

Wind field evaluation of the MM5 over the Strait of Gibraltar 20th-23rd August, 2004

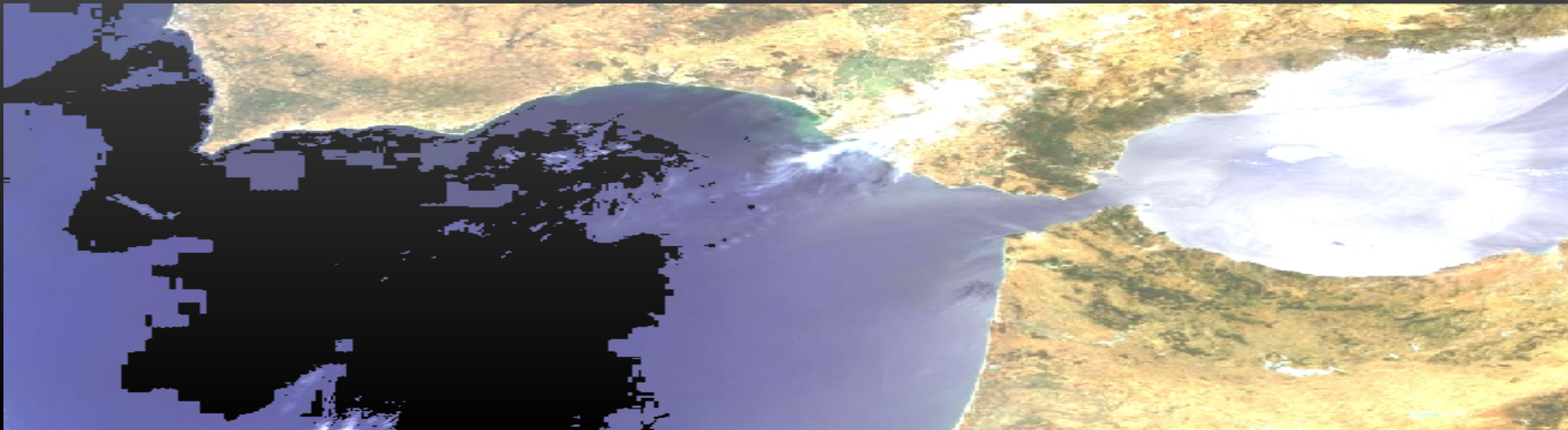
E. Reyes, A. Izquierdo, O. Alvarez,
C. Mejias, S. Vinogradov
Applied Physics Department, Cádiz University, Spain
emma.reyes@uca.es

RED IBÉRICA MM5
4th Meeting, Aveiro
26th-27th April, 2007

- **INTRODUCTION**
- **AIMS**
- **MM5 IMPLEMENTATION**
- **OPERATIONAL SYSTEM FRAMEWORK**
- **EVALUATION METHODOLOGY**
- **PRELIMINARY RESULTS**
- **CONCLUDING REMARKS**

- The mesoscale atmospheric model MM5 is used to force a hydrodynamic model UCA2.5 (Izquierdo *et al.*, 2001) in the Strait of Gibraltar
- As a **prerequisite** for such studies, the atmospheric model has to be implemented and validated in the Strait of Gibraltar.
- A major part of such a **validation** is the comparison of simulation results with observational data and with the results from other models, which have been independently developed.
- In this study **72-hour simulated wind field with the MM5** at different resolutions (30 km, 10 km and 3.3 km) from the period 20-23 August 2004 has been compared and evaluated with the wind direction and intensity measurements from 6 **automatic meteorological stations** from the Spanish Meteorological National Institute within the model domain and with simulated wind field of **HIRLAM (0.2°)**

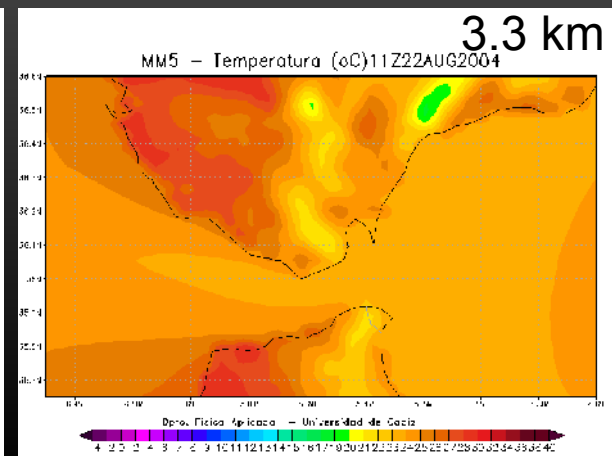
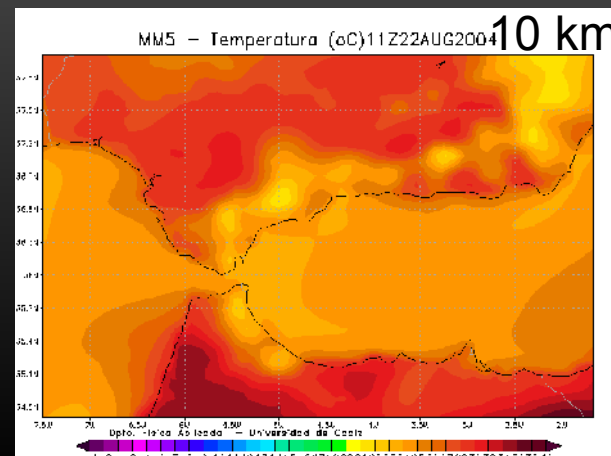
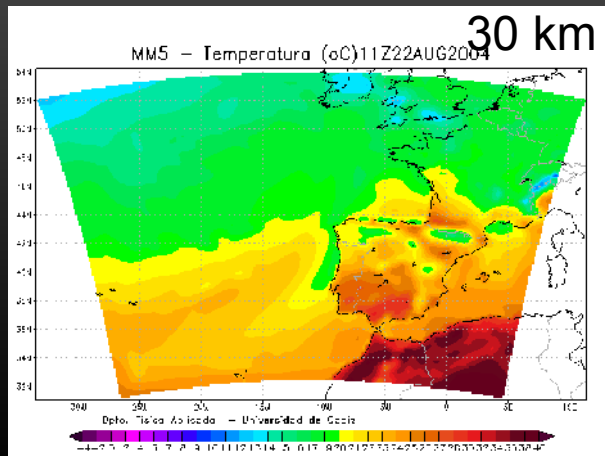
- **Principal aim: providing atmospheric forcing to hydrodynamic models in the local scale: Strait of Gibraltar.**
 1. **Implementation of the high resolution model MM5 in the Gulf of Cadiz - Strait of Gibraltar and Alborán Sea system**
 2. **Creation of three domains with different resolutions (30, 10 and 3.3 km) in one way nesting**
 3. **Evaluation of atmospheric model: it starts with the wind field from the different domains**



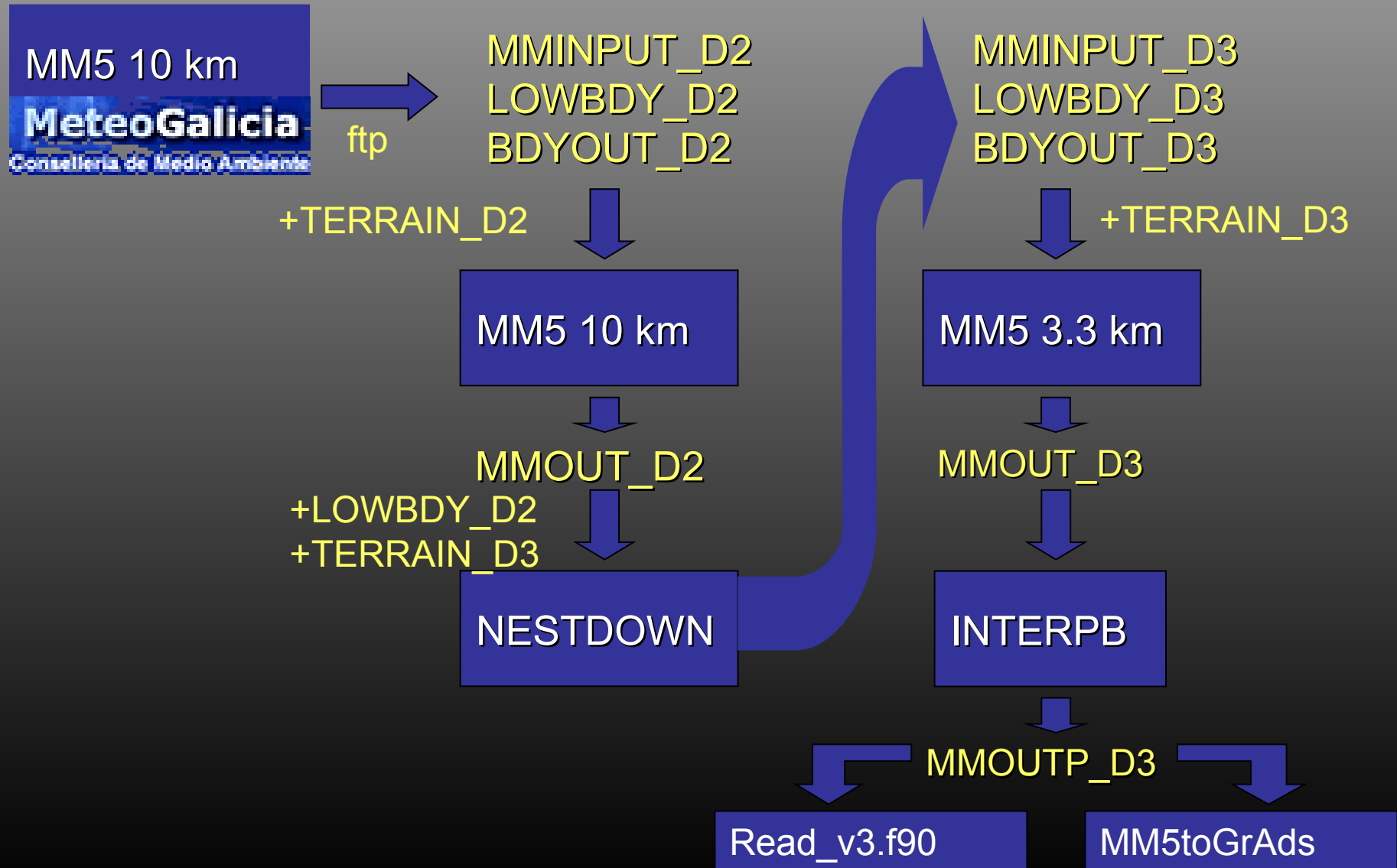
MM5 IMPLEMENTATION

RUNNING MM5

N° domains	1	2	3
Resolution (km)	30	10	3.3
Input data resolution (km)	4	0.9	0.9
Nesting	1 way	1 way	1 way
Vertical levels	35	35	35
Time step (seconds)	90	30	10



