



WIND WAVE OBSERVATIONS OF TYPHOONS FROM EAST AND ASIS BUOYS

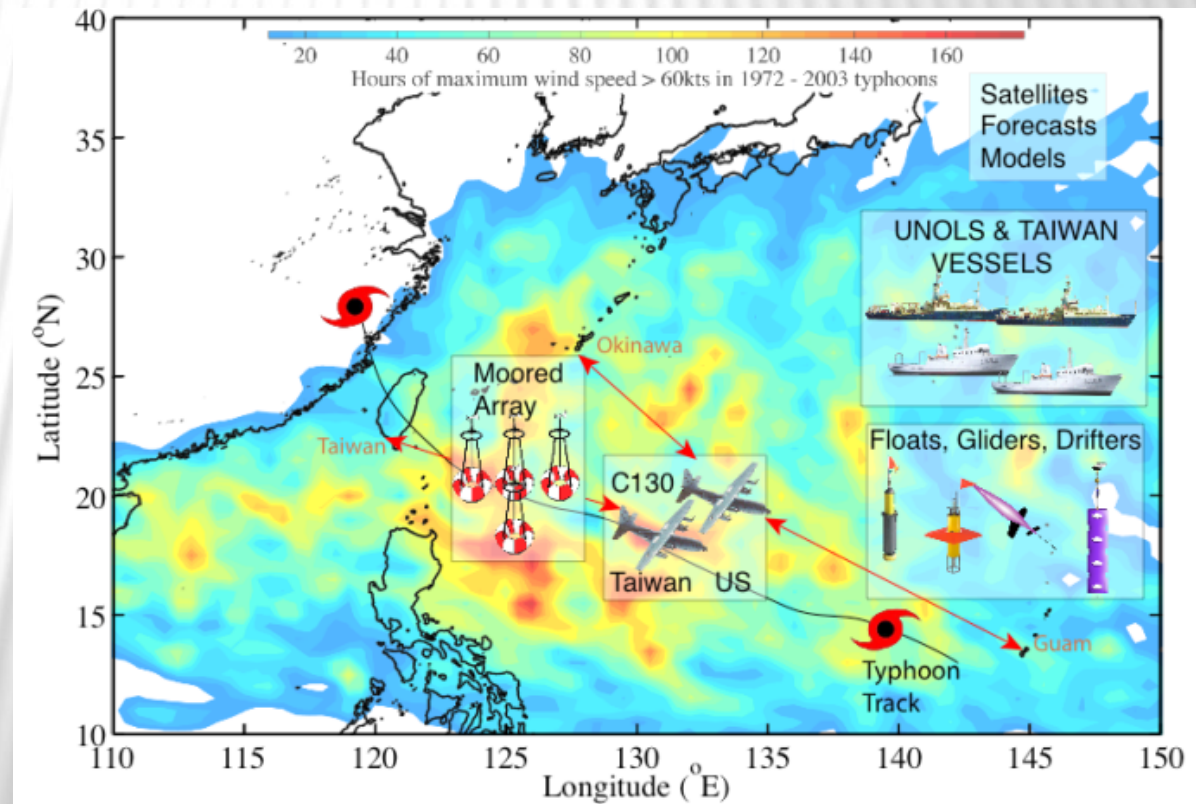
Hans C. Graber, Rafael Ramos
and Michael Caruso

Rosenstiel School of Marine & Atmospheric
Science
12th Int. Workshop on Wave Hindcasting and
Forecasting
University of Miami
Kohala Coast, Hawaii's Big Island - Oct 30 - Nov 4,
2011



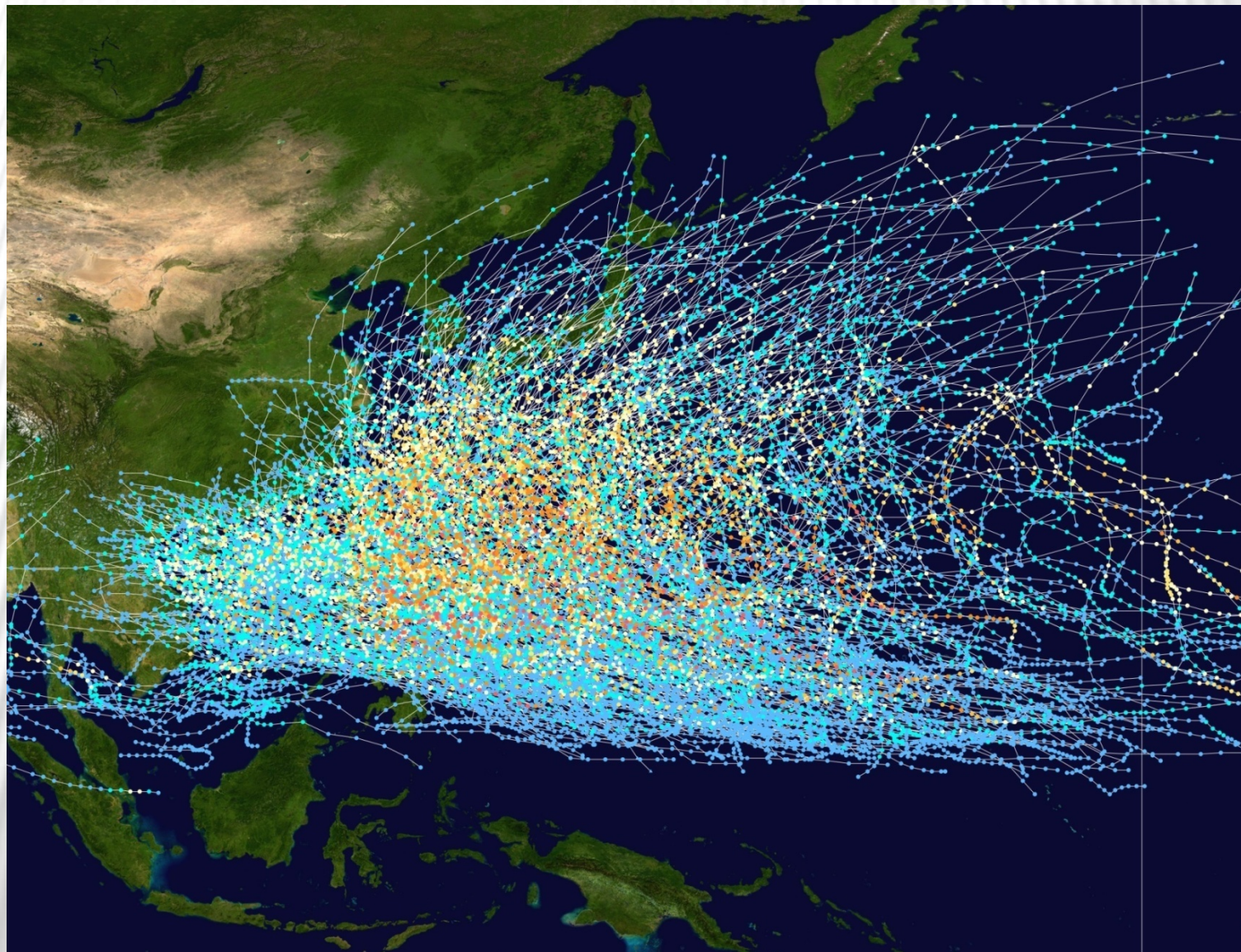
MOTIVATION

- Measure surface fluxes in typhoons
- Measure sea state information in typhoons
- Validate SAR-derived wind and wave fields of typhoons with in-situ, airborne and shipborne data as well as drifters and acoustic sensors

