Operational wind-wave forecasting system for the Gulf of Mexico.

11th International Workshop on Wave Hindcasting and Forecasting & 2nd Coastal Hazards Symposium.

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ESTADOS UNIDOS MEXICANOS

José Antonio Salinas P.
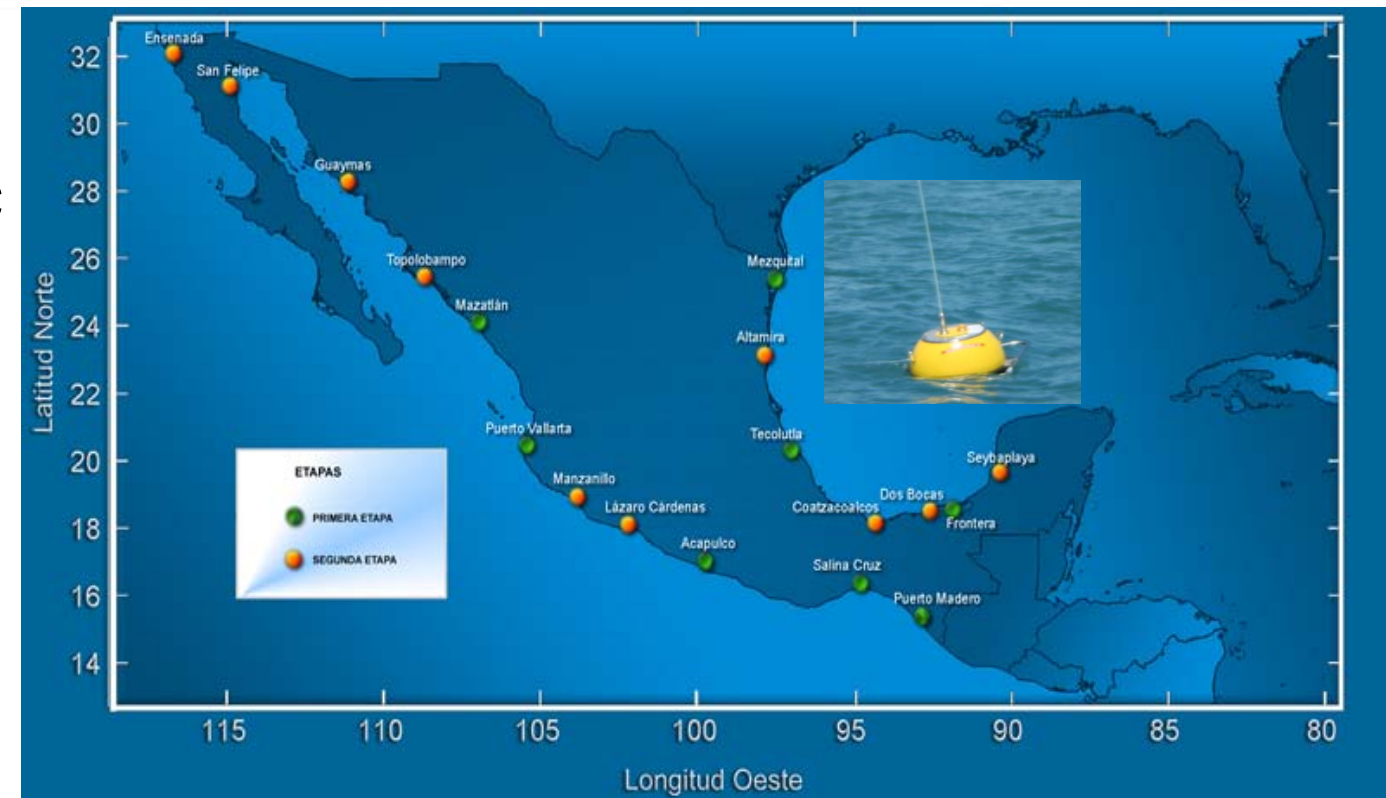Fernando Oropeza Rosales

Roberto Padilla H.
René Lobato Sánchez

October 2009.

SEMARNAT

Motivation

•The forecasting of high waves associated to extreme atmospheric events in the Gulf of Mexico (GoM), has become an important issue due to lost of lives, severe damage to human activities and societal infrastructure.

•Every year the GoM is the scene, on average, of 25 tropical storms (between June and October) and 40 cold fronts (between November and April).

•Due to the lack of wind and wind-waves measurements and forecasting in the Mexican Coast of the GoM, a numerical forecast system has been implemented.

Hurricane Gilberto, 1988
Tampico

Methodology
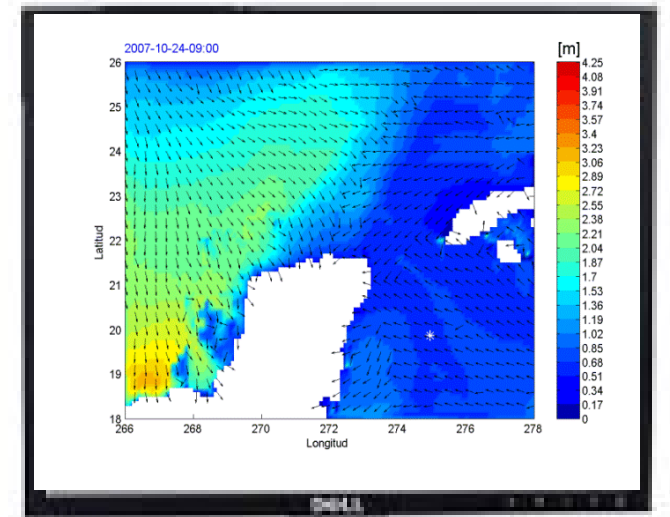
Summary and conclusions

The results for the Caribbean grid are presented.

The POMA system underestimates wind speed mainly during the peak of extreme events, such as the cold front and the hurricane cases.

It is believed that simulation of Hs will be better with the introduction of wind fields every hour from MM5, instead of every 6 hours.

Validation of POMA system is in progress.
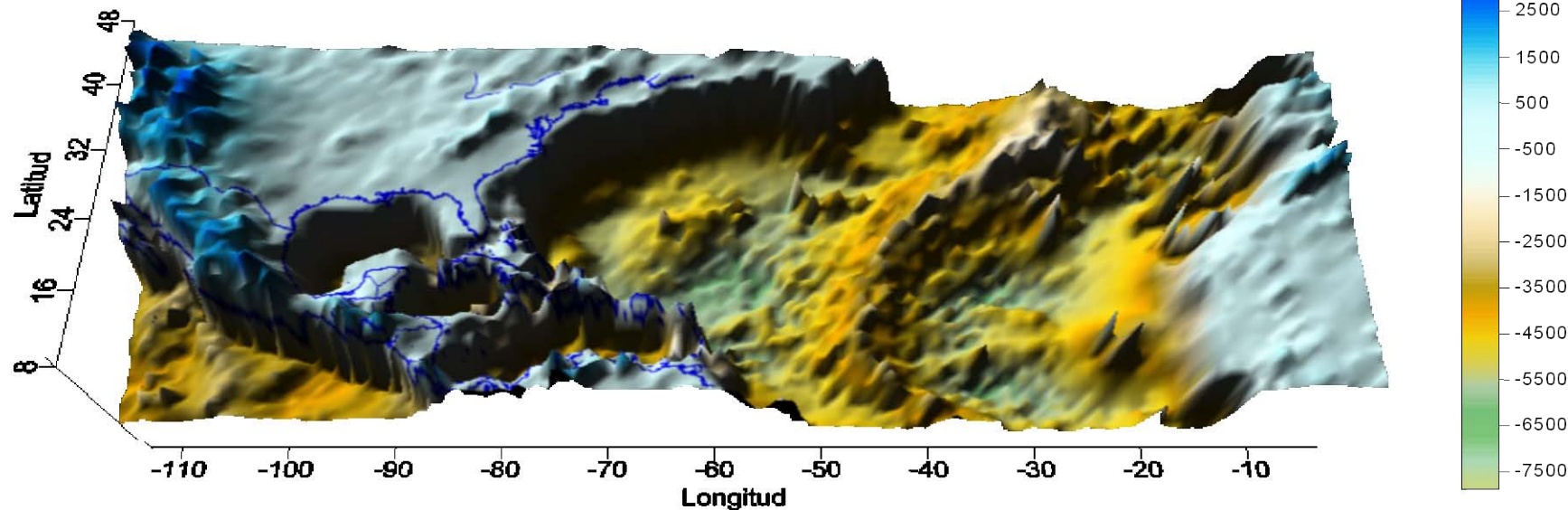
Models equations