OPERATIONAL SYSTEM FRAMEWORK



EVALUATION METHODOLOGY

MM5 vs. OBSERVATIONS MM5 vs. HIRLAM 0.2°



Location of the automatic meteorological stations INM

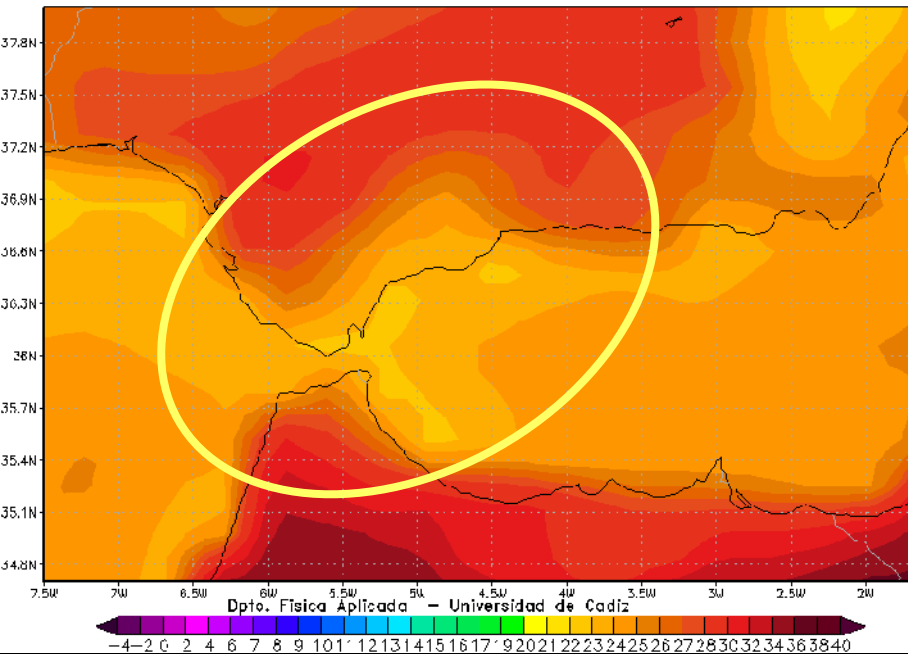
STATION NAME	
UTC TIME	OFFICIAL TIME
ALTITUDE (m)	
TEMPERATURE (C)	
RELATIVE HUMIDITY	
ACCUMULATED PRECIPITATION	
WIND INTENSITY (km/h)	
WIND DIRECTION (degrees)	
MAX. WIND INTENSITY (km/h)	
PRESSURE (mb)	

Observed data from A.M.S.

PRELIMINARY RESULTS

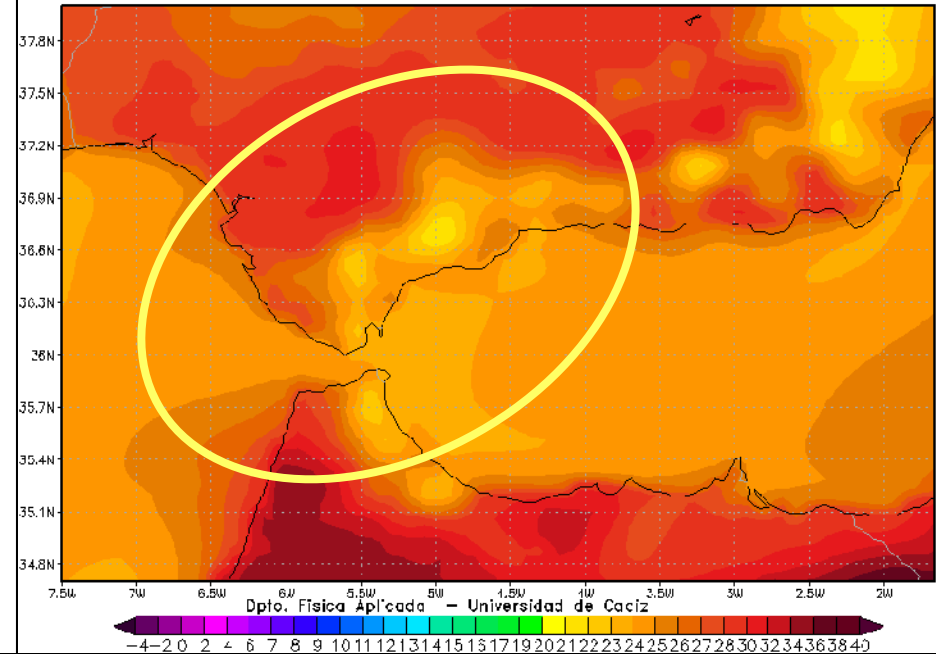
2m TEMPERATURE (°C)

MM5 - Temperatura (°C) 11Z22AUG2004



DOMAIN 1 = 30 km

MM5 - Temperatura (°C) 11Z22AUG2004



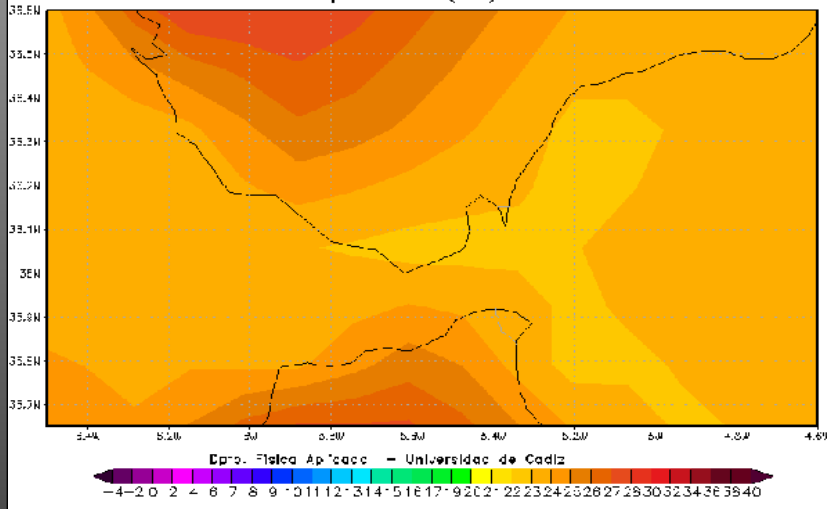
DOMAIN 2 = 10 km

PRELIMINARY RESULTS

2m TEMPERATURE (°C)

