Diagnostic Studies Using SoWMEX/TiMREX Sounding Data

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• Nine IOPs; 15 dropsonde missions
• Quality-control efforts continuing (Paul’s talk Weds.)
• Sounding, dropsonde, profiler, surface data will be integrated into gridded data set
Field-phase data analysis - CSU web site:
http://tornado.atmos.colostate.edu/timrex/products/soundings/index.html
Southwest Ship Winds, RH Time Series

Time series for 99810 from 05/21 to 05/28

Time series for 99810 from 05/28 to 06/04

Time series for 99810 from 06/04 to 06/11

Time series for 99810 from 06/11 to 06/18

21 May

June 4

June 18

EOP (IOPs 3-6)

4 June

4 June

18 June

EOP

IOP 8
- TiMREX-mean rainfall heaviest over southern Taiwan and just upstream of island.
• Sounding network designed to sample upstream conditions
• Strong SST gradient across northern and central Taiwan

TiMREX Sounding Network and SST field 2009 (May-June)
Land/Ocean Rainfall Time Series

TRMM 3B42v6 daily rainfall over TiMREX EBA

- **Ocean Array**
- **Land Array**

**Land/ocean rain comparable**

**Land exceeds ocean rain**

**Ocean exceeds land rain**
TiMREX Sounding Network and SST field 2009 (May-June)
During IOPs: enhanced southwest-erly flow, deep moisture, and increase in midlevel $\theta_e$ (reduced potential instability)
Periods of rainfall over ocean generally correspond to periods of diagnosed upward motion.
Periods of rainfall over land generally correspond to periods of diagnosed upward motion.
Possible impacts of SST gradient upstream of island:
- Modification of boundary layer stability
- Enhancement of LLJ
- Warm air flowing over cool water
- Leads to stable boundary layer
Dropsonde mission on 4 June 2008

Dropsonde #5 over cooler water, #7 over warmer water
Dropsonde #5, over cool water

Dropsonde #7, over warmer water

Stable boundary layer

Well-mixed boundary layer
SST and 850 hPa wind field (knots) for SOP

- SOP-mean, 850-hPa mean flow shows blocking by Taiwan
- LLJ in Taiwan Straits possibly enhanced by SST gradient/baroclinic PBL
South China Sea Monsoon Experiment (SCSMEX) – May–June 1998

Similar SST pattern during 1998 SCSMEX
Mean Diurnal Cycle of Rainfall

- Afternoon/evening rainfall maximum over land
- Mid-day maximum in rainfall over ocean (?)

TRMM 3B42
Ten years of TRMM PR-based diurnal cycle of rainfall
South China coastline

Afternoon convection over land

Aves and Johnson (2008)
Diurnal cycle of precipitation systems over southwestern Taiwan during the 2008 Meiyu season

Jou et al. (2009)

Early morning max over the strait, eastward propagation in the morning, afternoon max foothills and mtns, weak aftn max over strait (40 precipitation features identified during the period)
Year of Tropical Convection (YOTC)

A Scientific Framework for Addressing the Multi-scale Organization of Tropical Convection and its Interaction with the Global Circulation

Duane Waliser, JPL/Caltech
Mitch Moncrieff, NCAR
Co-chairs, Science Planning Group

YOTC Data Archiving Period
May 2008 – Oct 2009

A Contribution to Seamless Weather-Climate Prediction
ECMWF YOTC Special Operational Analysis and Forecast Data Set – T799 (25-km grid; 4 per day)

http://data-portal.ecmwf.int/data/d/yotc
TiMREX Sounding Network and SST field 2009 (May-June)

ECMWF YOTC Special Operational Analysis T799 (~25 km)
Preliminary analysis suggests mid-to-upper-level maximum in vertical motion over ocean.
Summary and Conclusions

- Averaged over 43-day TiMREX SOP, heaviest rainfall occurred over southern Taiwan and upstream of island; land vs. ocean proportion varied with time.
- Strong SST gradient over Taiwan Strait; gradient in PBL structure; enhancement of LLJ(?); stable PBL over northern SCS, warm air flowing over cool water.
- Preliminary results: sounding data describe time series of $\omega$ reasonably well, but more work needed.
- Diurnal cycle: further work underway, including comparisons with ECMWF YOTC, 25-km product.
48-h 7-9 August rainfall at Alishan, Taiwan: 2777 mm = 109.3 in !!
ASTER dropsonde mission on 31 May 2008, Taiwan Straits

Photo by Paul Ciesielski