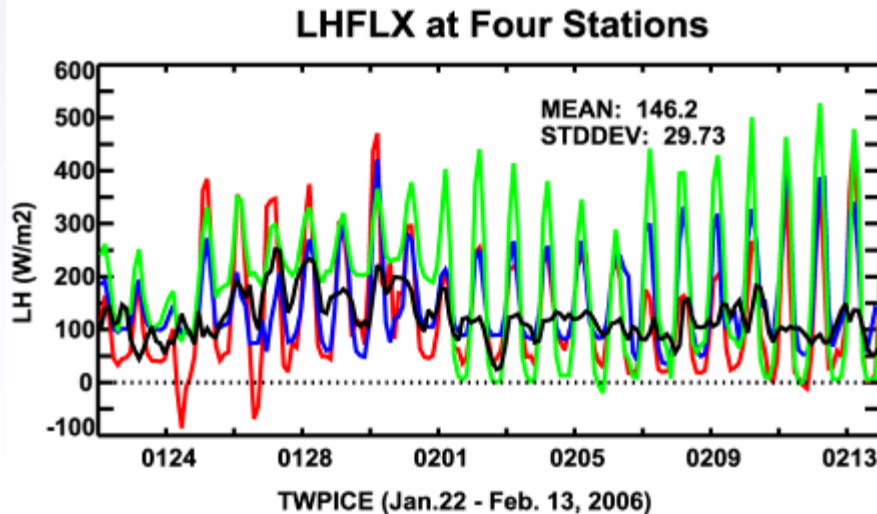
Courtesy of Drs. Hume and Jakob

Turbulence Fluxes Show Large Spatial Variation

SH & LH over Different Surface types



???



4 Turbulence Flux Stations

Darwin Harbour: Inshore waters

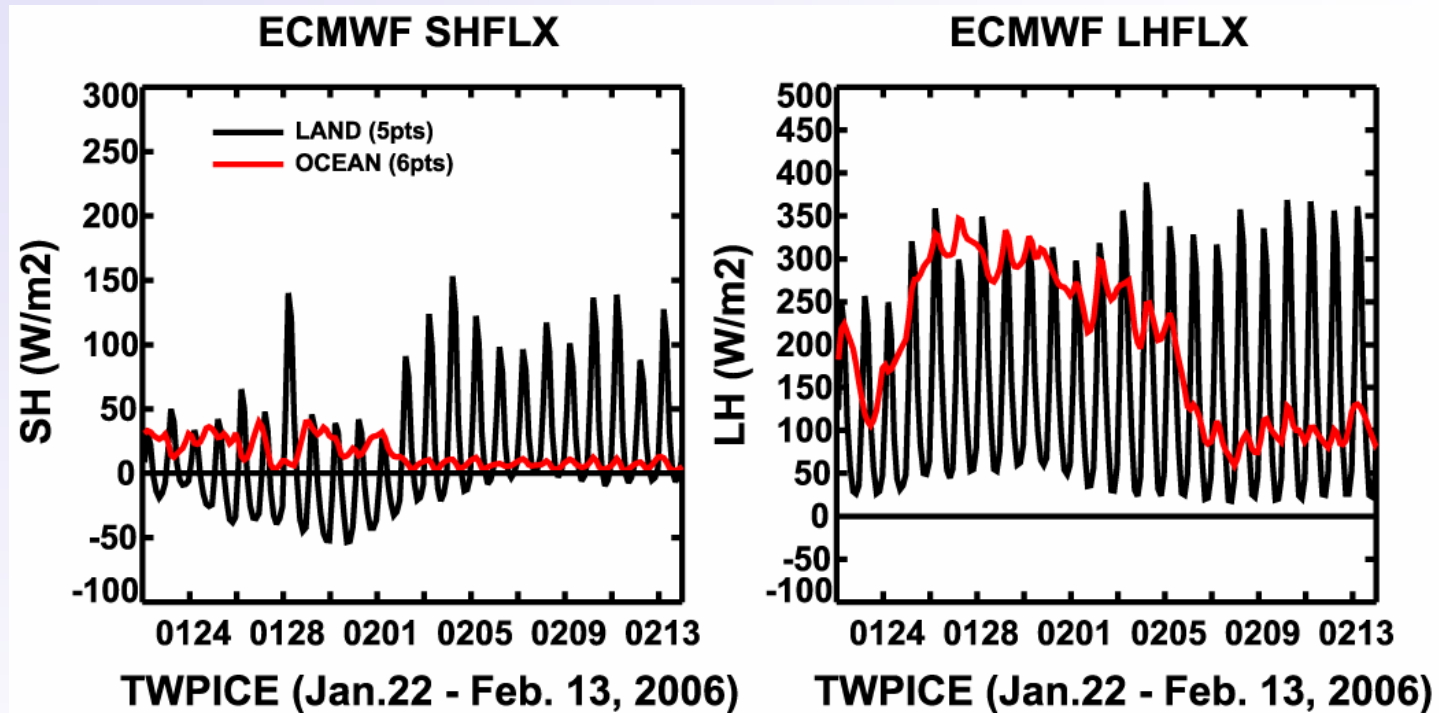
Howard Springs: Eucalypt open forest savanna