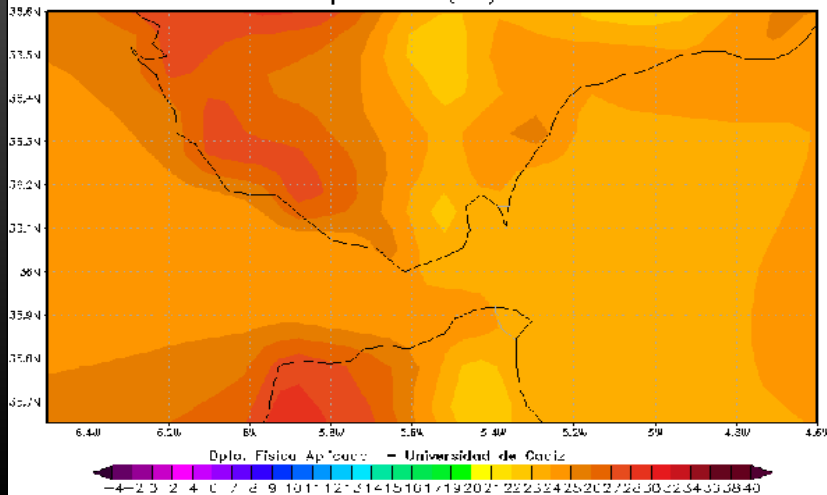
DOMINIO 1 = 30 km

MM5 - Temperatura (°C) 11Z22AUG2004



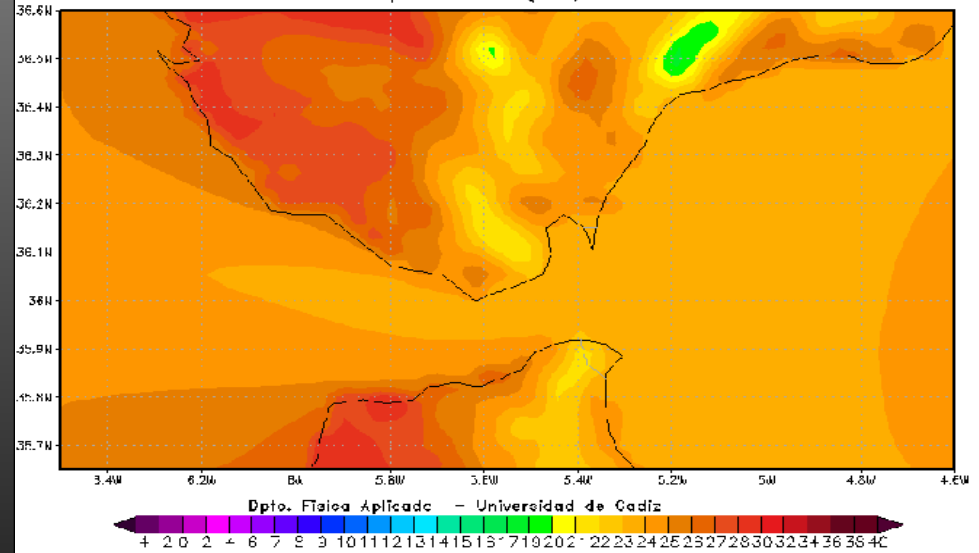
DOMINIO 2 = 10 km

MM5 - Temperatura (°C) 11Z22AUG2004



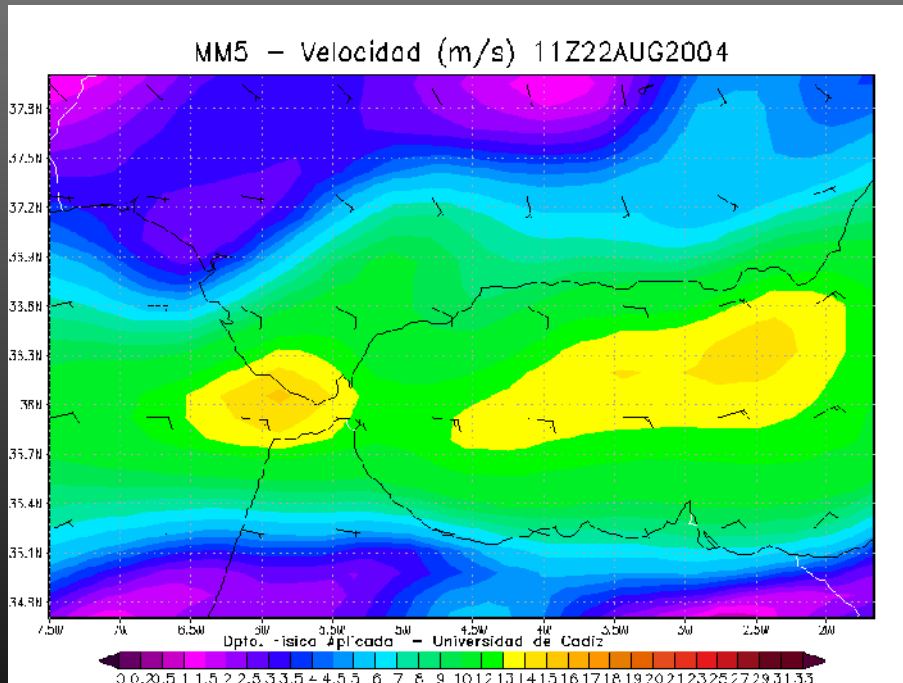
DOMINIO 3 = 3.3 km

MM5 - Temperatura (°C) 11Z22AUG2004

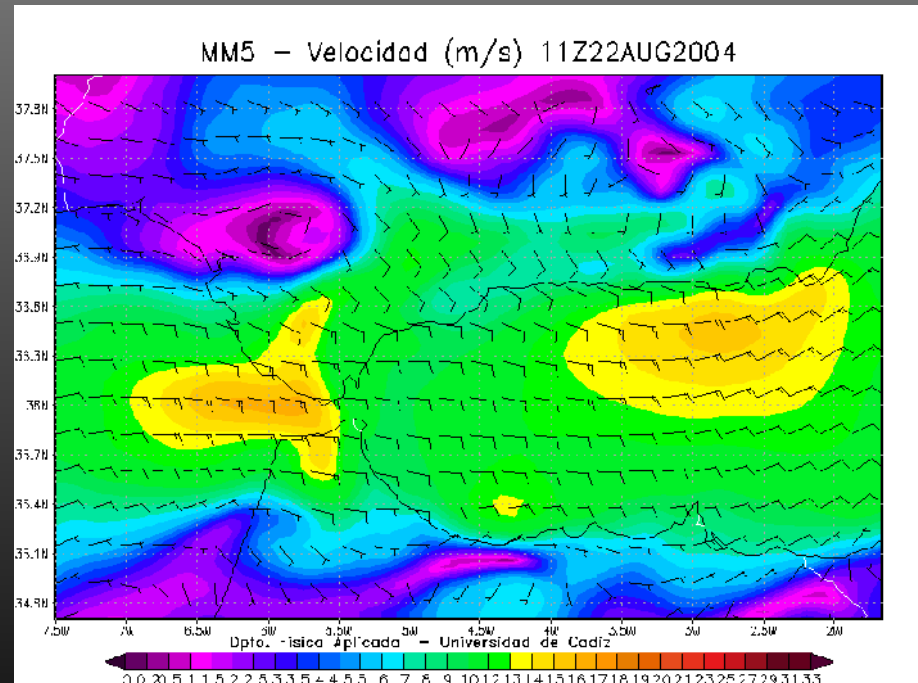


PRELIMINARY RESULTS

10 m WIND SPEED (m/s)



DOMAIN 1 = 30 km

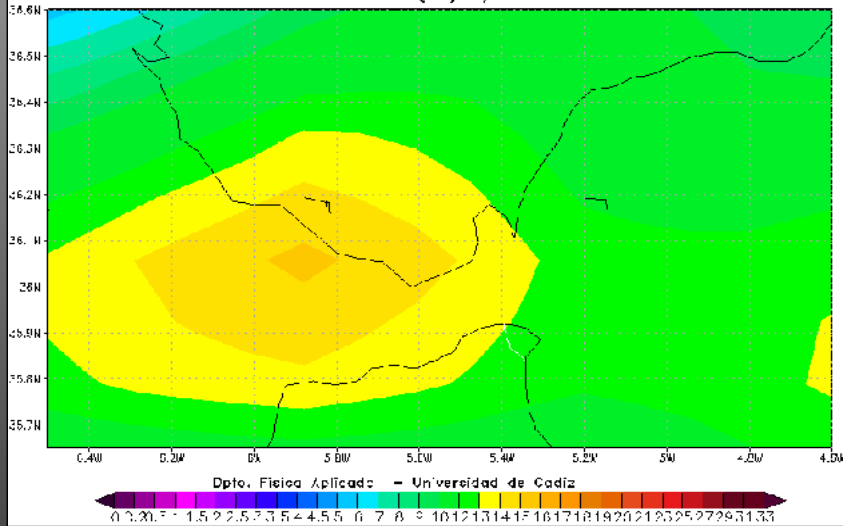


DOMAIN 2 = 10 km

PRELIMINARY RESULTS

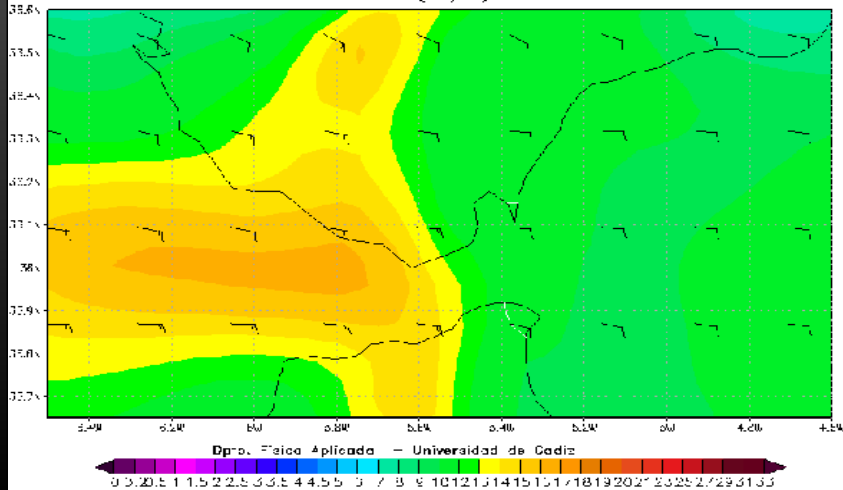
DOMINIO 1 = 30 km

MM5 - Velocidad (m/s) 11Z22AUG2004



DOMINIO 2 = 10 km

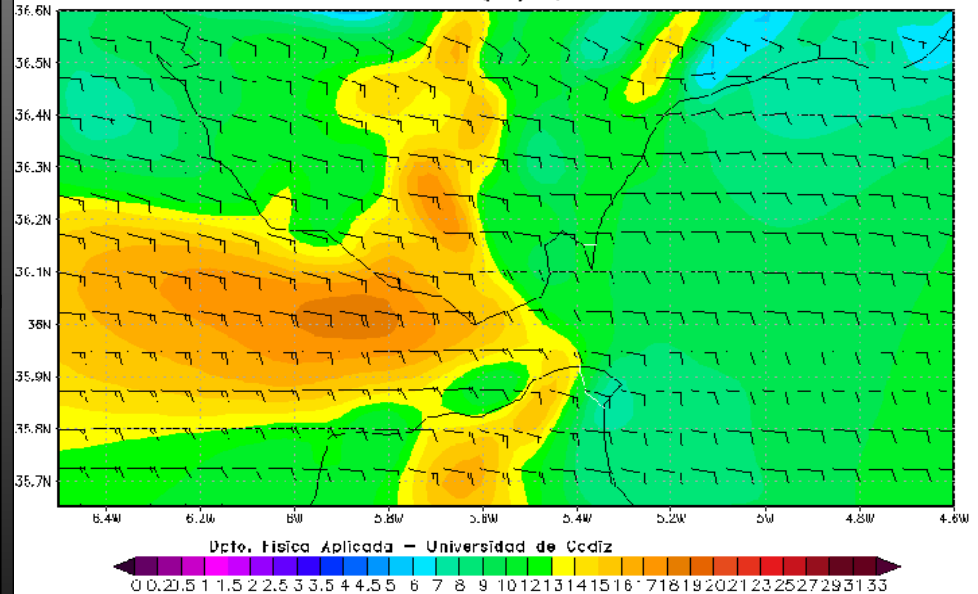
MM5 - Velocidad (m/s) 11Z22AUG2004



10 m WIND SPEED (m/s)