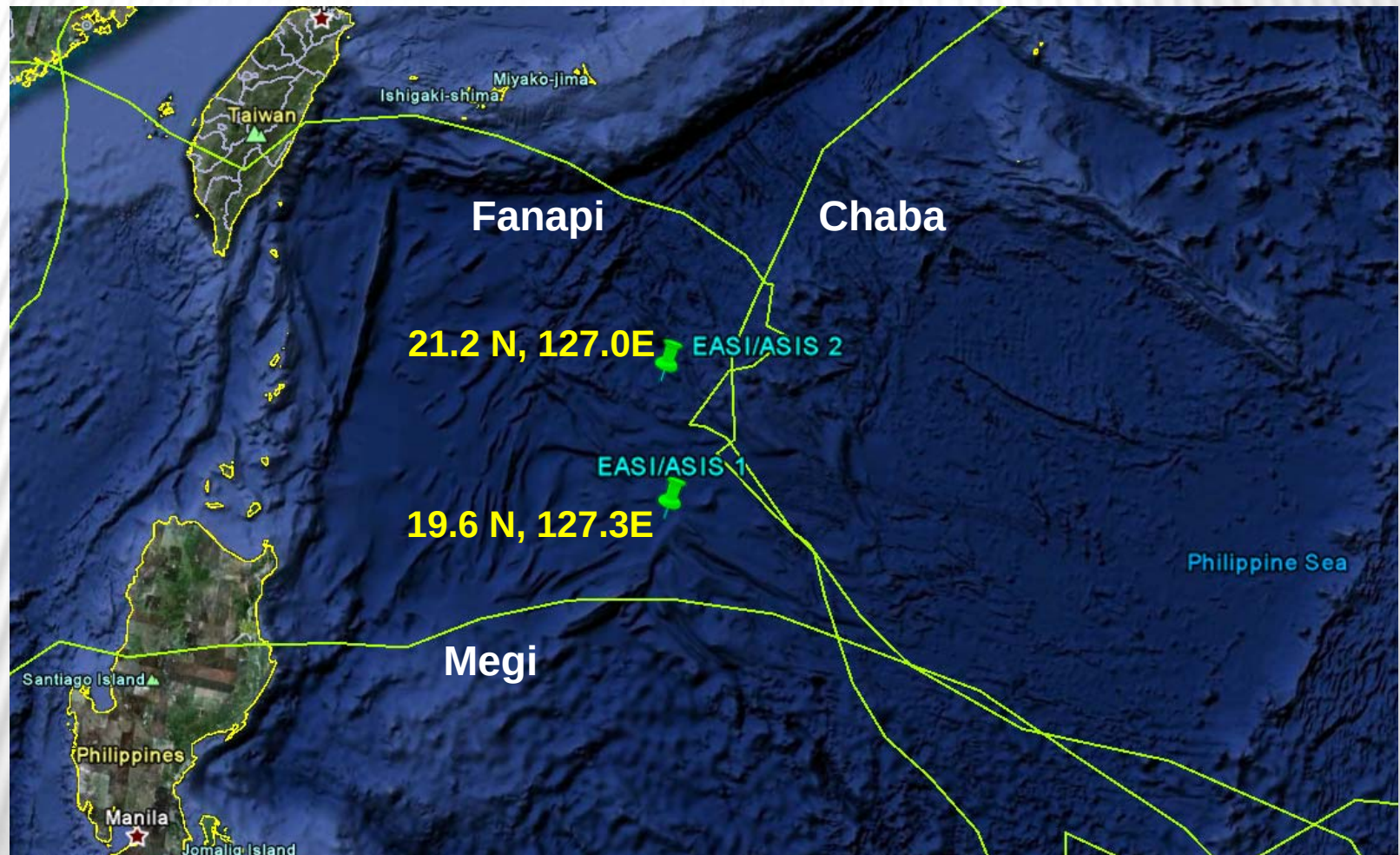


PACIFIC TYPHOONS TRACKS 1980 TO 2005

UNIVERSITY
OF MIAMI



LOCATIONS AND STORM TRACKS



EASI-ASIS TETHERED

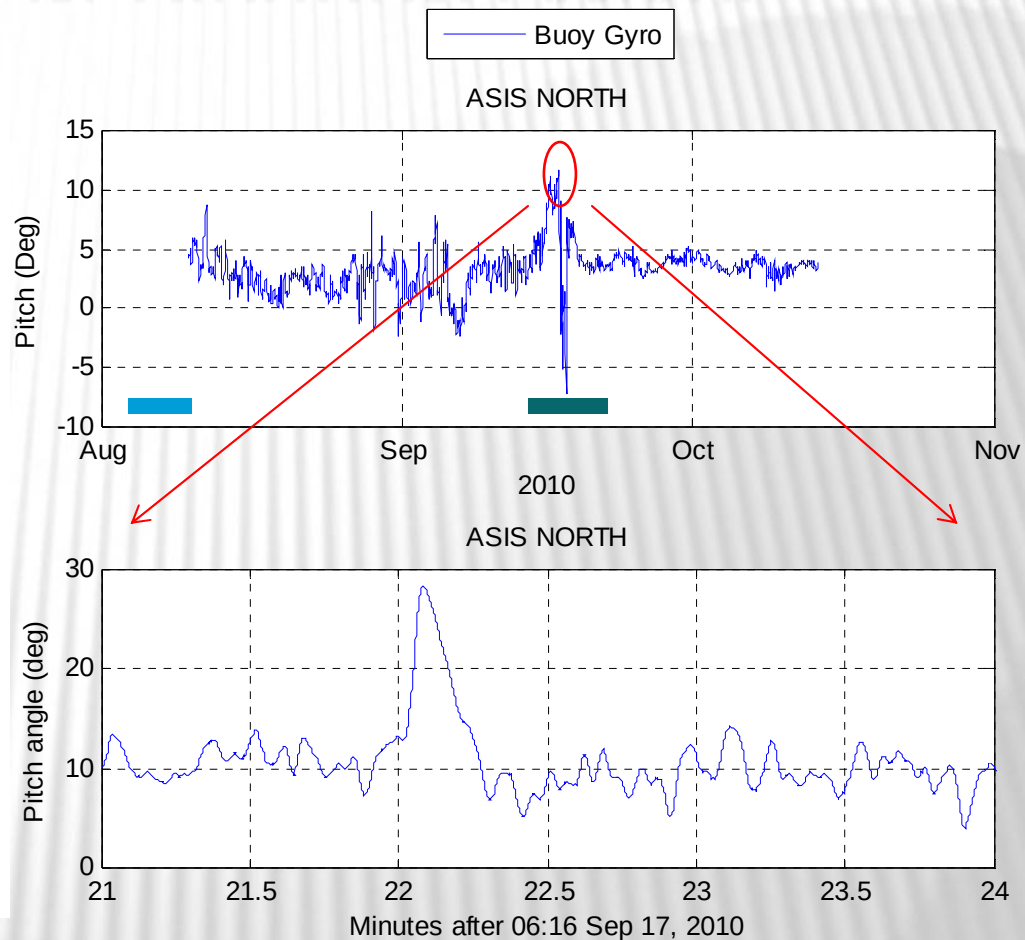
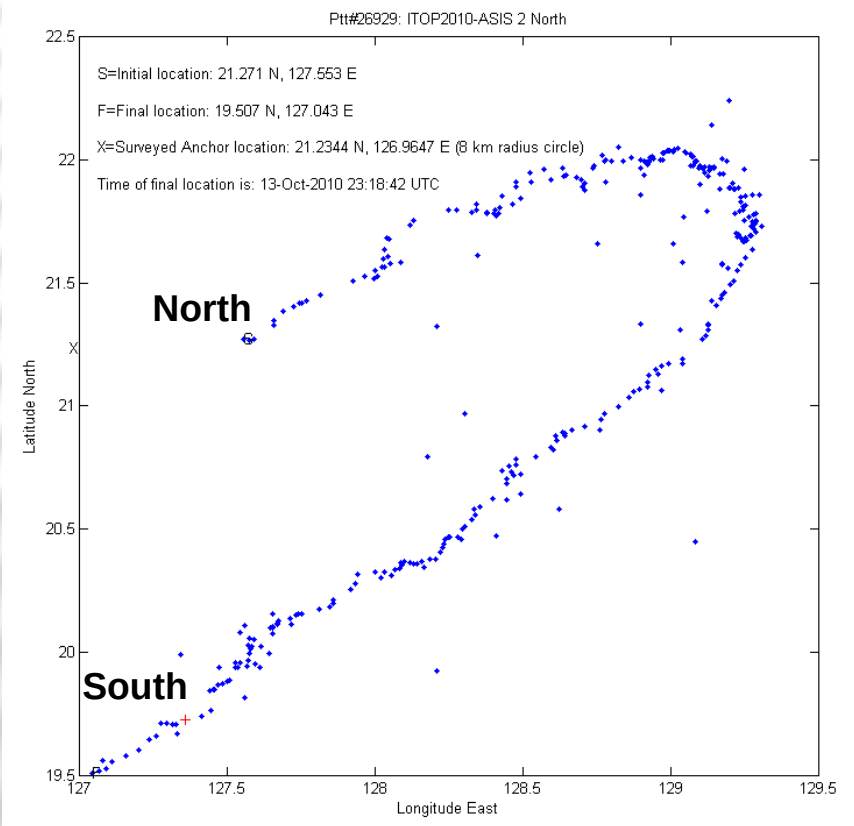