Atmospheric Momentum equation
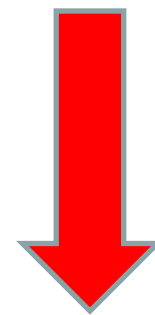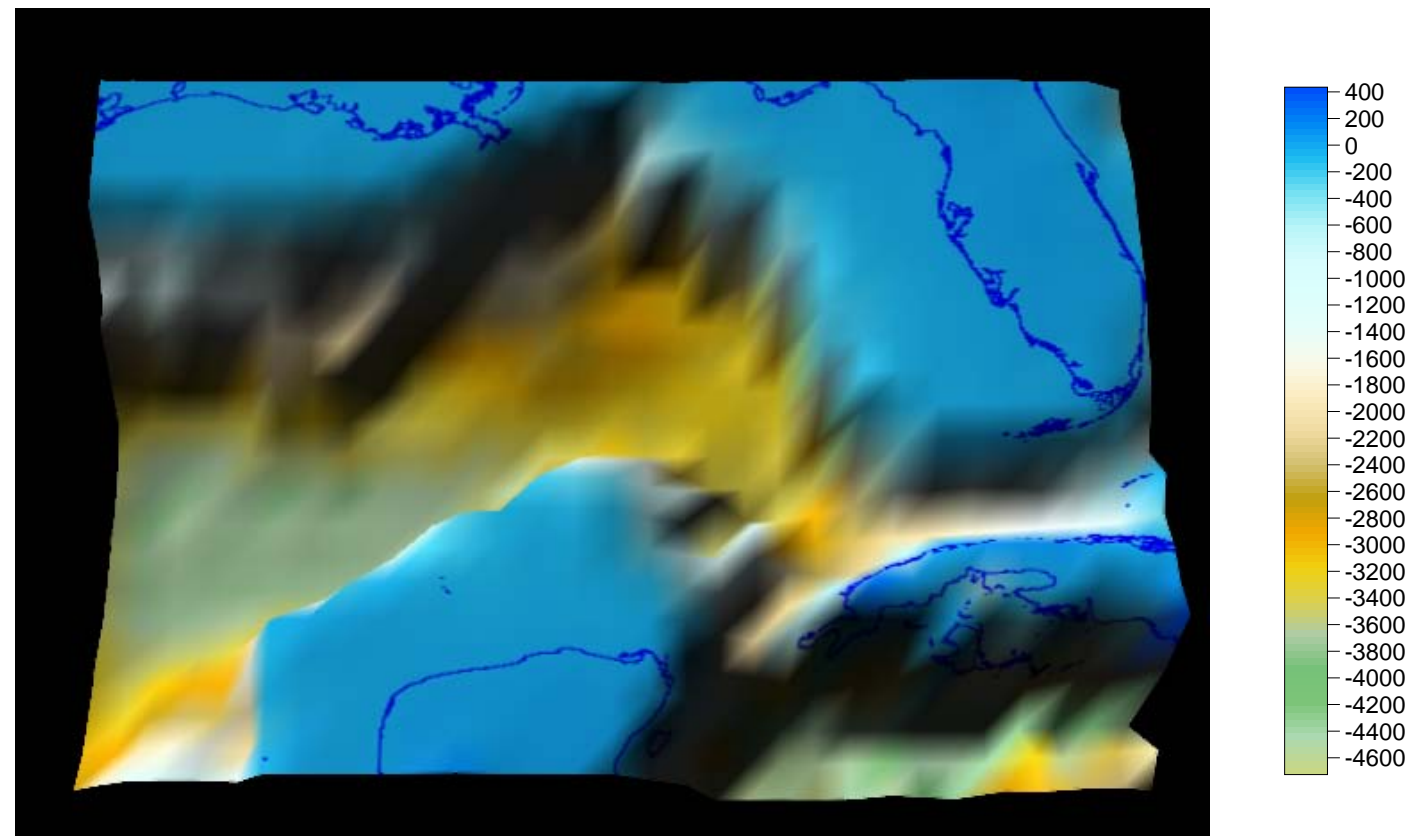
One-way coupling

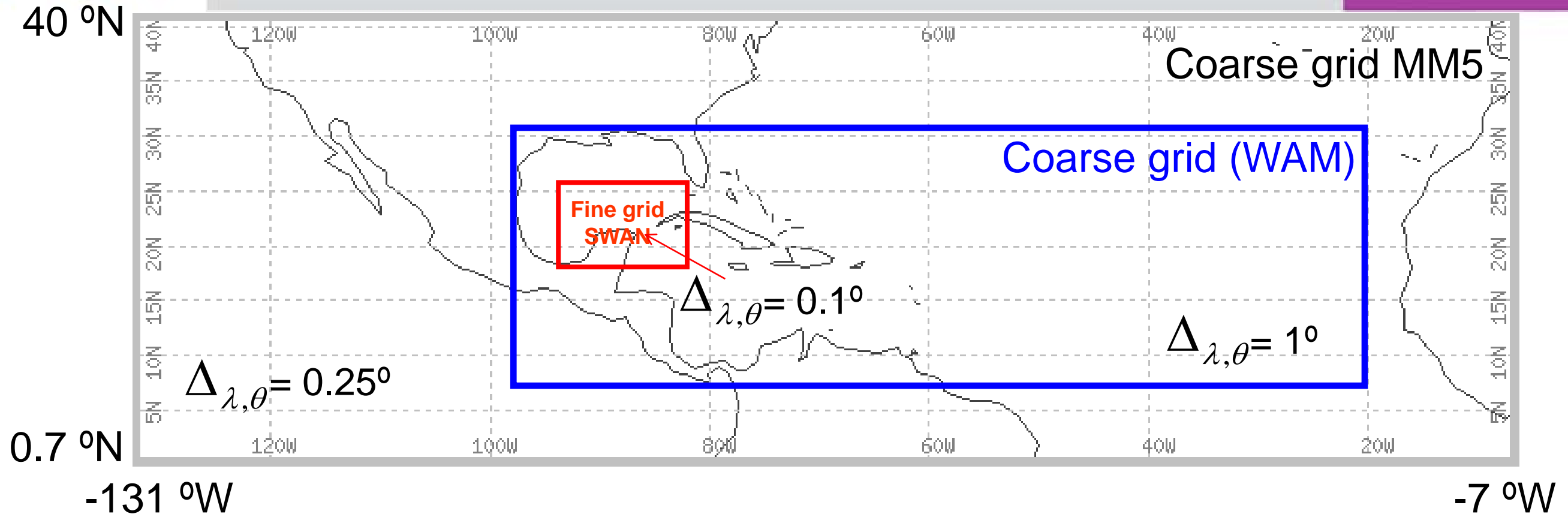Spectral wave action equation

Batimetría Gruesa

The coarse grid (used by WAM) has a resolution of 1 degrees. <u>West Atlantic</u>

The fine grid (used by SWAN) has a resolution of 0.1 degrees. <u>Yucatan Peninsula</u>.