DOMINIO 3 = 3.3 km

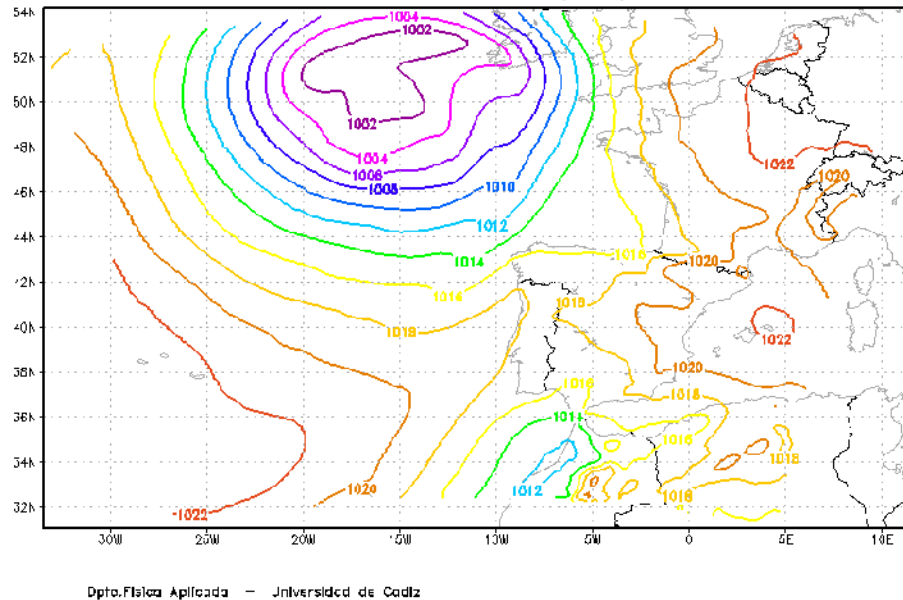
MM5 - Velocidad (m/s) 11Z22AUG2004



PRELIMINARY RESULTS

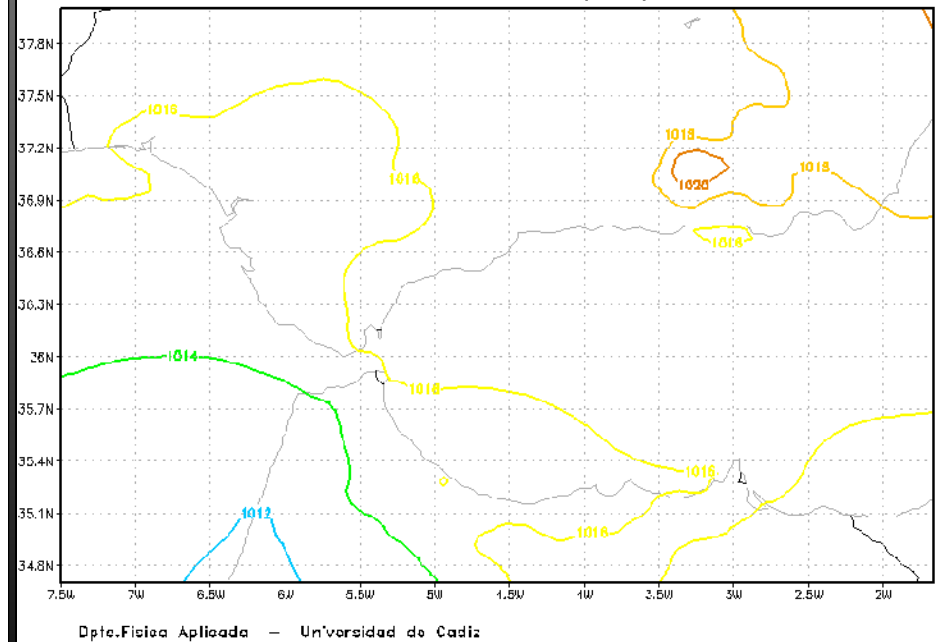
SEA LEVEL PRESSURE (hPa)

MM5 - Presion a nivel del mar (hPa) 11Z22AUG2004



DOMAIN 1 = 30 km

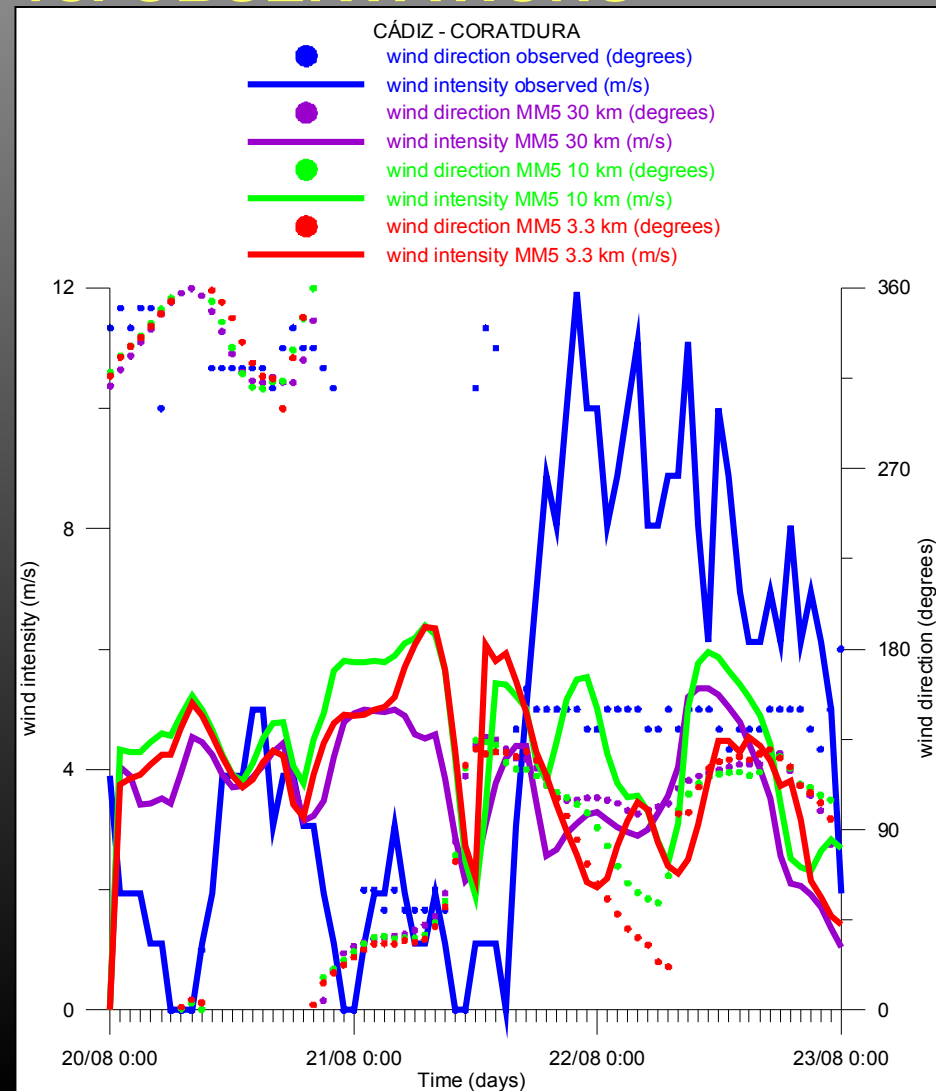
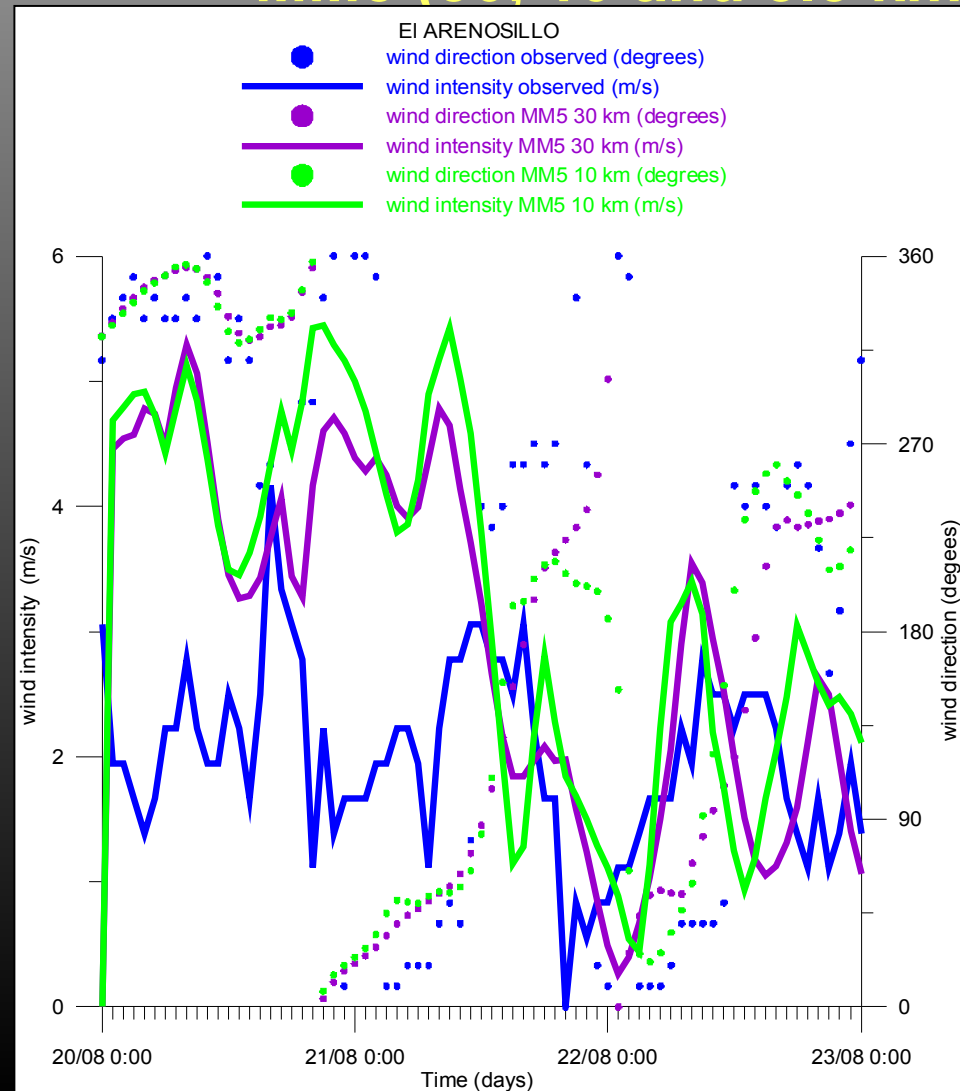
MM5 - Presion a nivel del mar (hPa) 11Z22AUG2004