6.2 M WAVE ABOUT TO BREAK OVER SHIP DECK SOUTHEAST OFF TAIWAN

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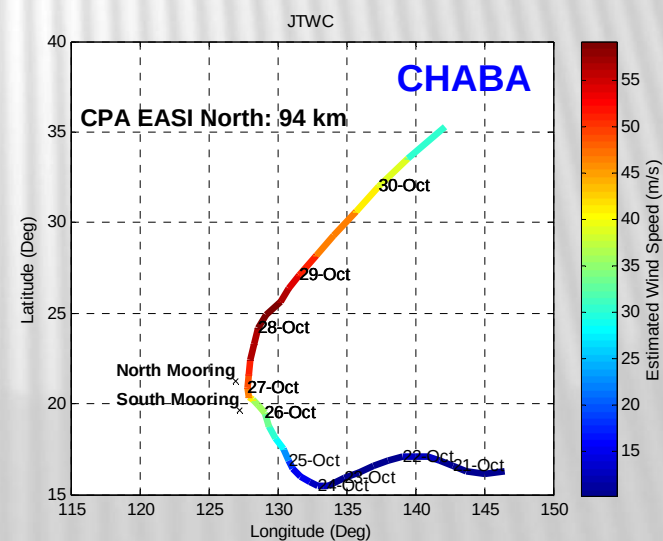
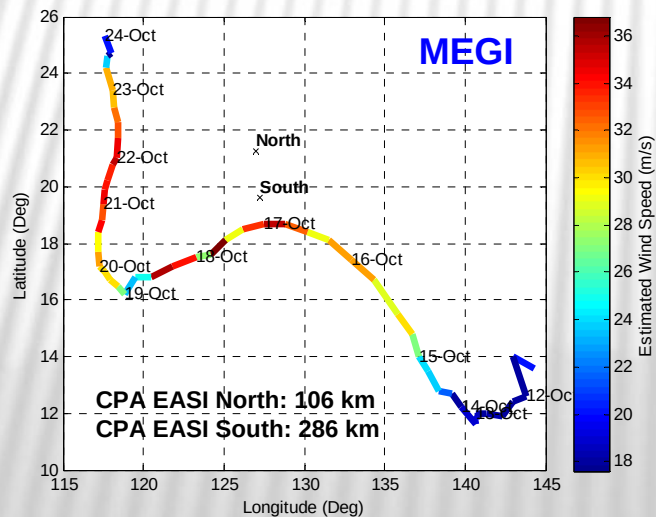
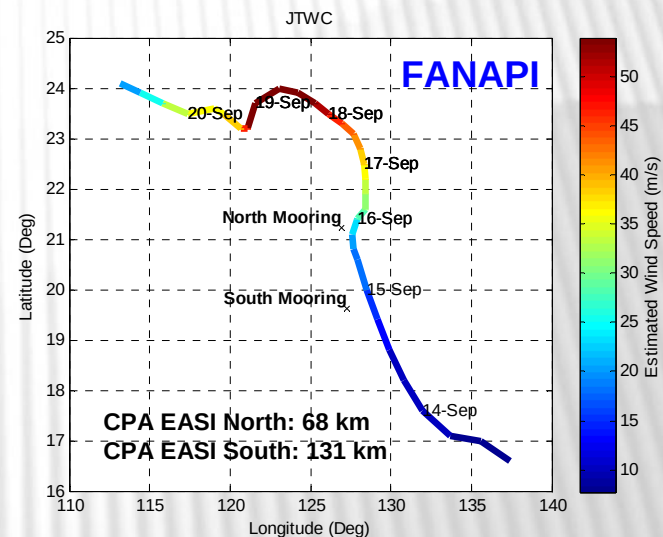
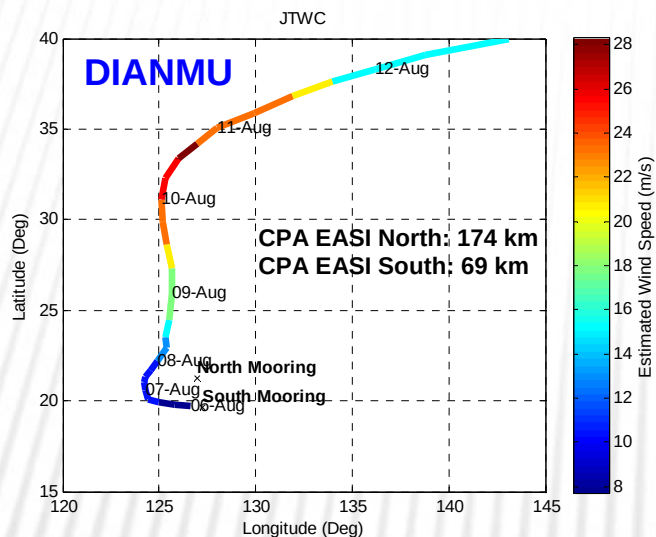