Fogg Dam: Typical northern floodplain

Daly River: Eucalypt woodland/grassland savanna

Need to get surface type data for the domain average

Strong Ocean-Land Contrast

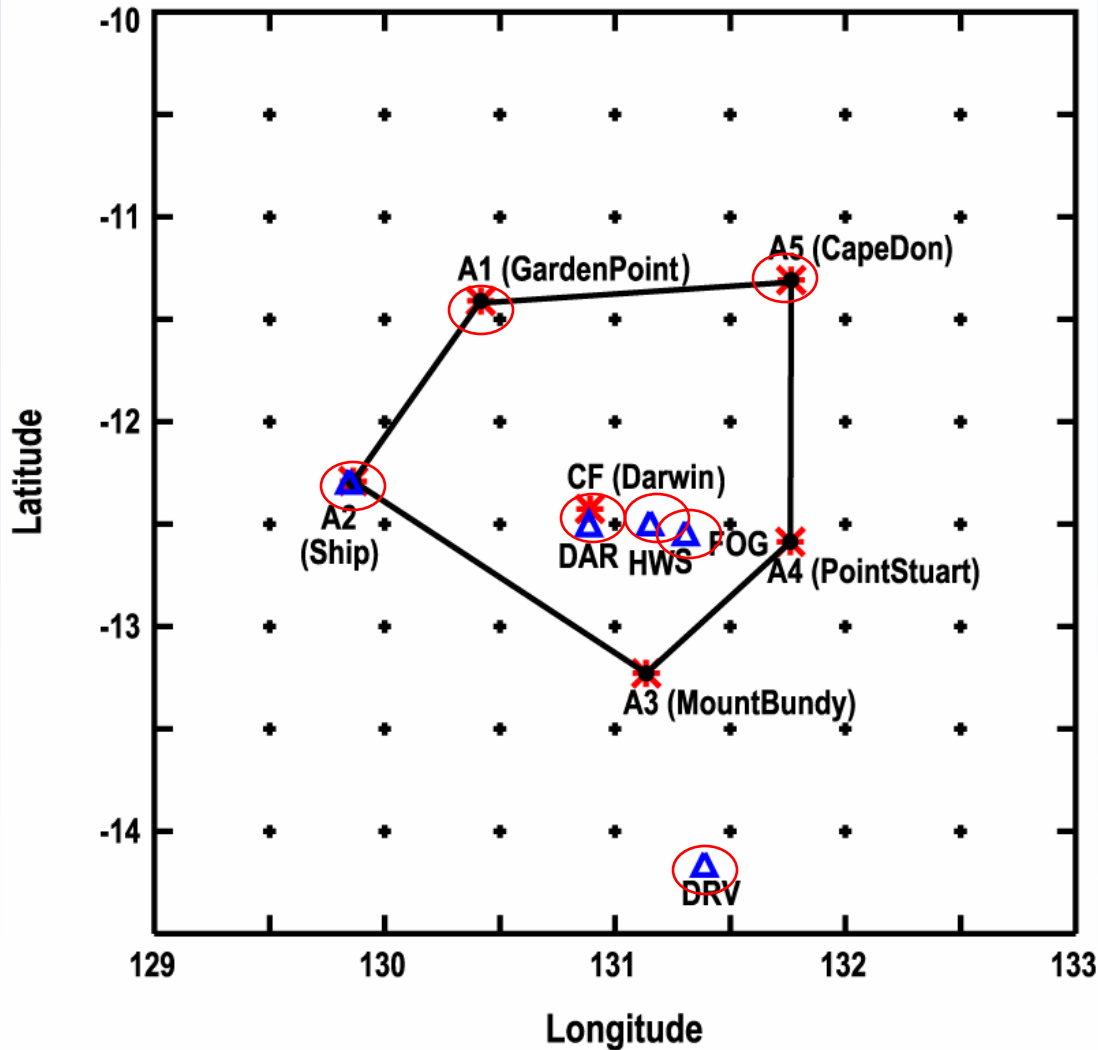


Ocean fluxes are needed for domain average

- Ocean fluxes from the Ship
- Ocean fluxes from ECMWF
- Aircraft data

Surface Radiative Fluxes

TWICE Observation Network




Problems:

- No upwelling SW & LW at CapeDon and Garden Point
- Some issues need to be addressed with the Monash University's radiative fluxes

Can we calculate upwelling SW and LW based on surface albedo and temperature?