DOMAIN 2 = 10 km

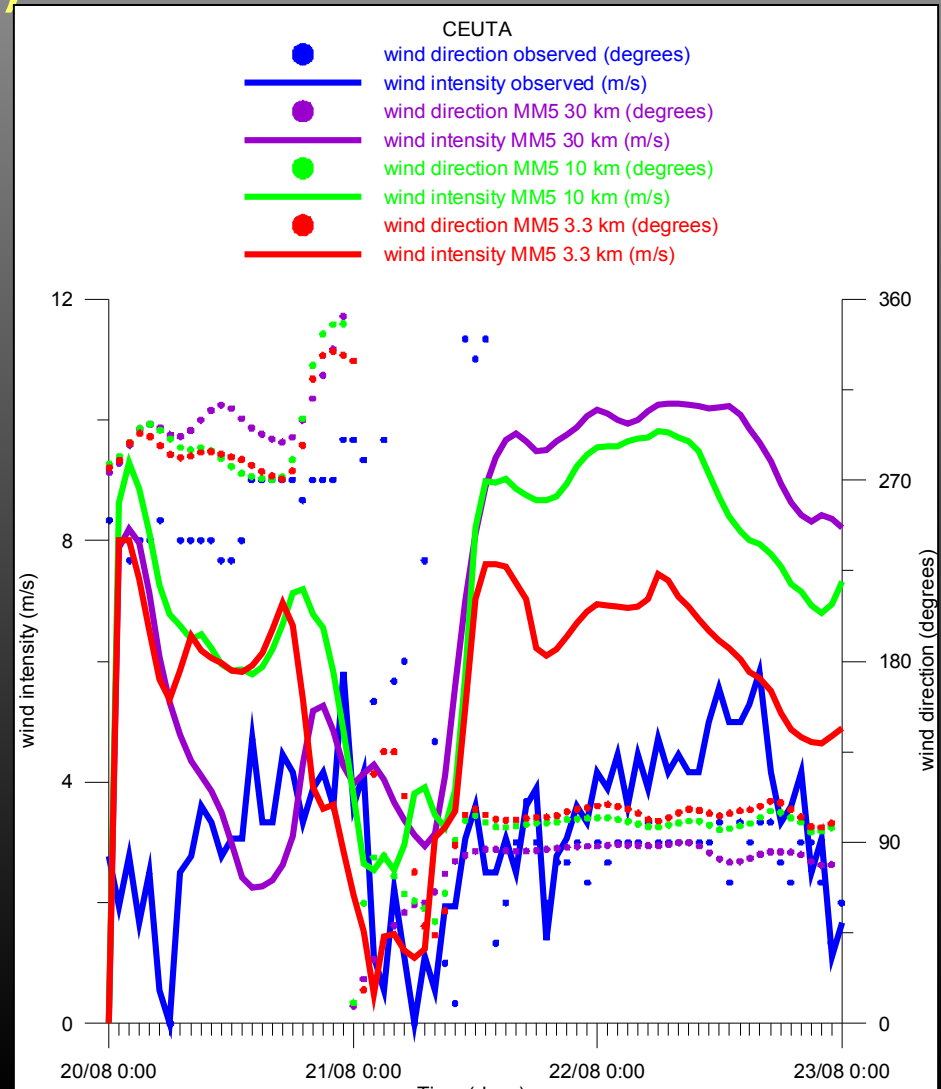
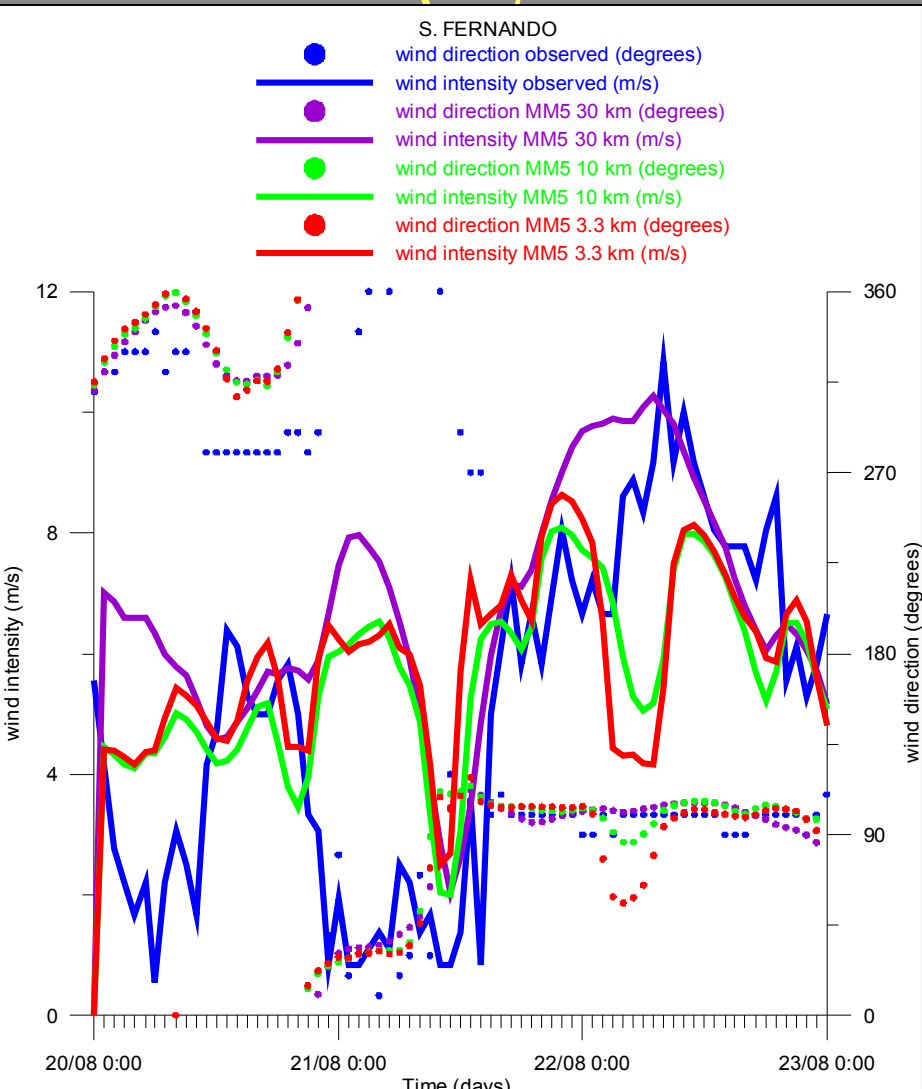
PRELIMINARY RESULTS