ASIS NORTH ADRIFT IN TYPHOON FANAPI

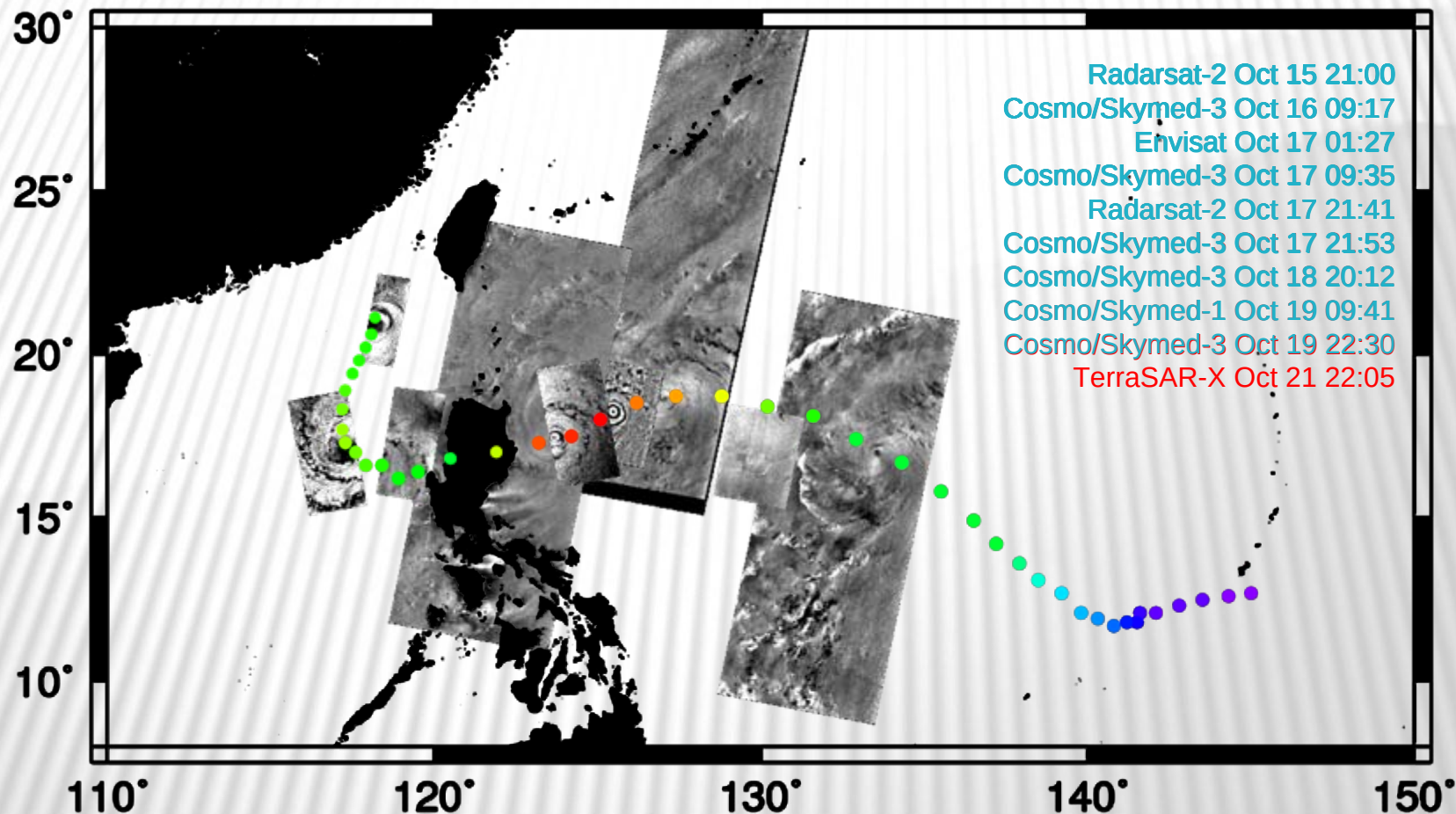




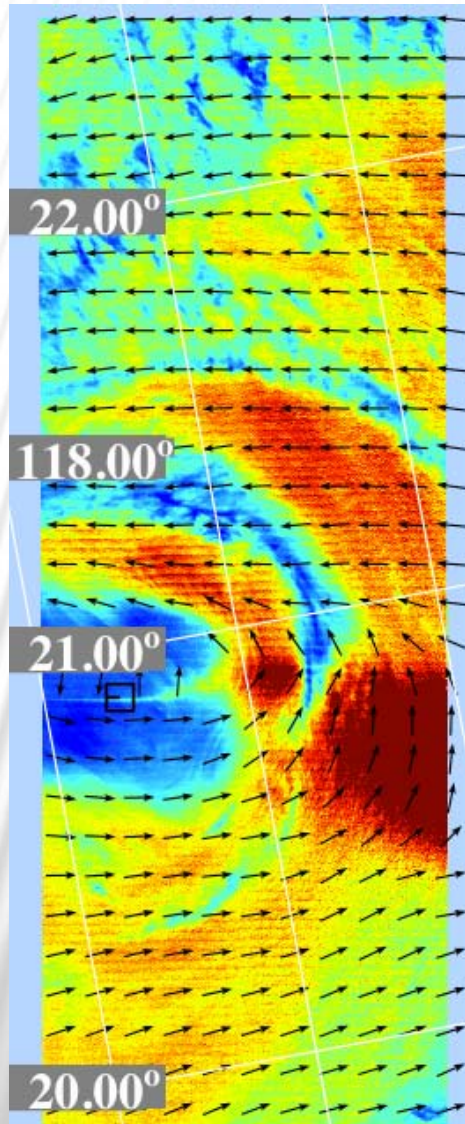
2010 TYPHOON SEASON



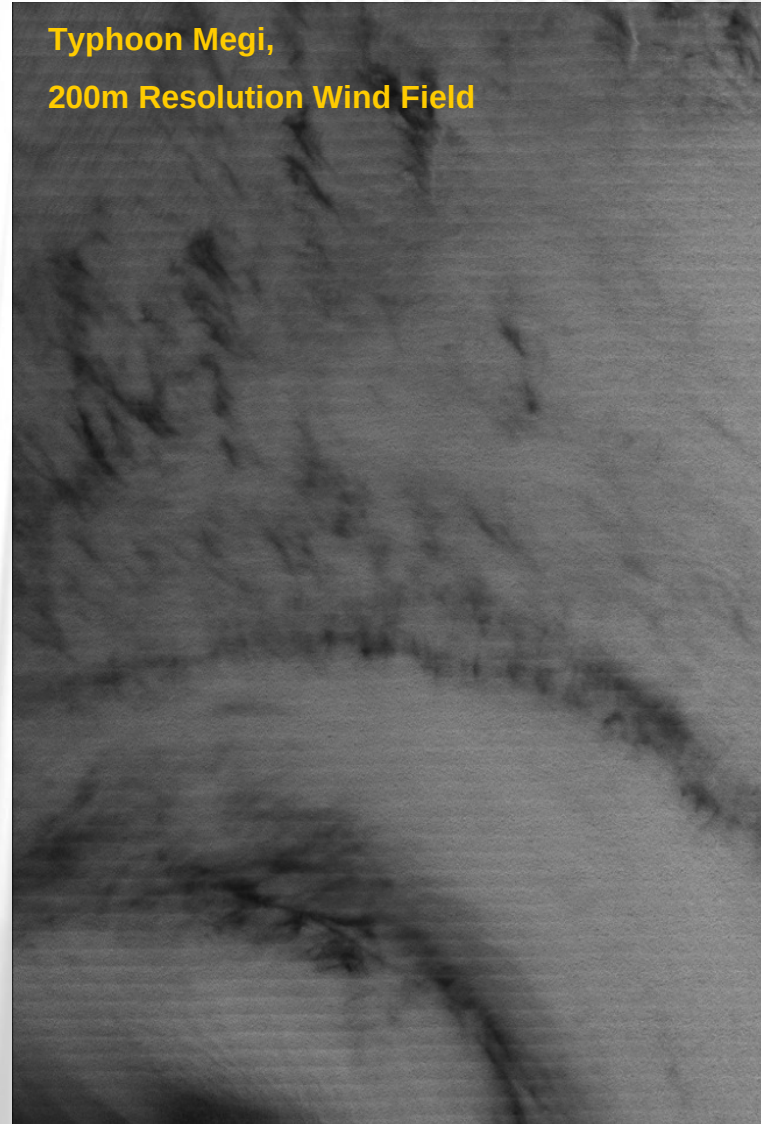
TYPHOON MEGI COLLECTION SEQUENCE



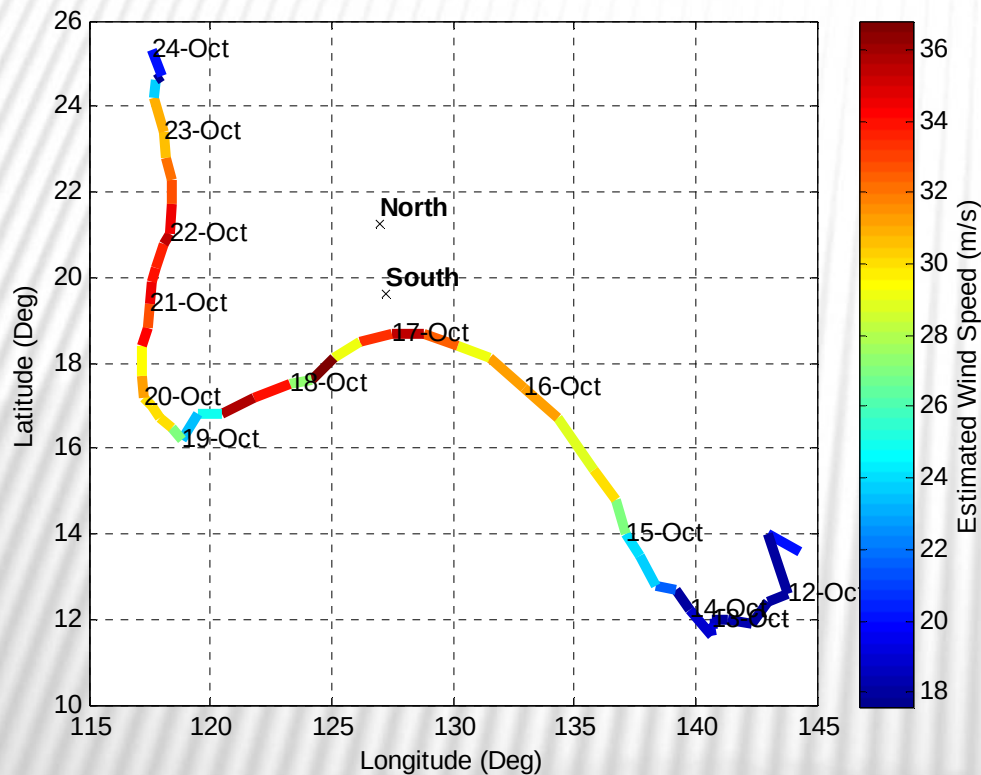
SAR WIND FIELD OF TYPHOON MEGI



Typhoon Megi,
200m Resolution Wind Field