TOA Satellite Measured Radiative Fluxes

Japan's Multi-functional Transport Satellite (MTSAT) *Hourly MTSAT-1R VISST products from Pat Minnis Group*



The screenshot shows a web browser window with the URL <http://angler.larc.nasa.gov/twpice/>. The page title is "NASA Langley Satellite Support Website Tropical Warm Pool International Cloud Experiment (TWP-ICE)".

On the left side, there is a navigation menu with the following items:

- [TWP-ICE Homepage](#)
- [NASA Langley](#)
- [Real-time Imagery](#)
- [-MTSAT -FY2C](#)
- [-MTSAT/FY2C](#)
- [-AVHRR GAC](#)
- [Real-time Products](#)
- [-MTSAT -FY2C](#)
- [-MTSAT/FY2C](#)
- [-MODIS -AVHRR](#)
- [-DARWIN ggd site](#)
- [-PIXEL/getcd\(\)](#)
- [-GRIDDED/netcd\(\)](#)
- [-SFC FLUX PRODUCTS](#)
- [Orbital Predictions](#)
- [-Custom Predicts](#)
- [-Interactive Tool](#)
- [Flight Track Overlay](#)
- [-All Aircrafts](#)
- [Flight Track Matched](#)
- [-All Aircrafts vs](#)
- [MTSAT-1R](#)

On the right side, there is a section titled "Current MTSAT 1R Image Taken on 2006092 (03/23) 2233 UTC". Below this title is a satellite image showing a tropical region with a color scale at the bottom ranging from 180 to 260. Below the image, there are quick links: "Quick links to latest image: [MTSAT 1R](#), [MTSAT VIS](#), [MTSAT 1km VIS](#), [FY2C 1R](#), [FY2C VIS](#), [FY2C 1km VIS](#)."

At the bottom of the page, there is a NASA logo and the following text:

Website address: <http://www-angler.larc.nasa.gov/twpice> Last Updated: Jan 20, 2006
Responsible NASA Official: [Patrick Minnis \(p.minnis@nasa.gov\)](mailto:p.minnis@nasa.gov)
Website Curator: [Louie Nguyen \(l.nguyen@nasa.gov\)](mailto:l.nguyen@nasa.gov) [Feedback on Langley Products and Services](#)

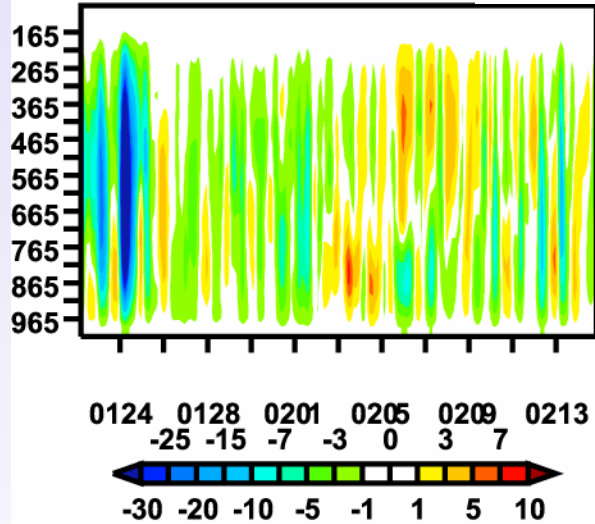


A Test Run of the Variational Analysis

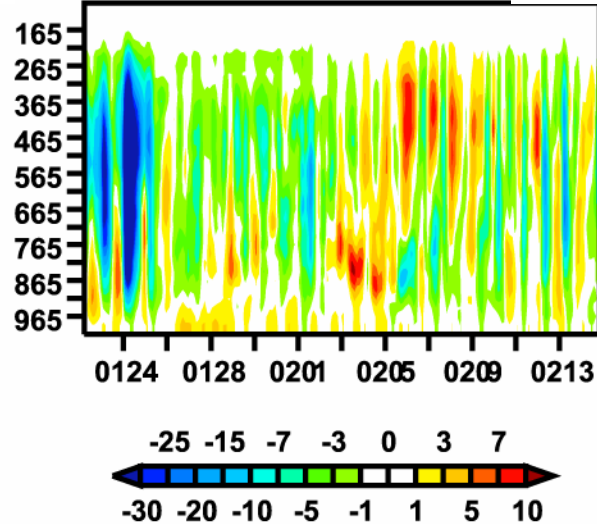
**Sounding data + Observed Precip + all other constraints from
ECWMF**