EVALUATION OF THE 10 m WIND SPEED (m/s) MM5 (30, 10 and 3.3 km) vs. OBSERVATIONS



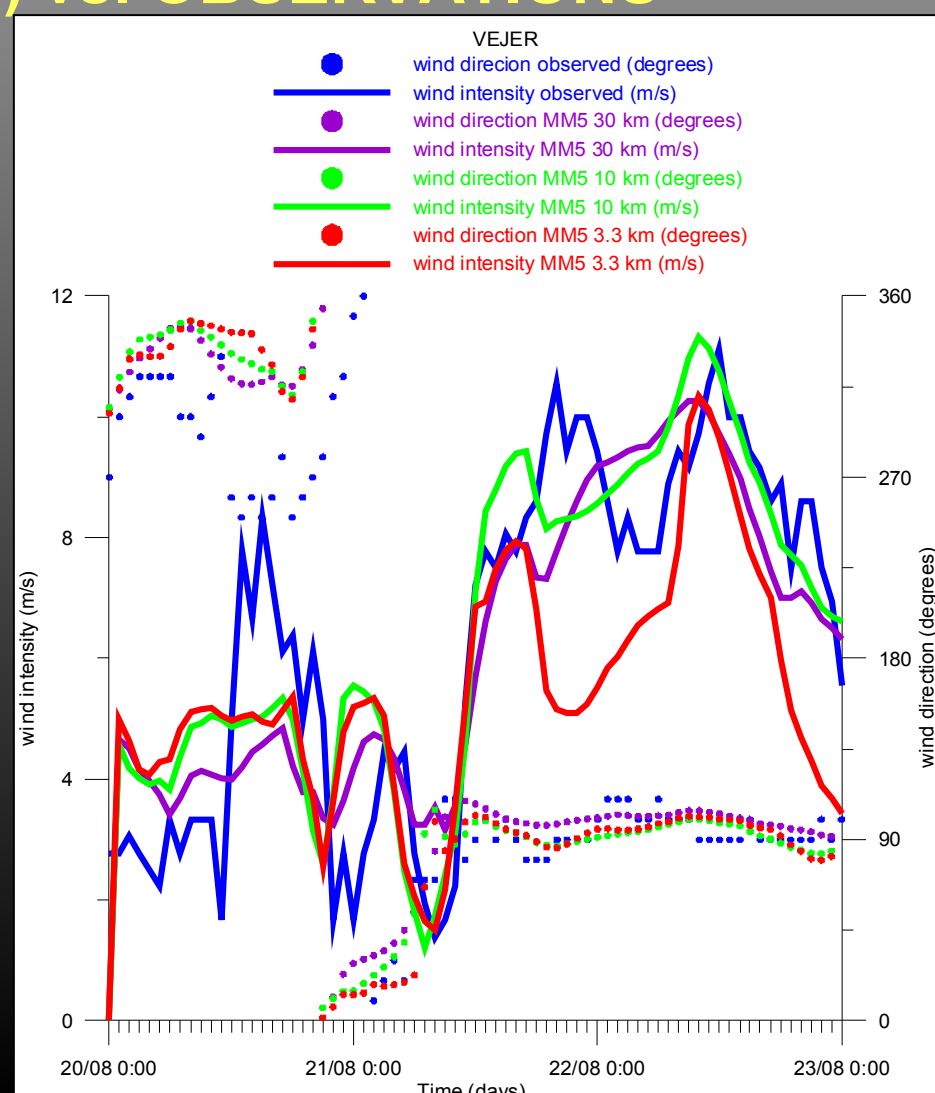
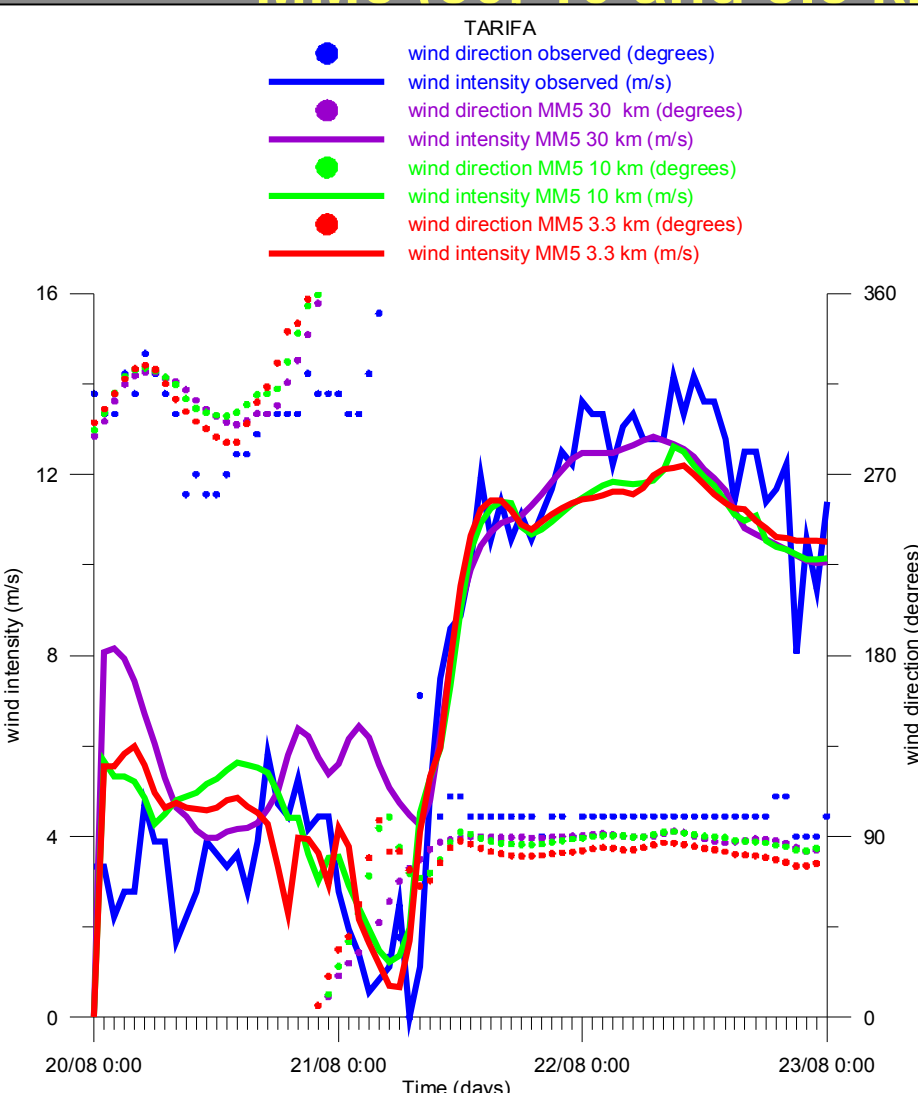
PRELIMINARY RESULTS

EVALUATION OF THE 10 m WIND SPEED 10 m (m/s) MM5 (30, 10 and 3.3 km) vs. OBSERVATIONS



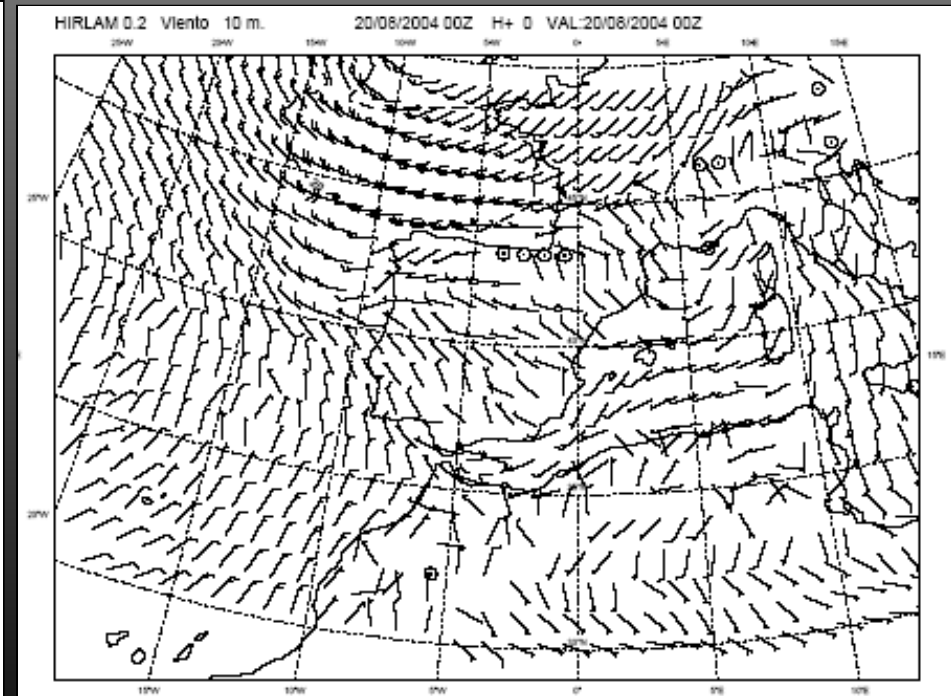
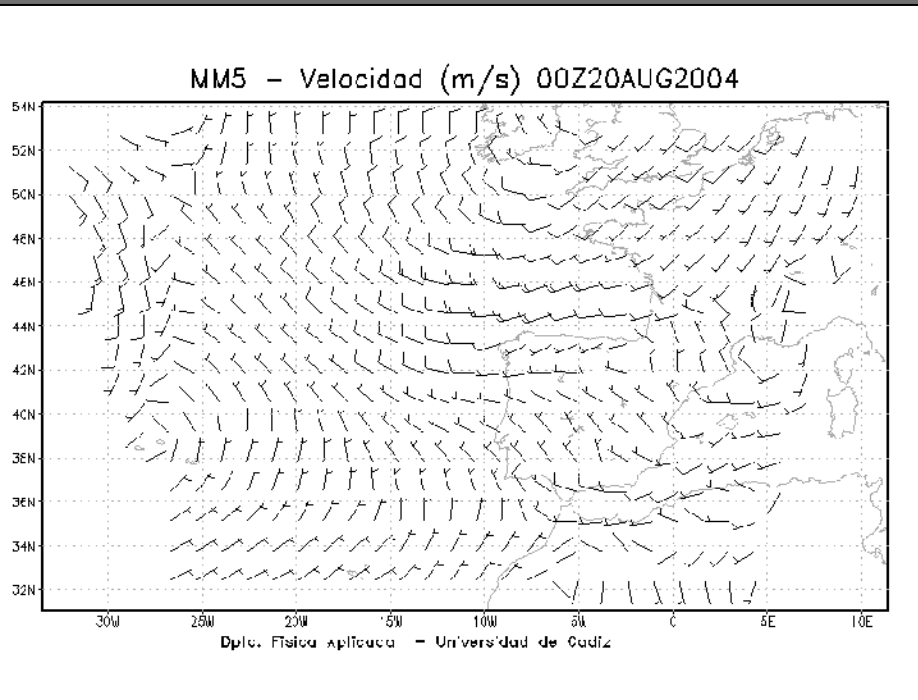
PRELIMINARY RESULTS

EVALUATION OF THE 10 m WIND SPEED (m/s) MM5 (30, 10 and 3.3 km) vs. OBSERVATIONS



PRELIMINARY RESULTS

EVALUATION OF THE 10 m WIND SPEED (m/s) MM5 (30 km) vs. HIRLAM (0.2 °) 20/08/2004 00:00



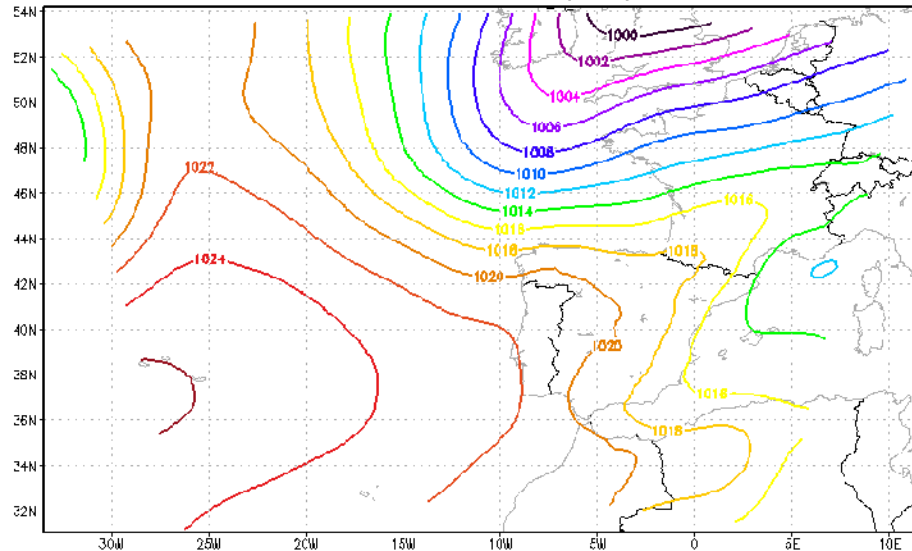
DOMAIN 30 km MM5

DOMAIN 0.2 HIRLAM (INM)