Grids characteristics

40 ºN

Coarse grid MM5

Coarse grid (WAM)

Fine grid SWAN

$\Delta_{\lambda,\theta} = 0.1º$

$\Delta_{\lambda,\theta} = 1º$

$\Delta_{\lambda,\theta} = 0.25º$

0.7 ºN

-131 ºW

-7 ºW

Parameters	Spectral domain	Value	
f_{low} f_{high}	[s-1]	0.0412,	0.4060
nf Δf		24,	0.015
nf $\Delta \theta$		36,	10º

Bouys location in the Caribbean Sea
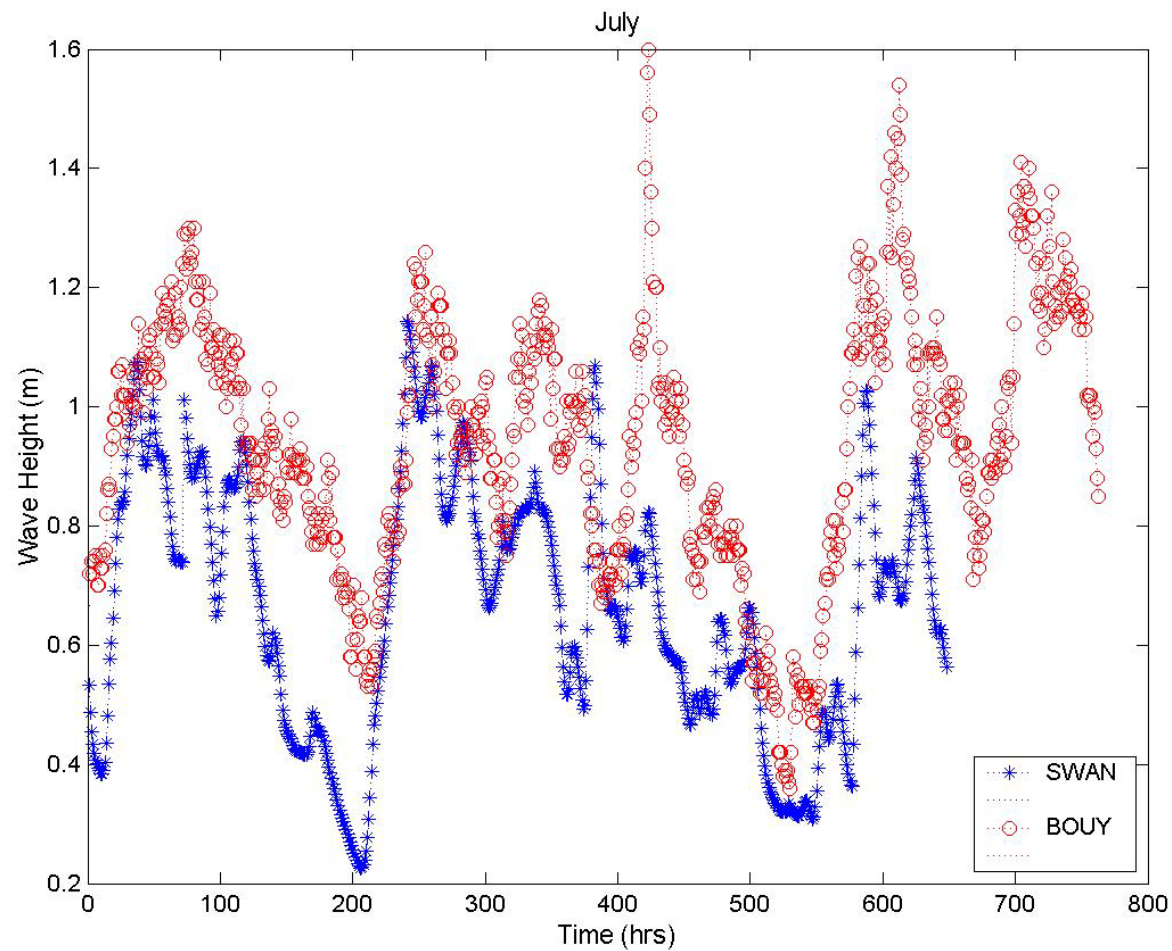
42056

Bouy 42056

Hs

Cold Front

20071023 1200 hrs. MM5. Winds fields (m/s)

2007-10-23-01:00

23 -31 October 2007

COLD FRONT No. 4. Octubre 2007.