Derived Large-scale Forcing Fields

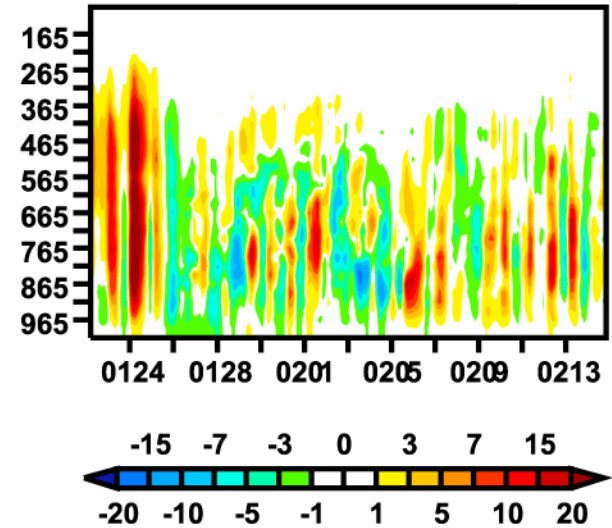
Omega (mb/hr) Test



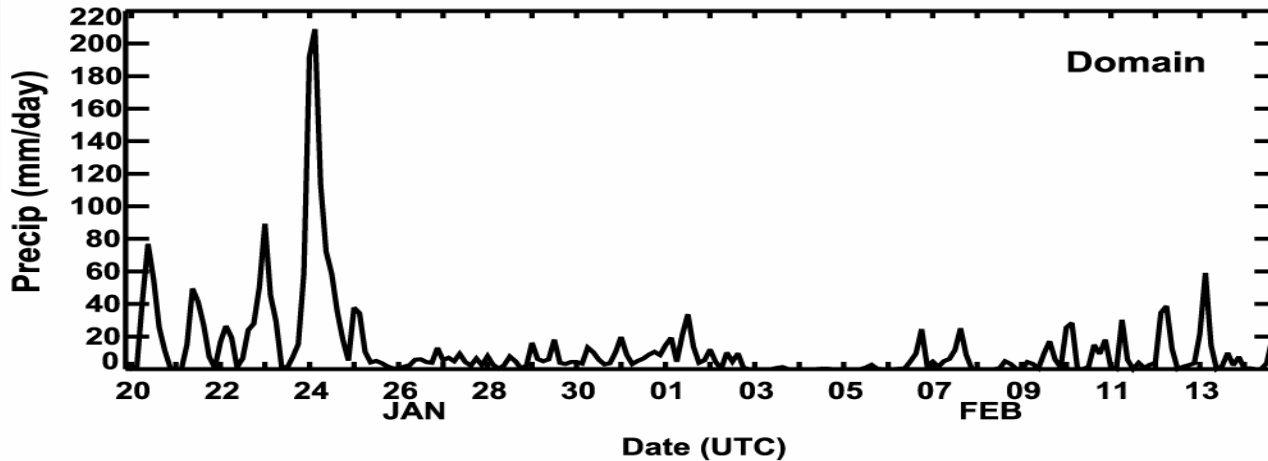
T Forcing (K/day) Test



q Forcing (g/kg/day) Test



TWIPCE Radar Precipitation



Summary

Issues need to address:

- *Dry bias in RH*
- *Uncertainties in the surface and TOA constraints*
- *How do the derived forcing fields respond to those uncertainties in RH and constraints?*
- *How do SCMs/CRMs respond to the uncertainty in the forcing fields?*

Uncertainty information about the forcing fields

In addition to the domain-mean fluxes, we are planning to also provide ocean mean fluxes and land mean fluxes with their spatial standard deviations for CRMs