TYPHOON MEGI TRACK AND INTENSITY (ECMWF)

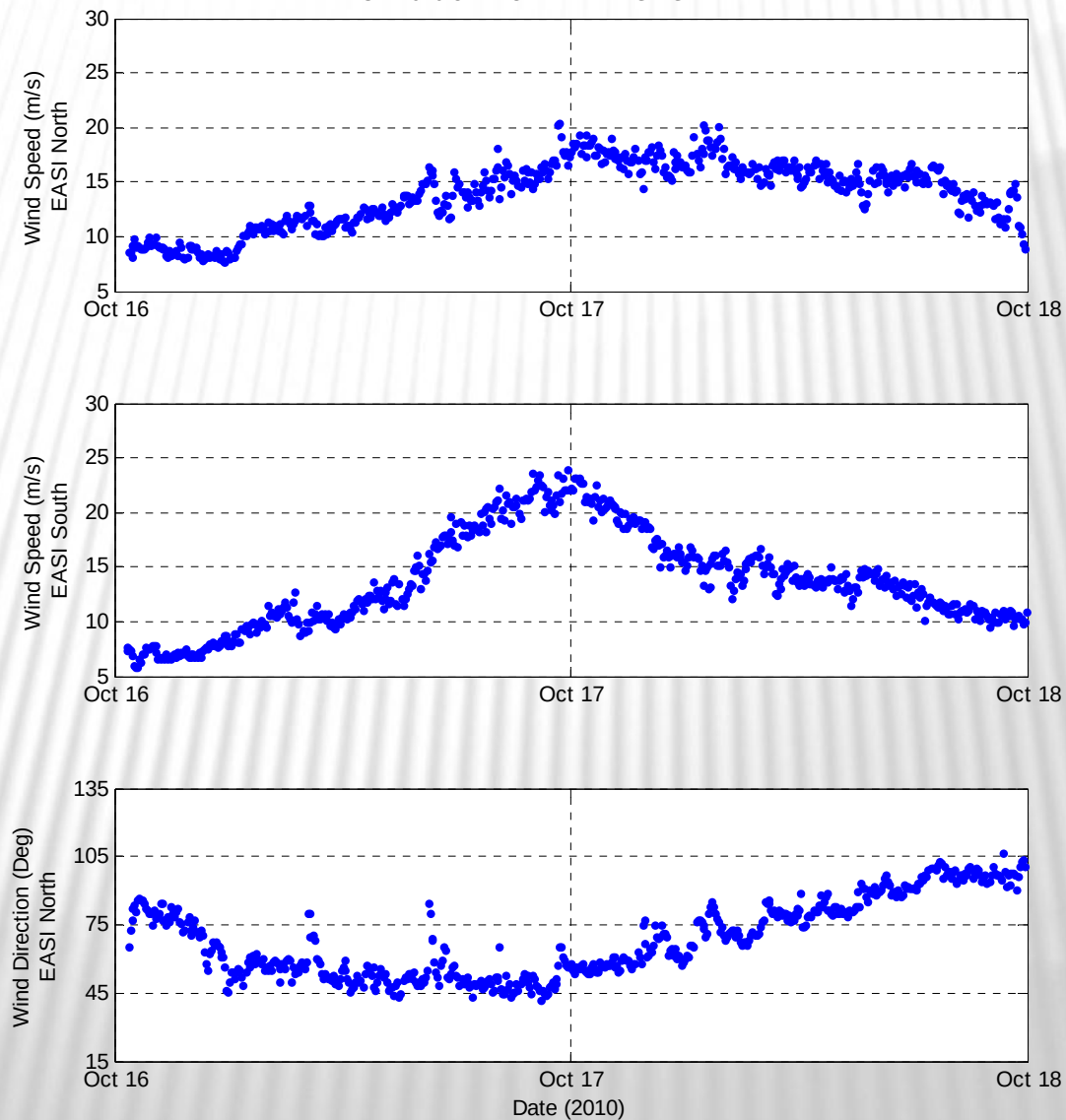


Minimum Distance to South Mooring	106 km (346 Deg)
Minimum Distance to North Mooring	286 km (349 Deg)
Date and Time	Oct 17 at 00:00
Wind Speed	33.25 m/s
Central Pressure	964.8 hPa
Distance between Max Winds and Central Pressure	7 km