STUDY CASES
Hurricane Dean

20070819 0600 hrs. Winds fields. MM5
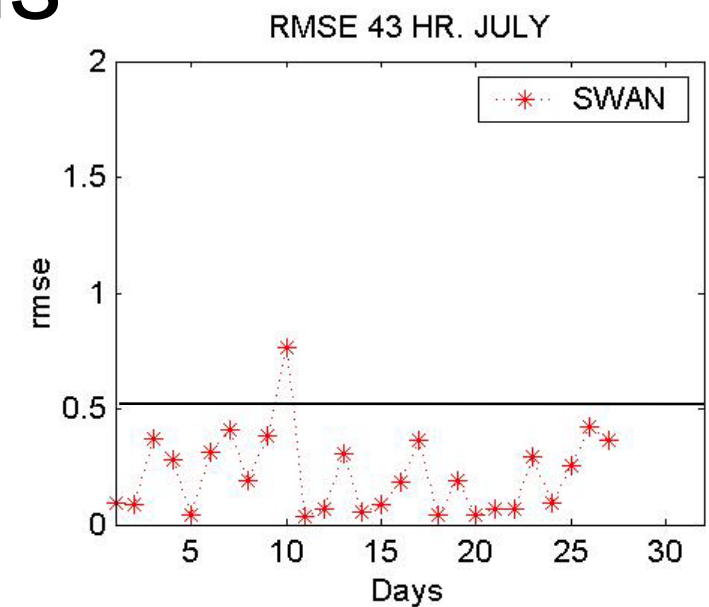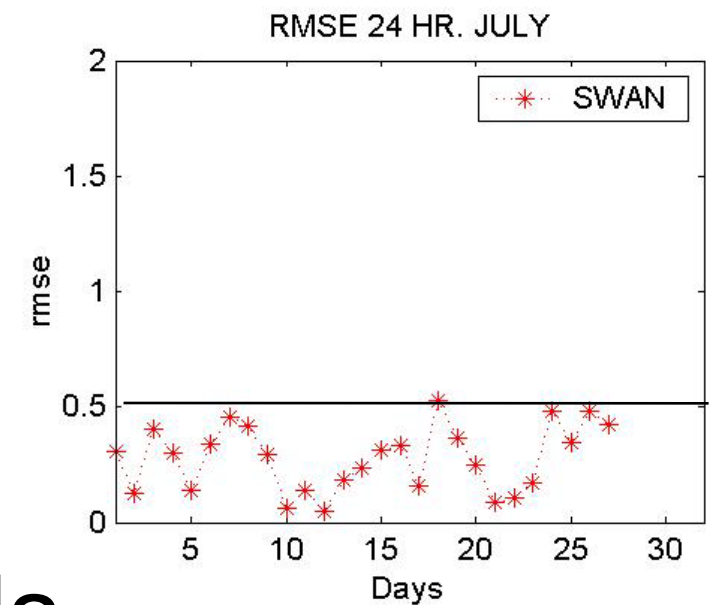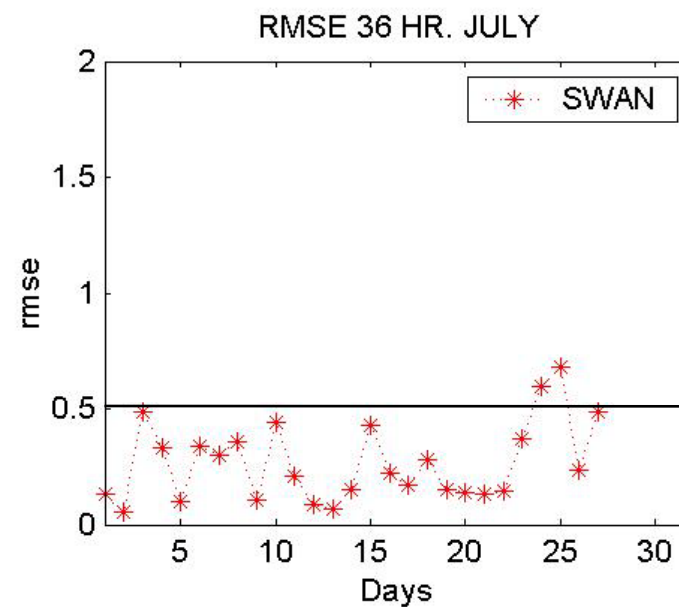