PRELIMINARY RESULTS

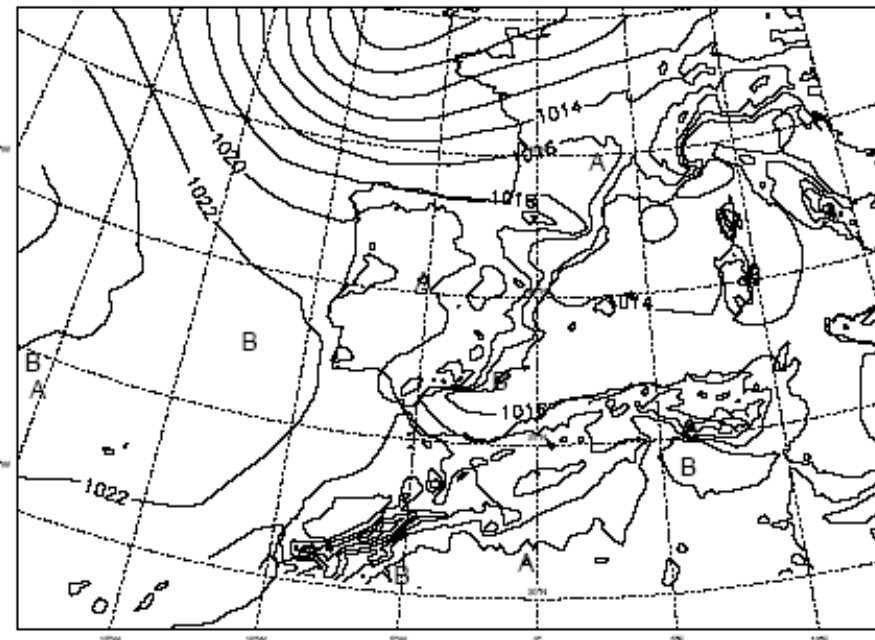
EVALUATION OF THE SEA LEVEL PRESSURE (hPa) MM5 (30 km) vs. HIRLAM (0.2°) 20/08/2004 00:00

MM5 - Presion a nivel del mar (hPa) 00Z20AUG2004



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HIRLAM 0.2 Presion al nivel del mar 20/08/2004 00Z H+ 0 VAL:20/08/2004 00Z

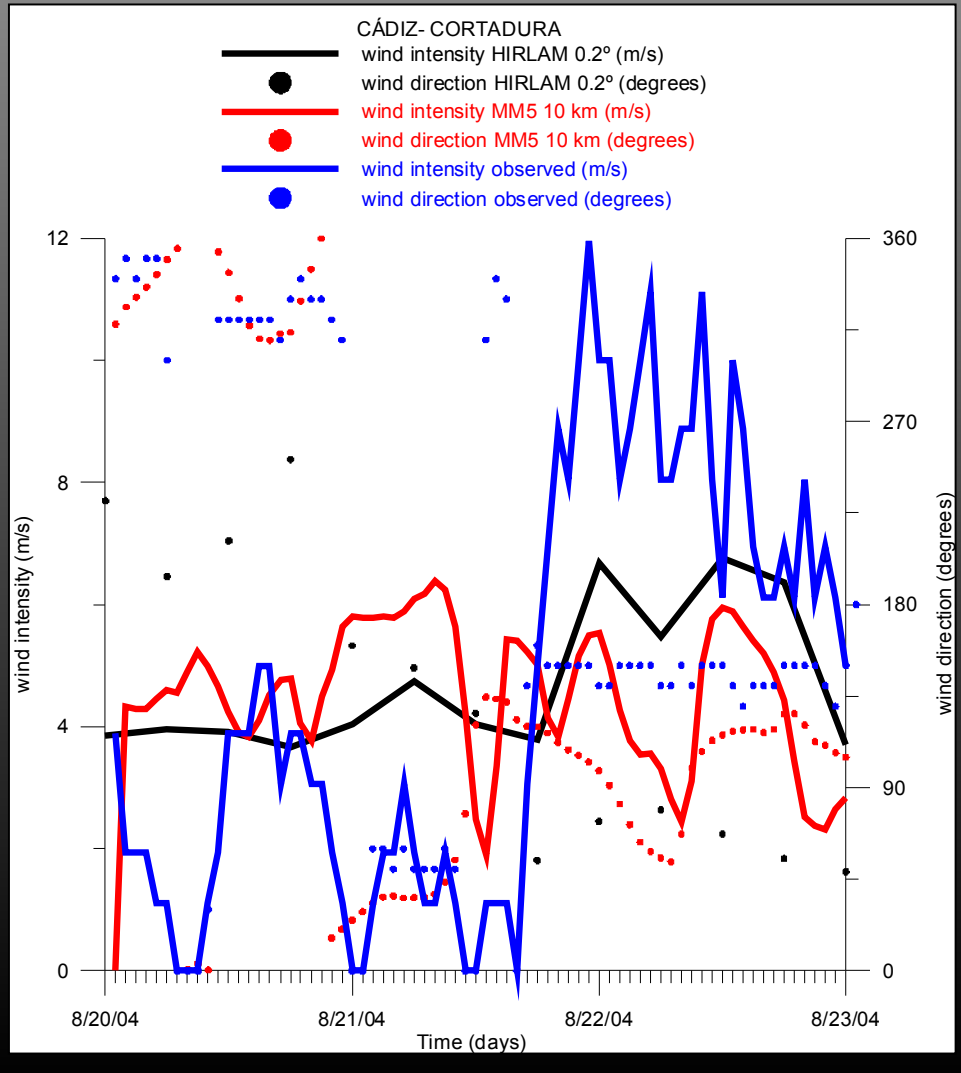
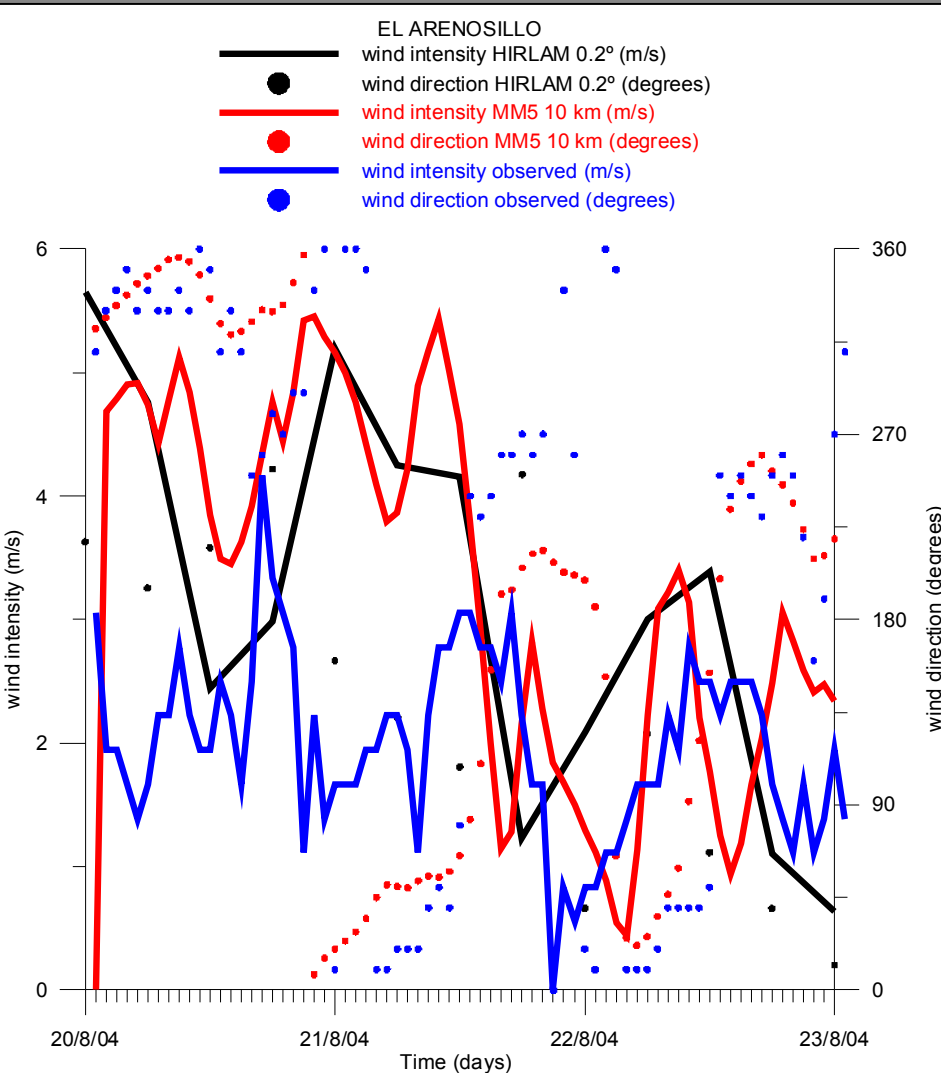


DOMAIN 30 km MM5

DOMAIN 0.2 HIRLAM (INM)