BOUY OBSERVATIONS DURING MEGI

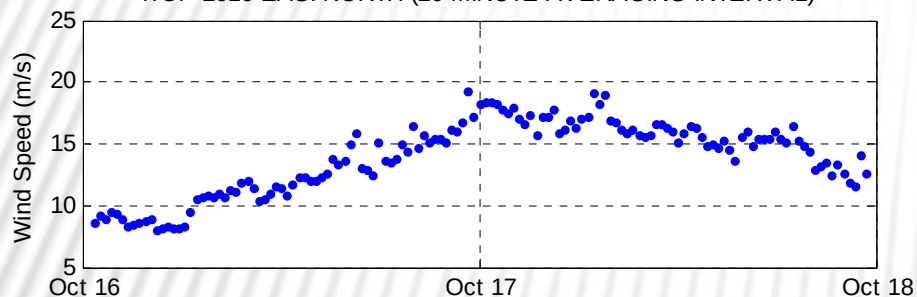
ITOP 2010 5-MINUTE AVERAGING INTERVAL



WINDS AND WAVES AT BUOYS

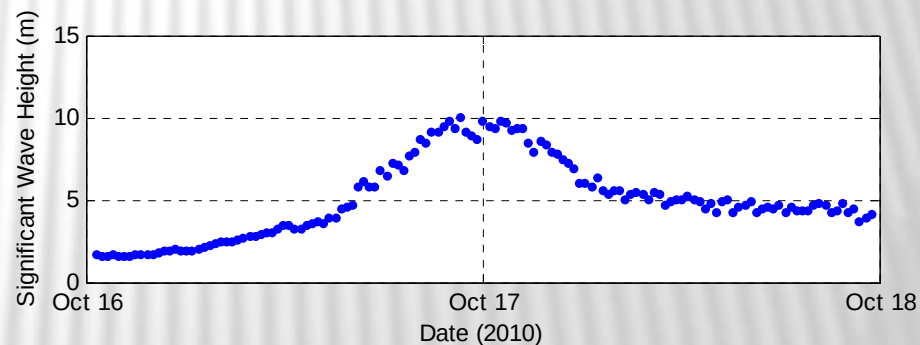
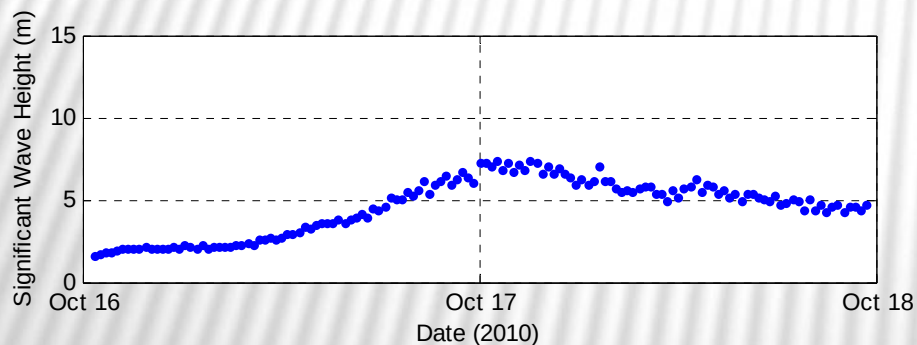
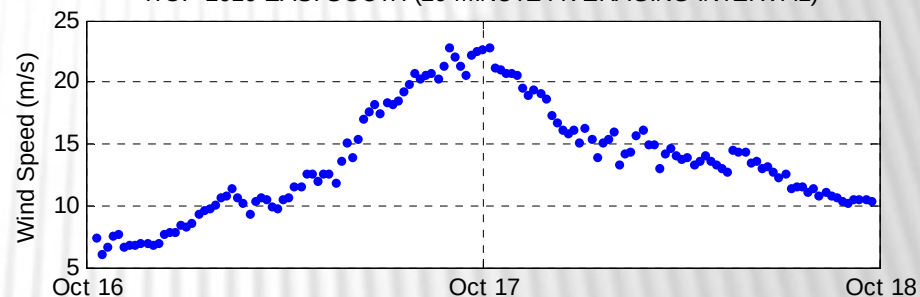
EASI North

ITOP 2010 EASI NORTH (20-MINUTE AVERAGING INTERVAL)



EASI South

ITOP 2010 EASI SOUTH (20-MINUTE AVERAGING INTERVAL)



PARAMETRIC HURRICANE MODEL (ROSS 1979)

Based on JONSWAP parametric approach

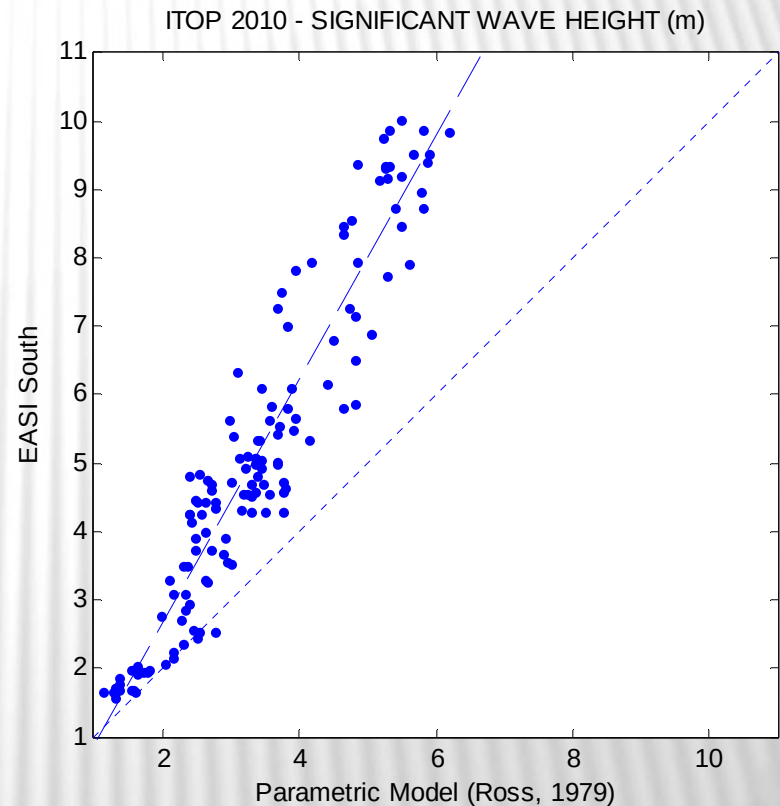
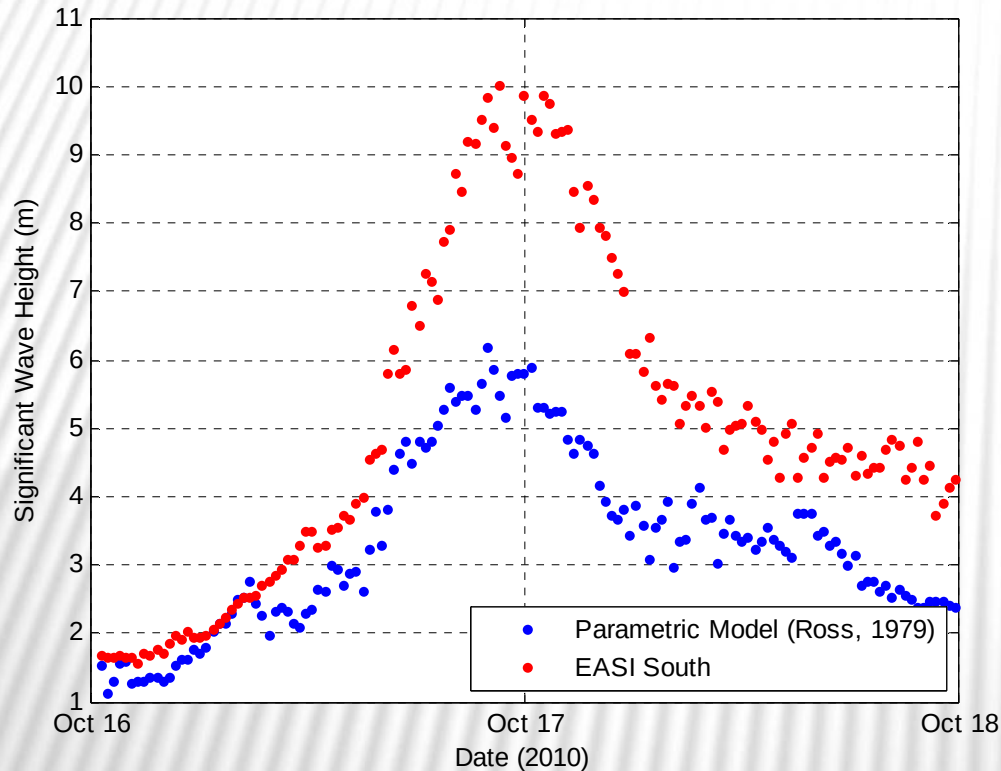
$$\frac{f_m U_{10}}{g} = \nu = 0.97 \xi_r^{-0.21}$$

$$\frac{E g^2}{U_{10}^4} = \epsilon = 2.25 \times 10^{-5} \xi_r^{0.45} \quad \text{where } H_{1/3} = 4\sqrt{E}$$