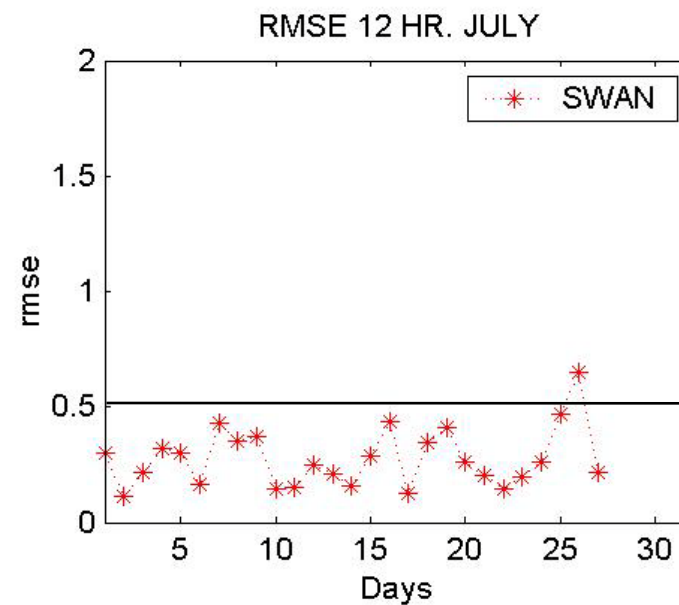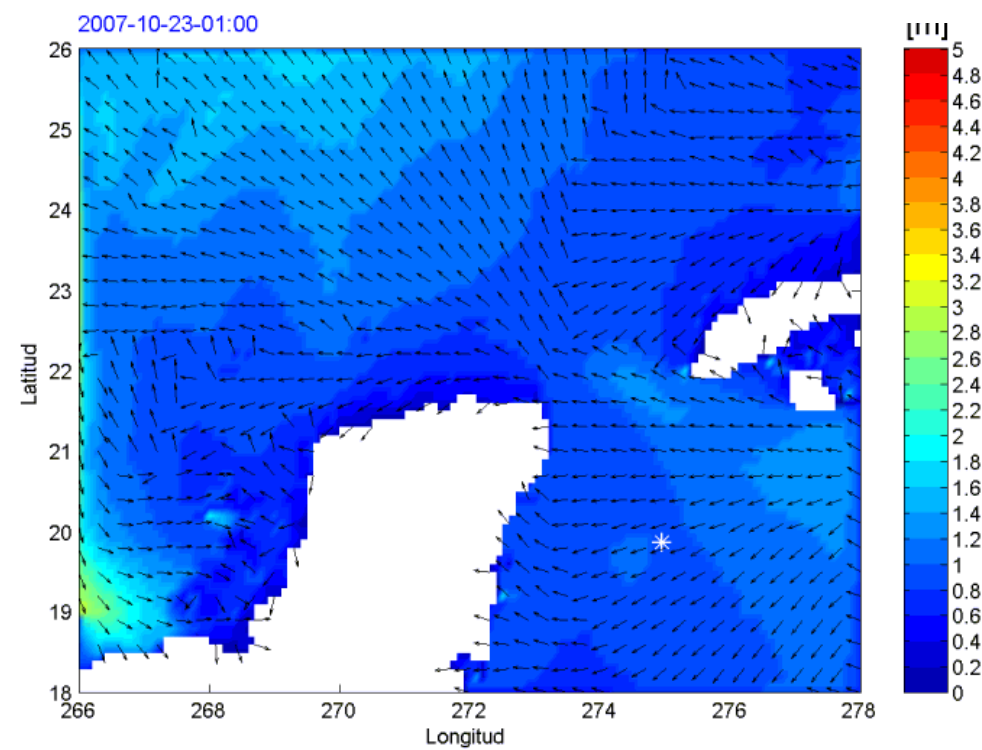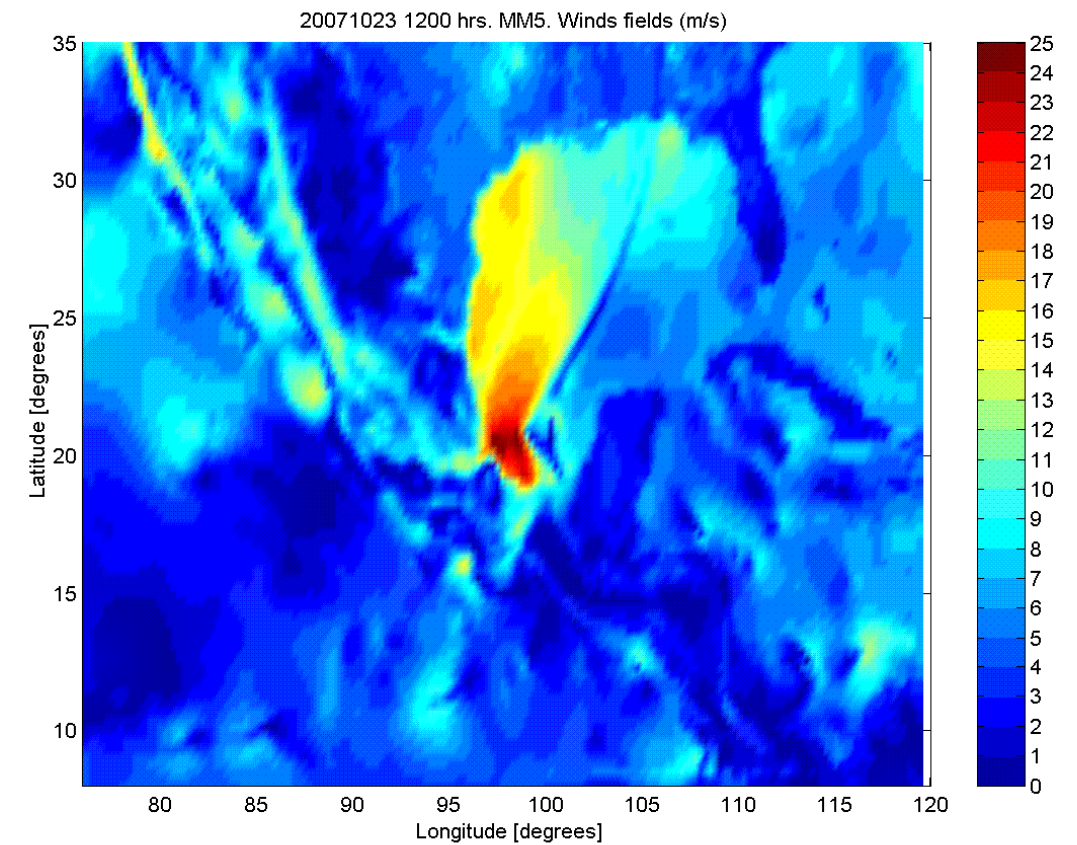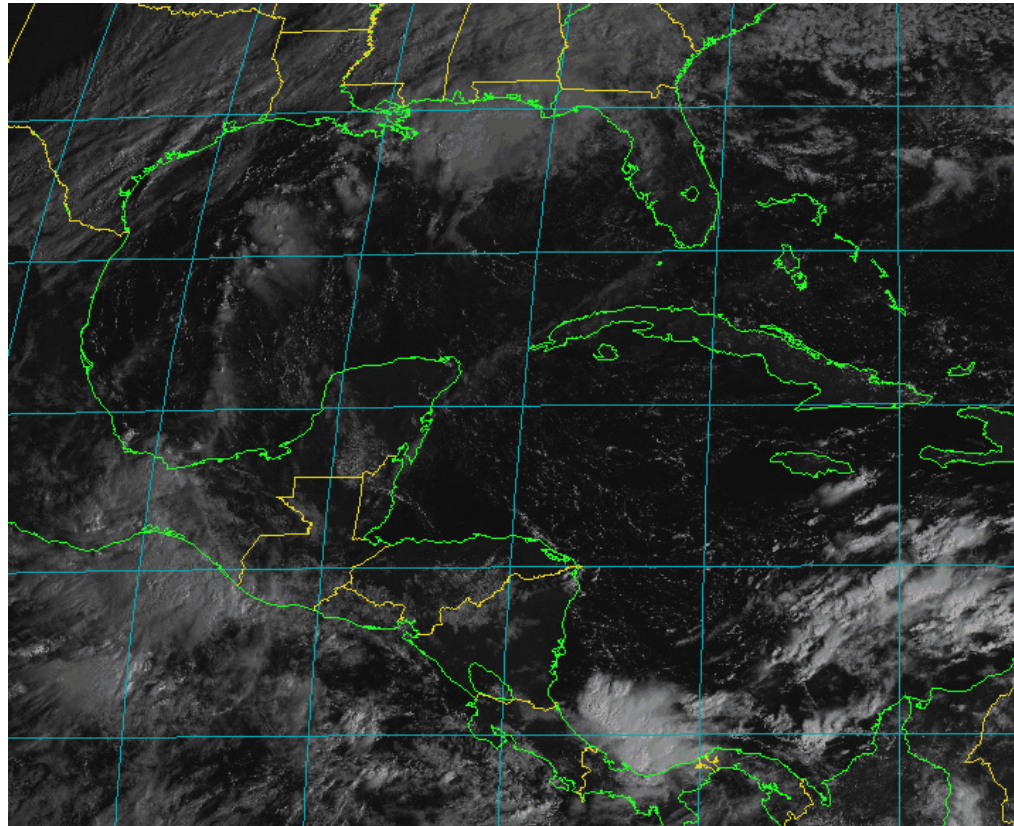