We plan to deliver the forcing data set by the next ARM STM

The END

Sensitivity Test to Uncertainties in Surface SH & LH

3 Runs

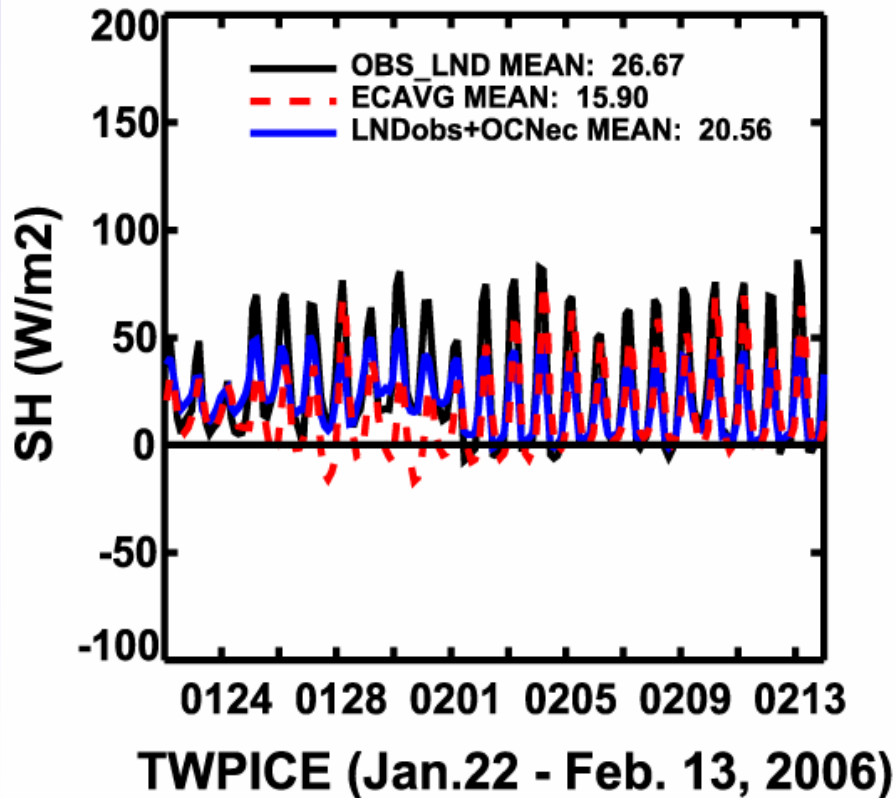
T1: Sounding data + Observed Precip + all other constraints from ECWMF

T2: Same as T1 except that SH & LH are from the four surface flux stations

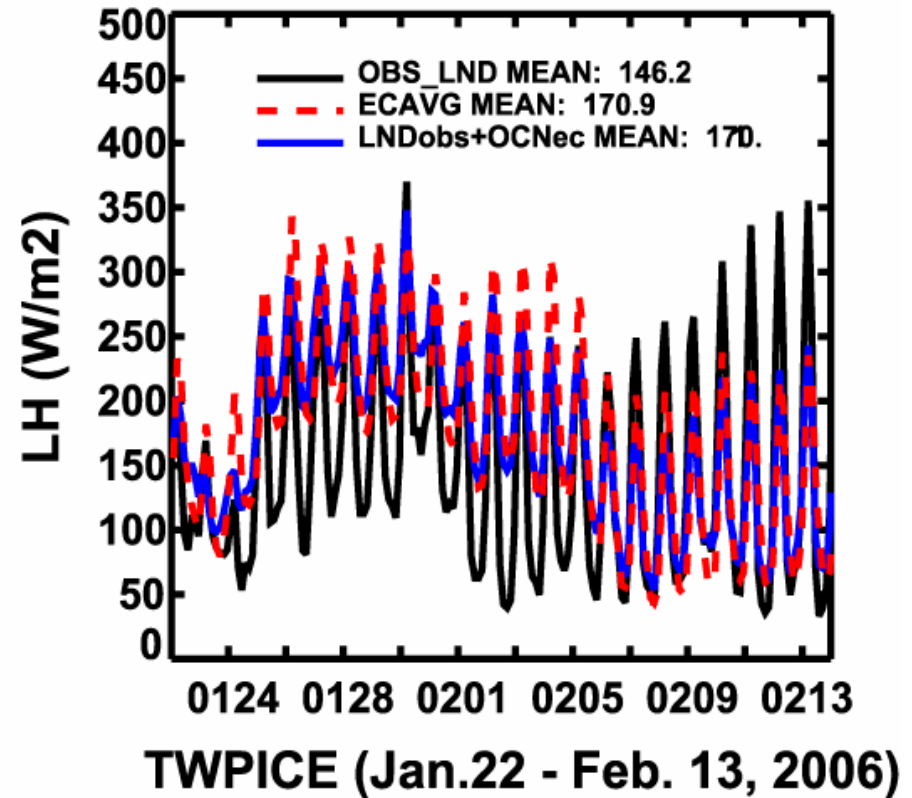
T3: Same as T1 except that SH & LH are the combination of ocean fluxes from ECMWF and land fluxes from the four surface flux stations

Domain-averaged SH & LH used in the Test Runs

SHFLX



LHFLX



How sensitive are the forcings to uncertainties in SH&LH?