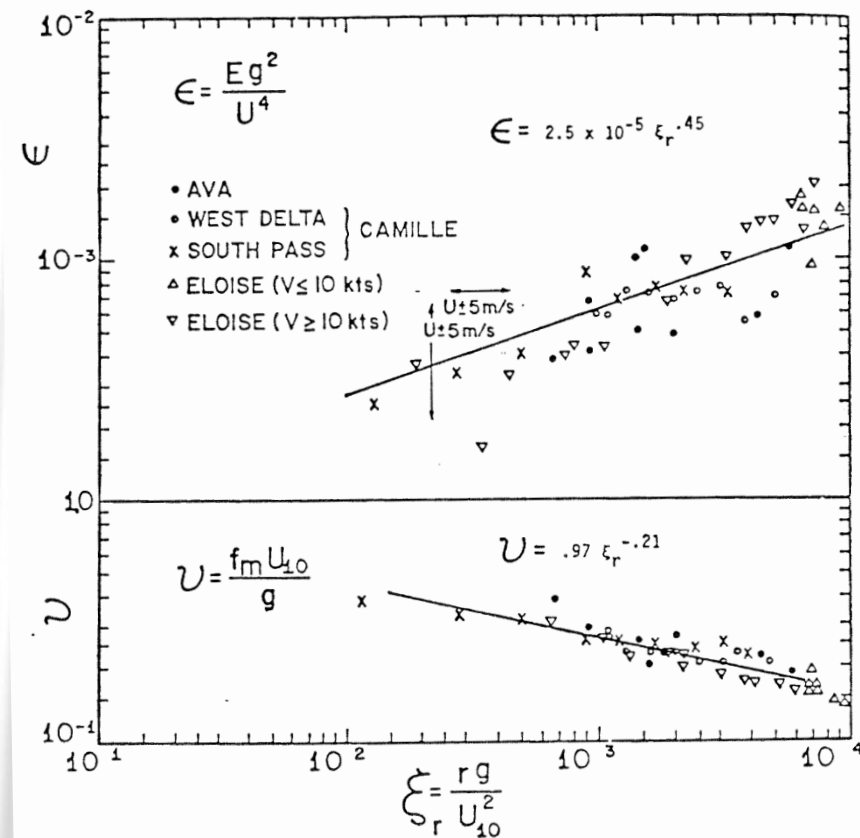
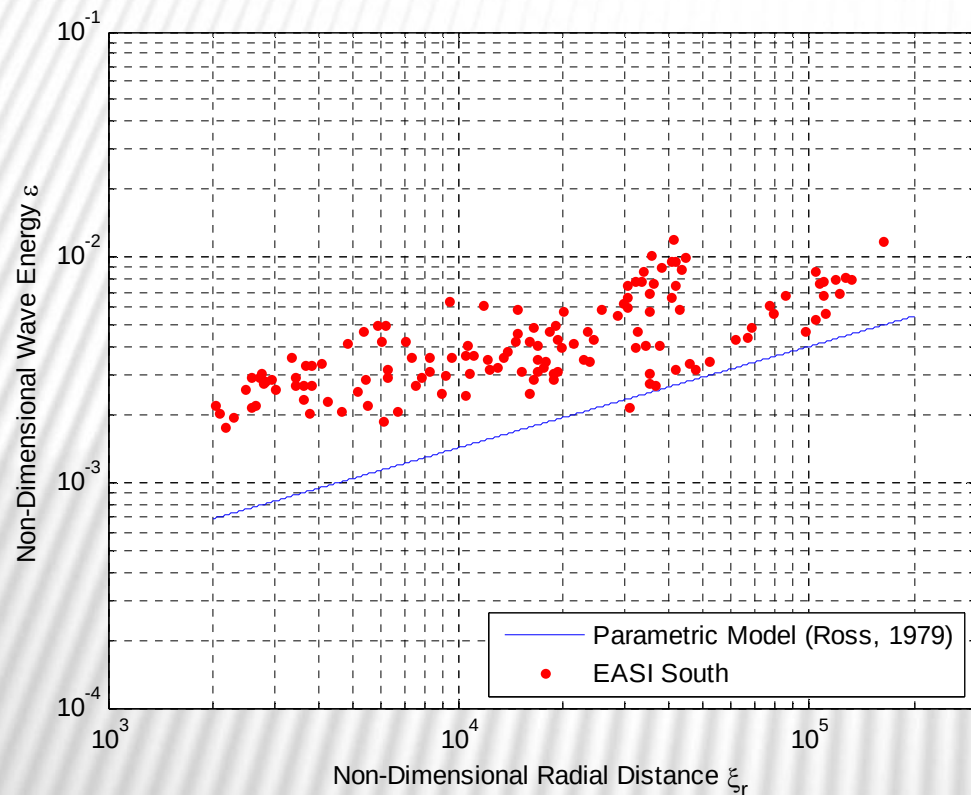
$$\xi_r = \frac{r g}{U_{10}^2} \text{ non-dimensional radial distance}$$