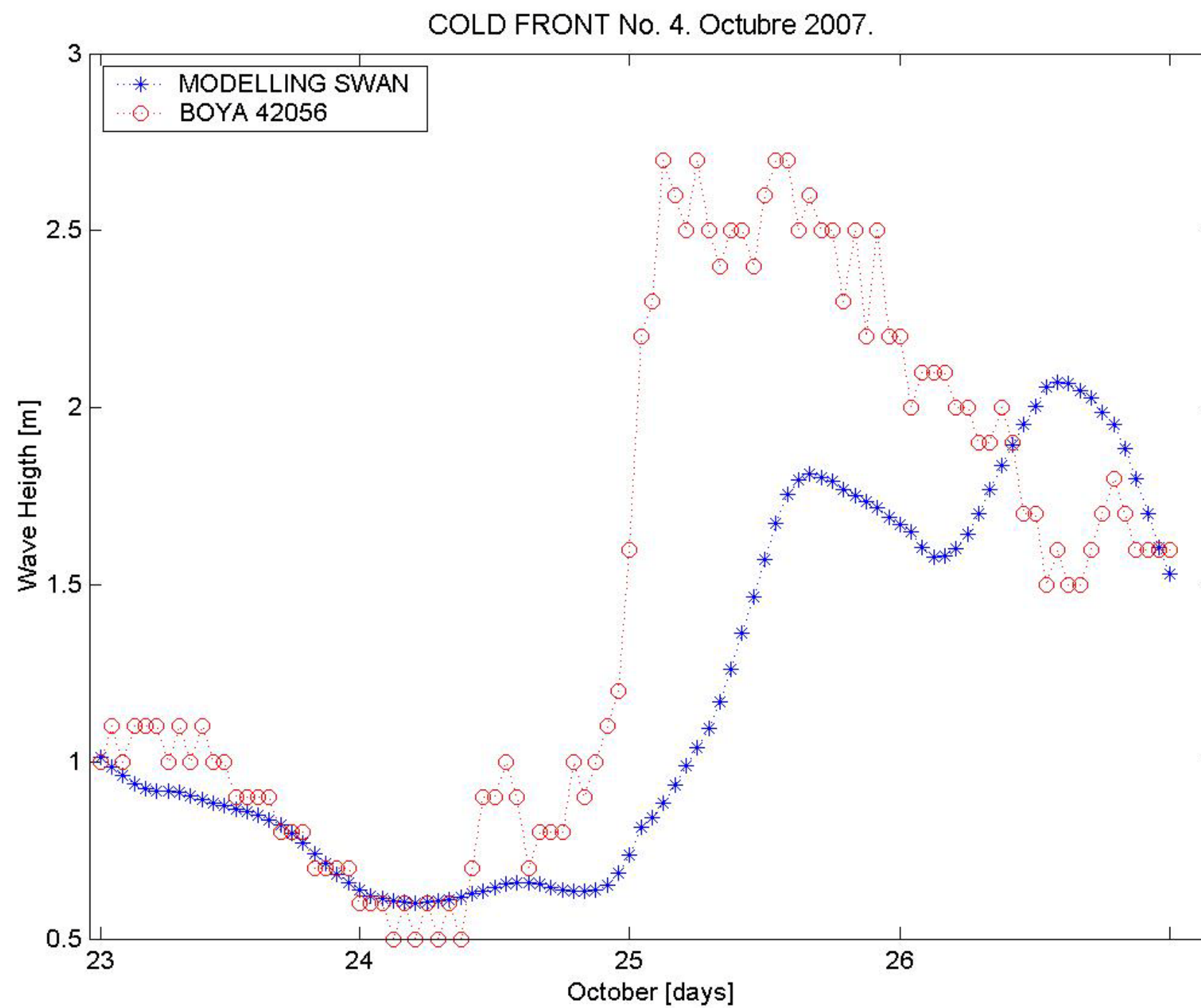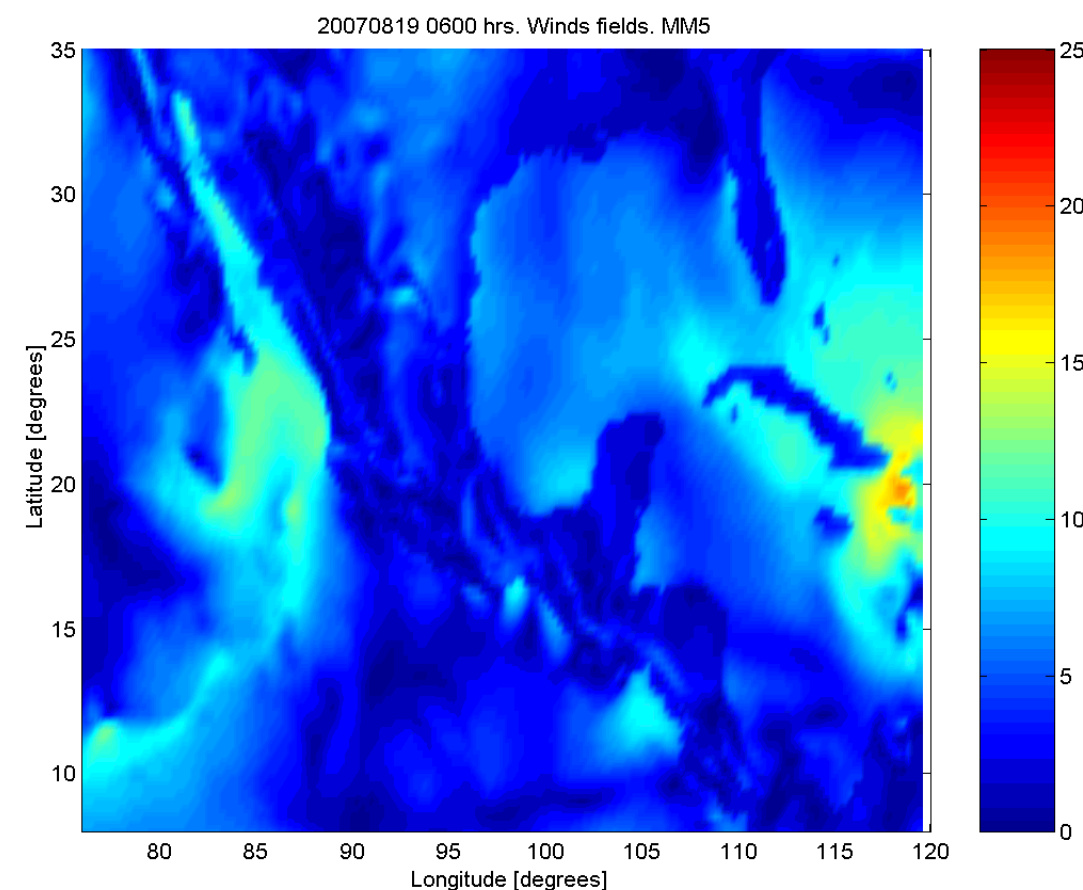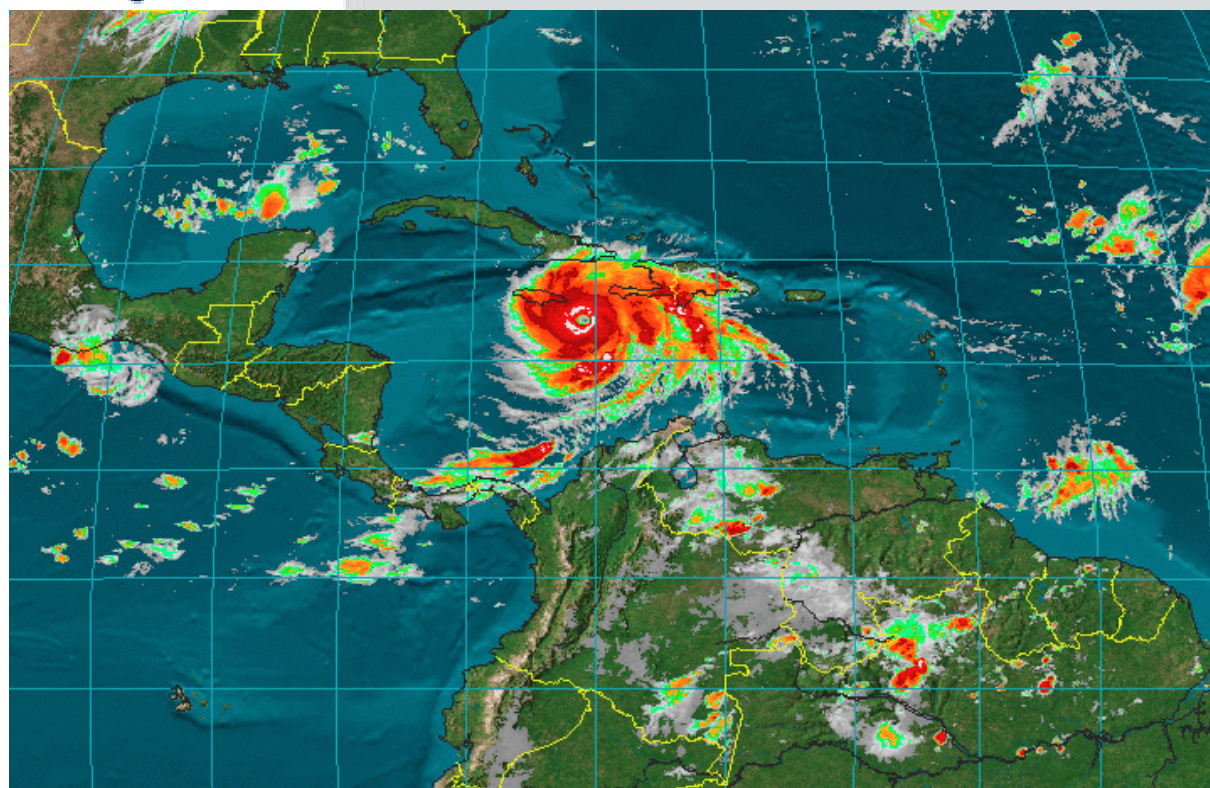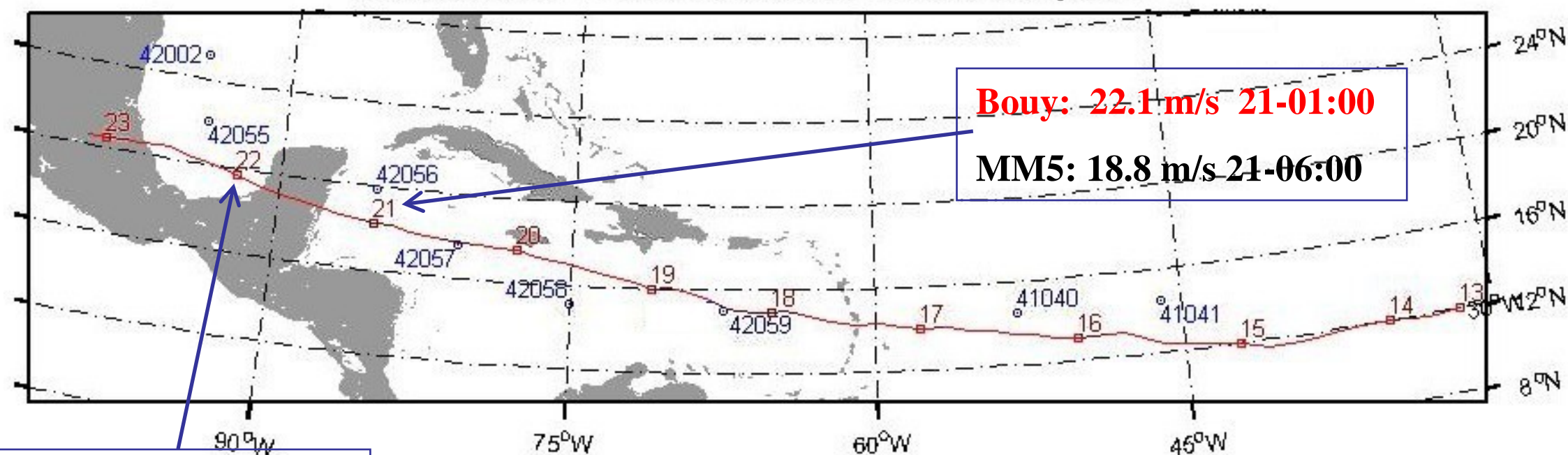