Model was calibrated with data from Hurricanes Ava, Camille and Eloise

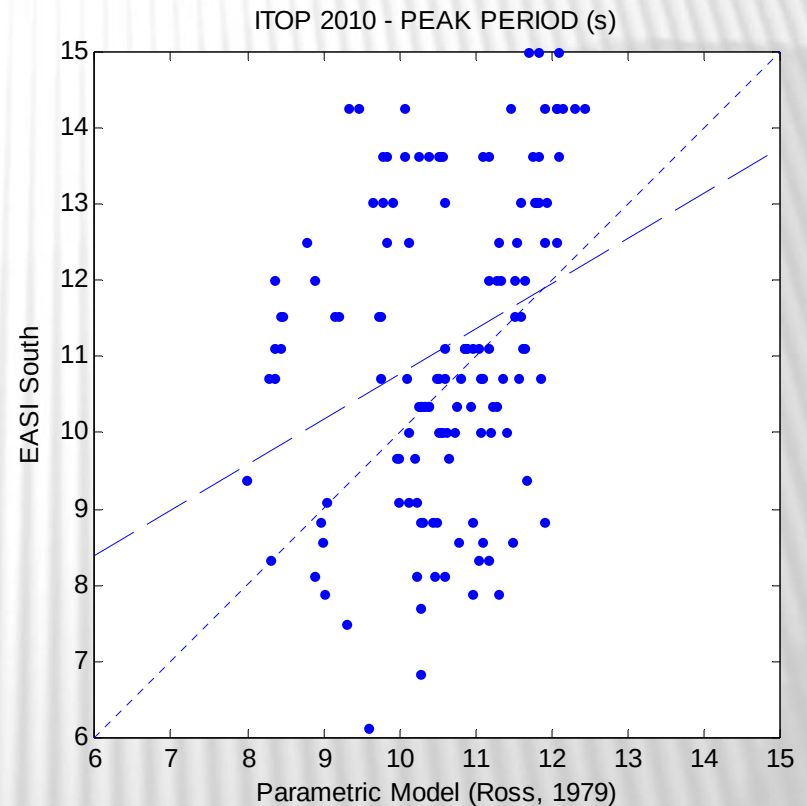
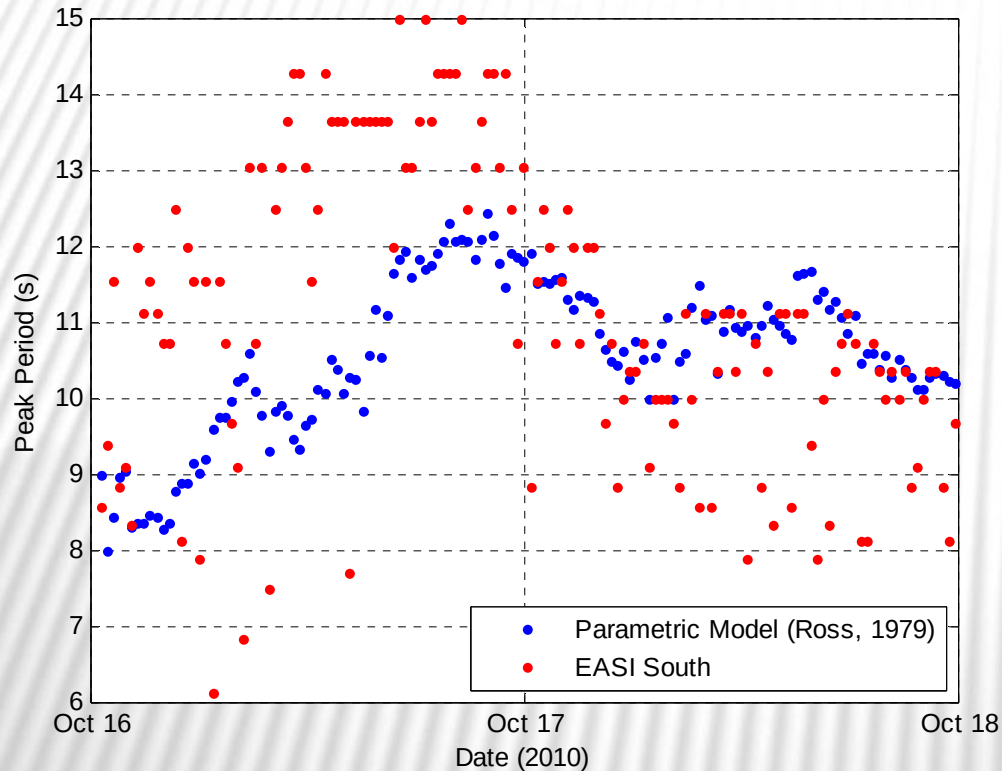
PARAMETRIC MODEL FIT TO TYPHOON MEGI WAVE HEIGHT



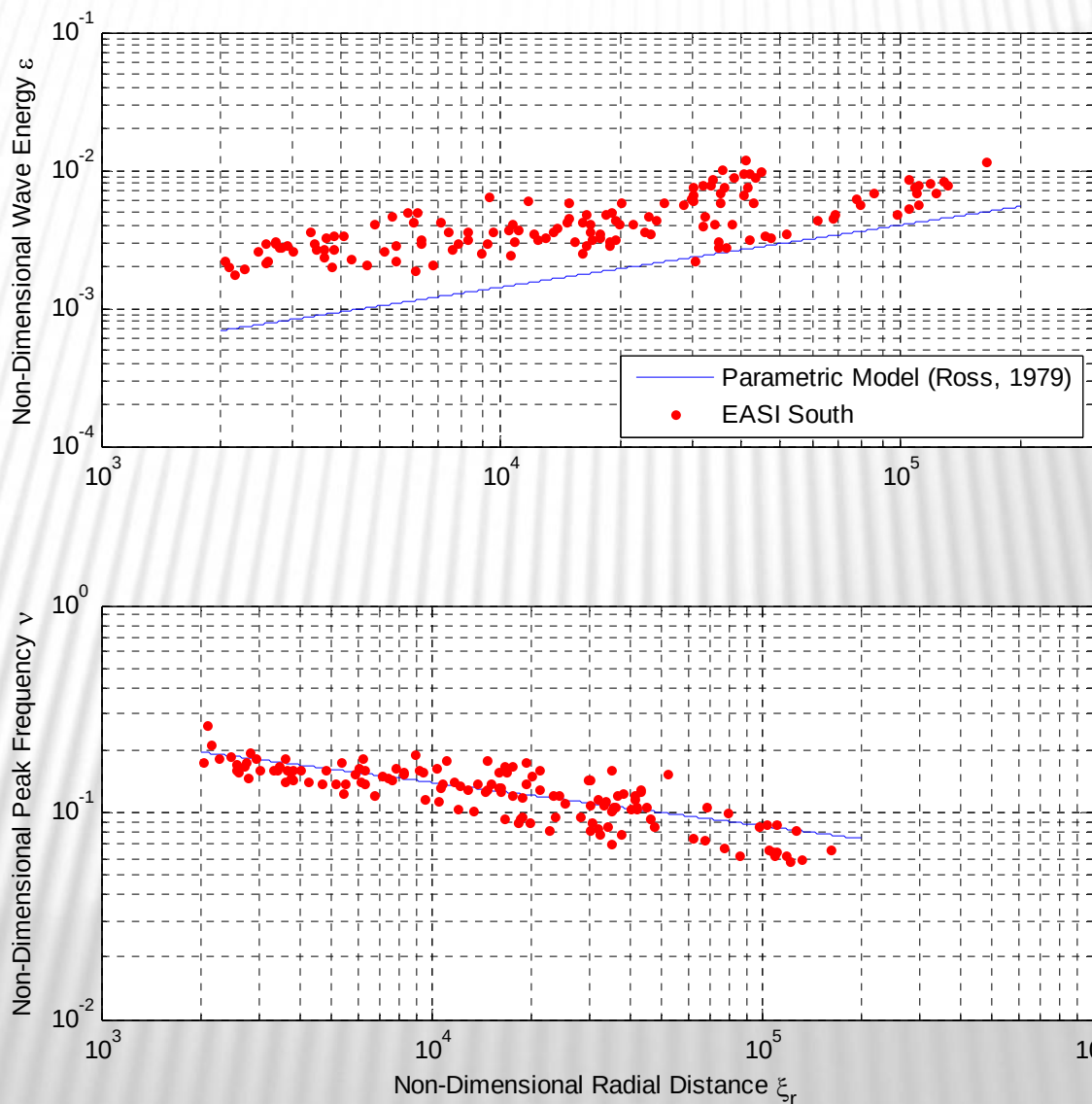
PARAMETRIC MODEL FIT TO TYPHOON MEGI WAVE HEIGHT



PARAMETRIC MODEL FIT TO TYPHOON MEGI PEAK PERIOD



PARAMETRIC MODEL FIT TO TYPHOON MEGI WAVE HEIGHT AND PEAK FREQUENCY



FUTURE WORK

- Complete sensor post-calibration
- Intercomparison of multiple sensors, e.g. sonic anemometer, K-Gill, RM Young anemometer
- Intercomparison with aircraft, WAMOS, SAR data.
- Computation of fluxes
- Revision of Ross parametric model