NDBC Stations within 300 NM of Hurricane Dean's Track 13 - 23 August 2007

Bouy: 22.1 m/s 21-01:00
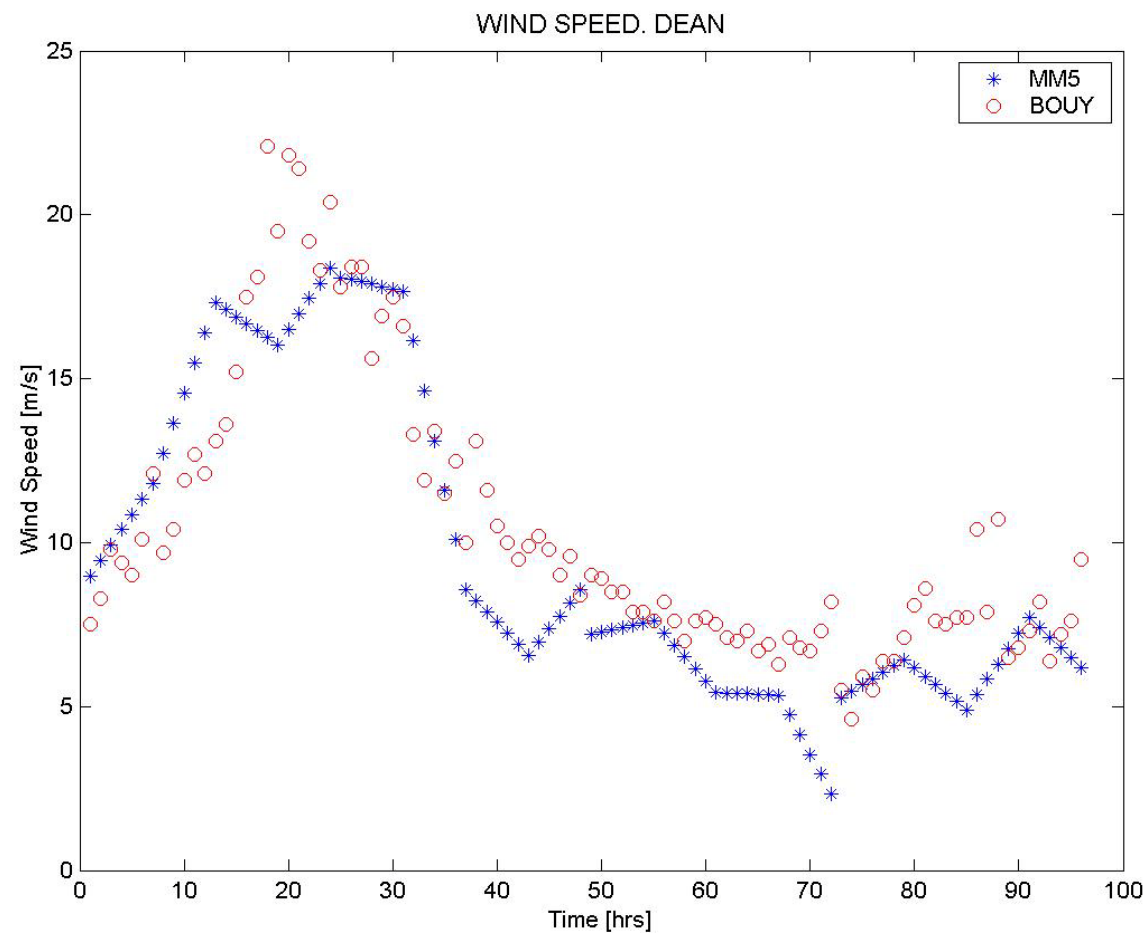
MM5: 18.8 m/s 21-06:00
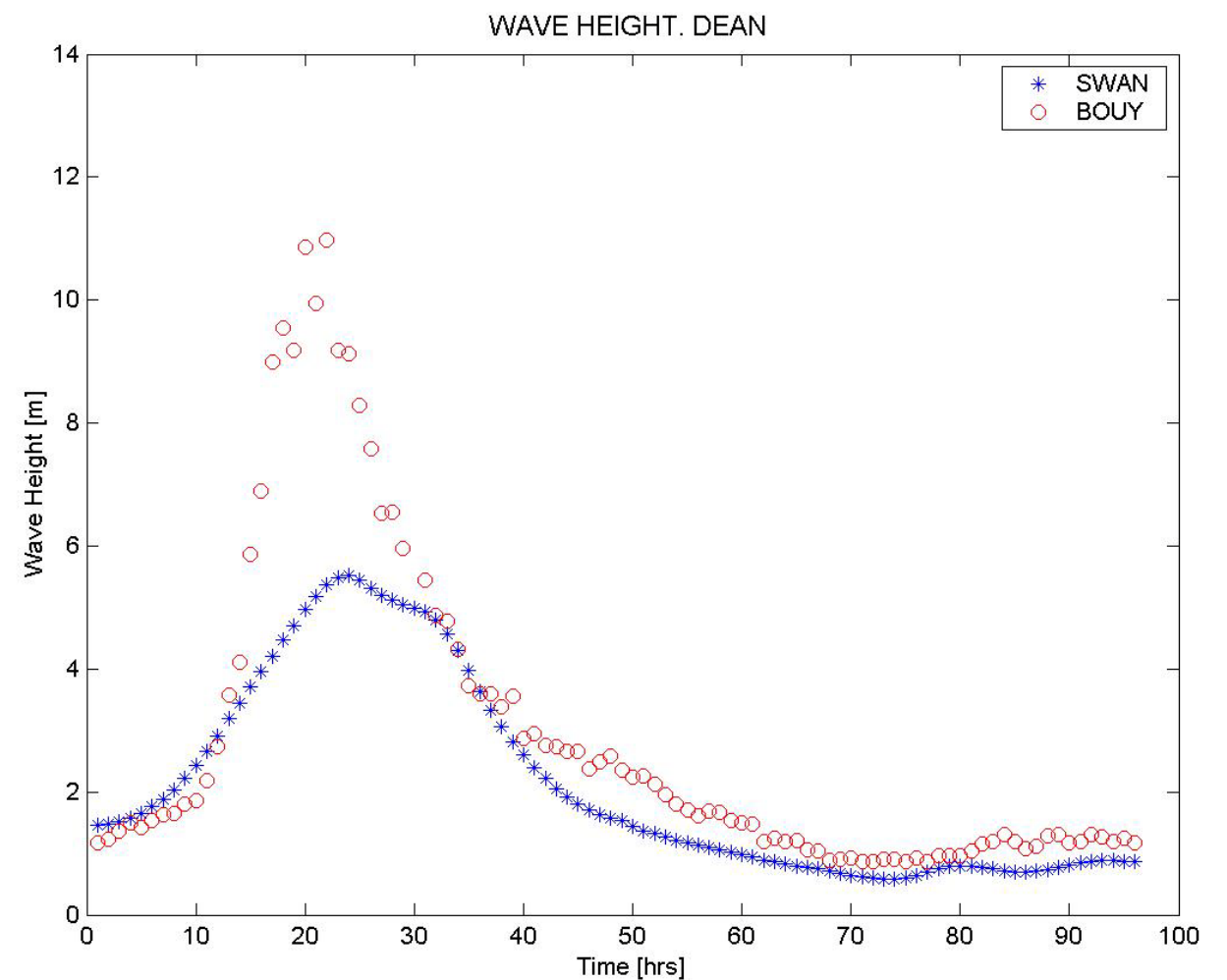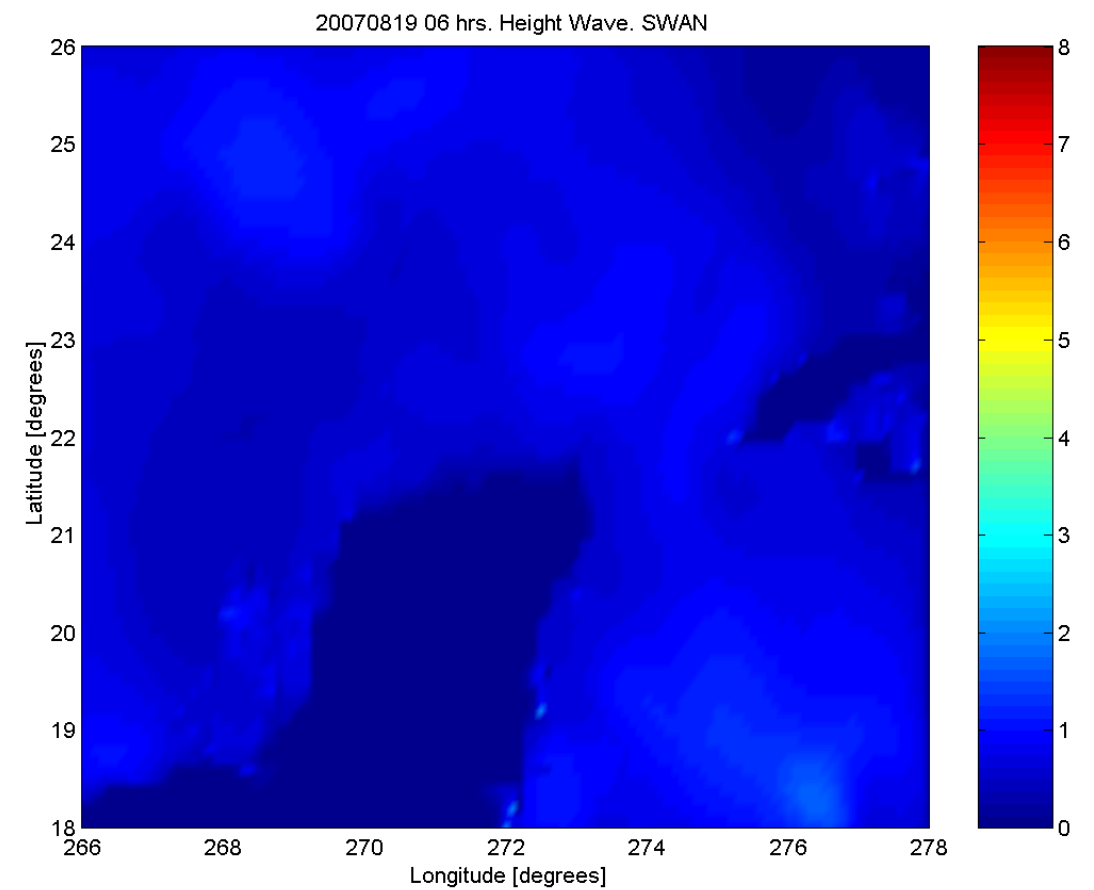
Bouy: 23.8 m/s 22-10:00

MM5: 23.3 m/s 22-12:00
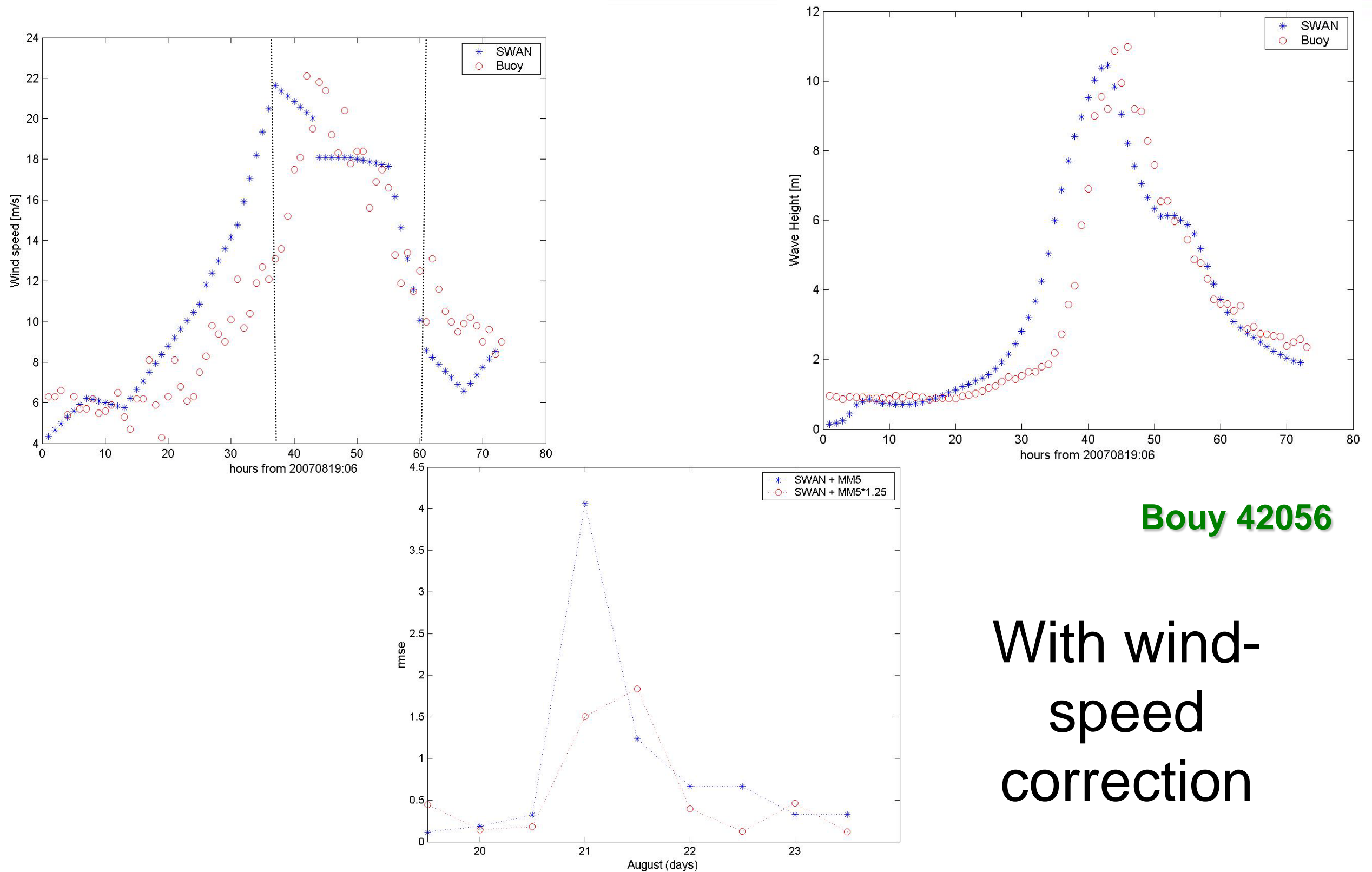
STUDY CASES
Hurricane Dean

Without wind-speed correction

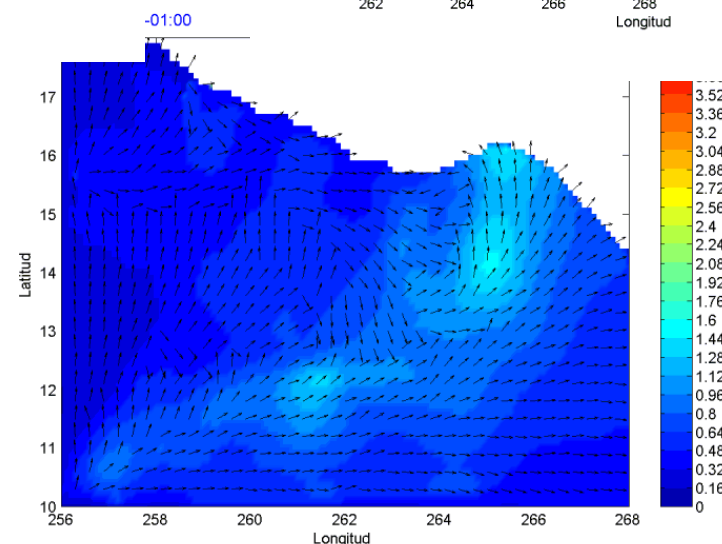**Bouy 42056**

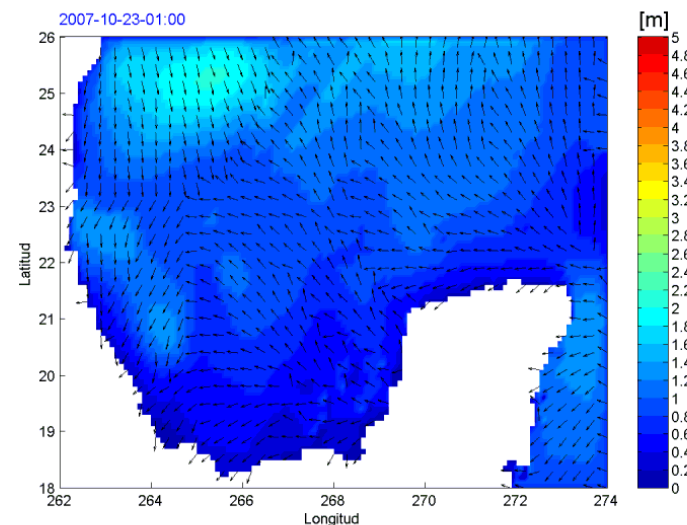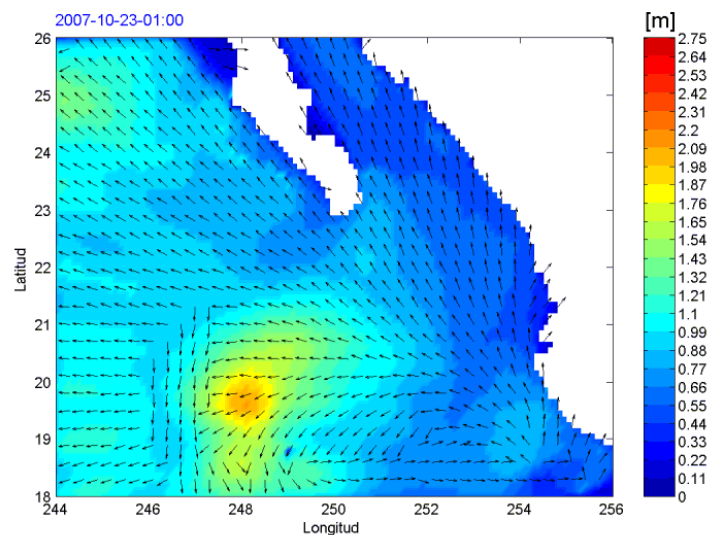# Hurricane Dean (Cont.)

Bouy 42056

With wind-speed correction

Concluding remarks.

The wind-wave forecasting system is working in an operational way in a five domains in a nested fashion over the Mexican waters

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