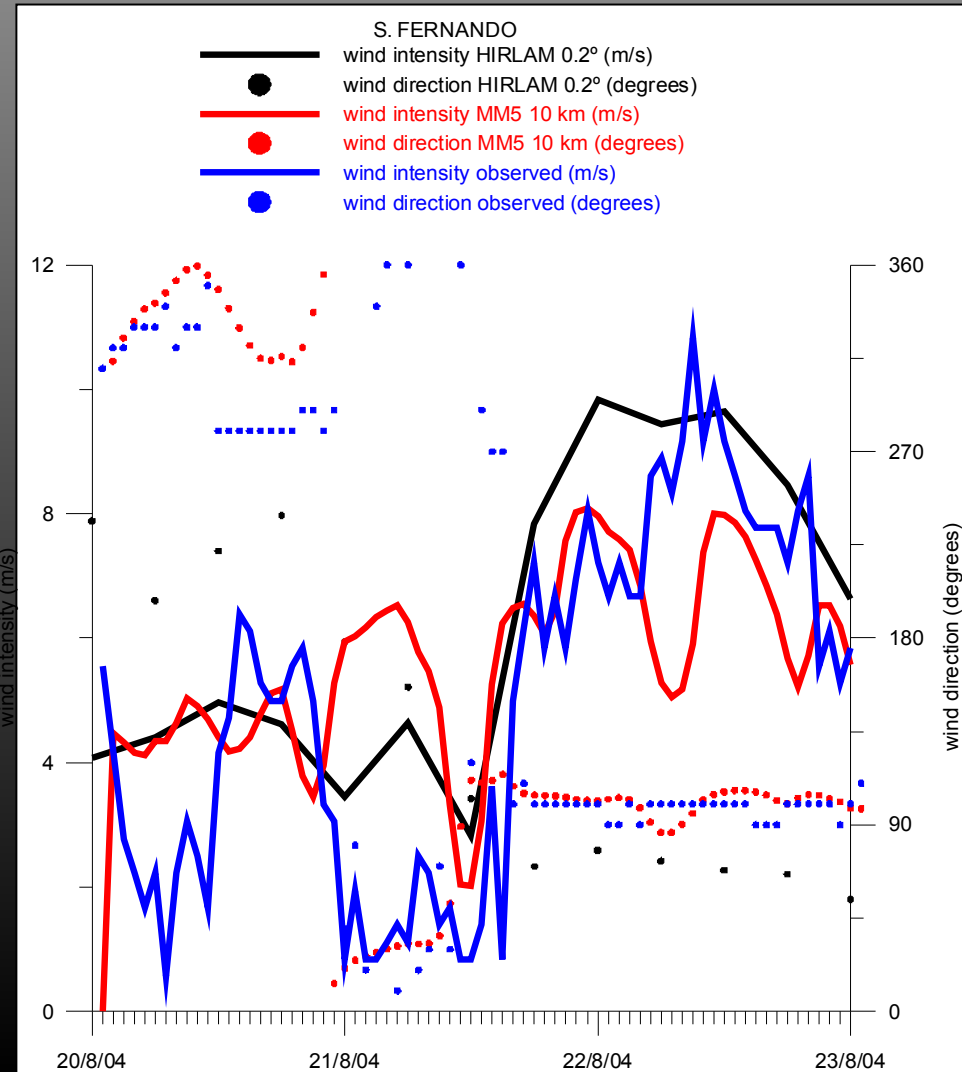
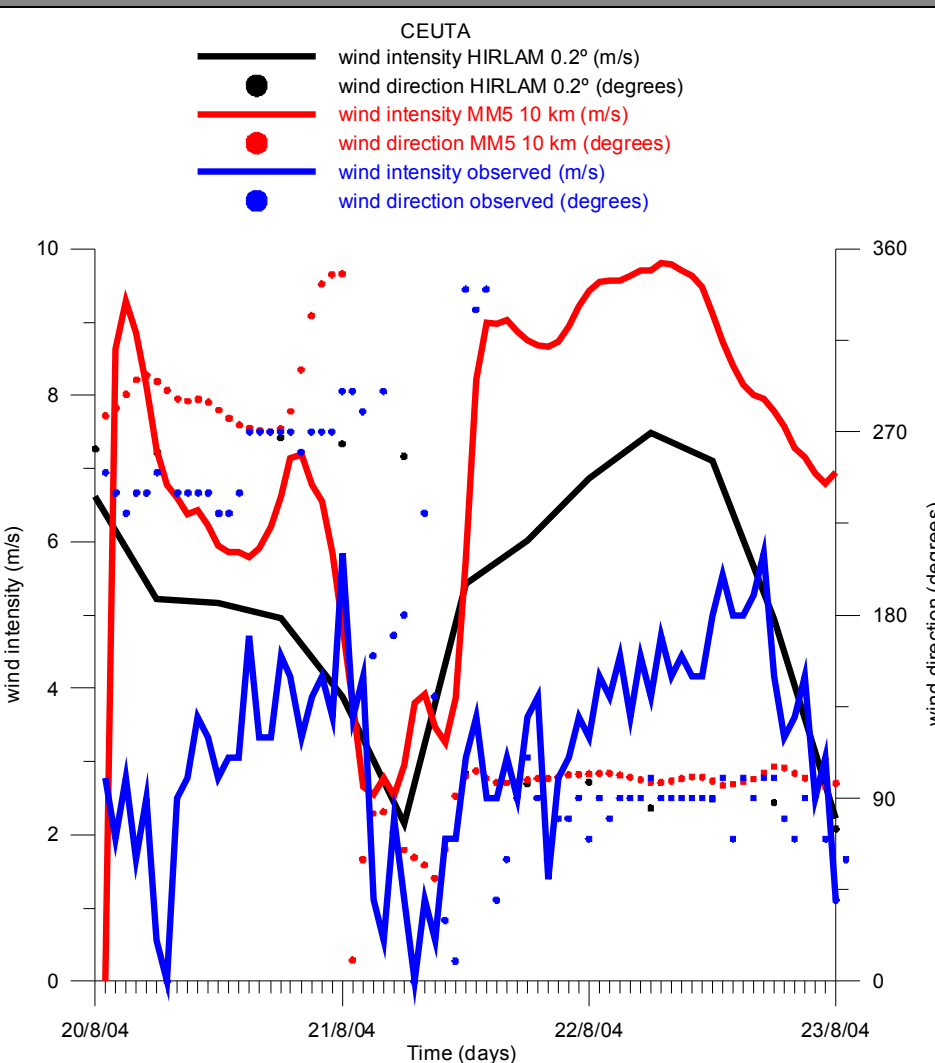
PRELIMINARY RESULTS

EVALUATION OF THE 10m WIND SPEED (m/s) MM5 (10 km) vs. HIRLAM (0.2°)



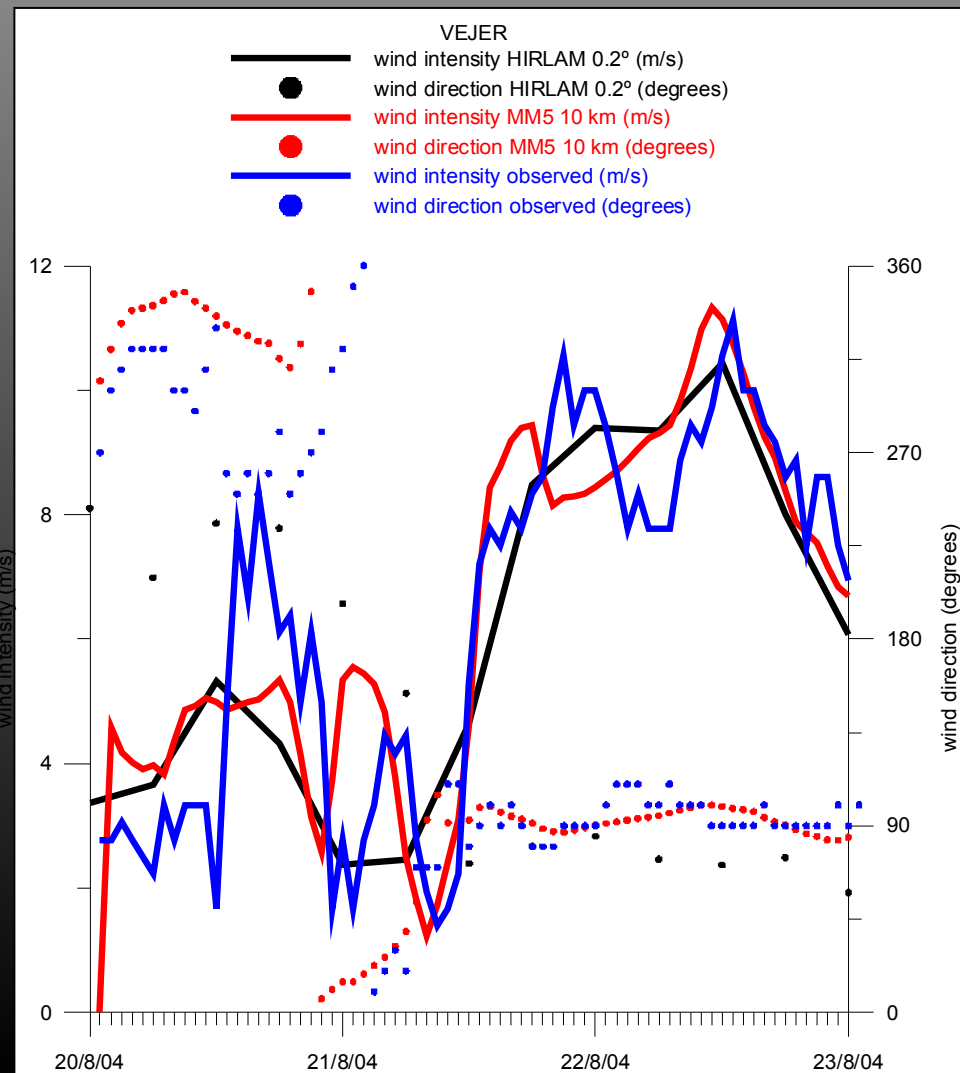
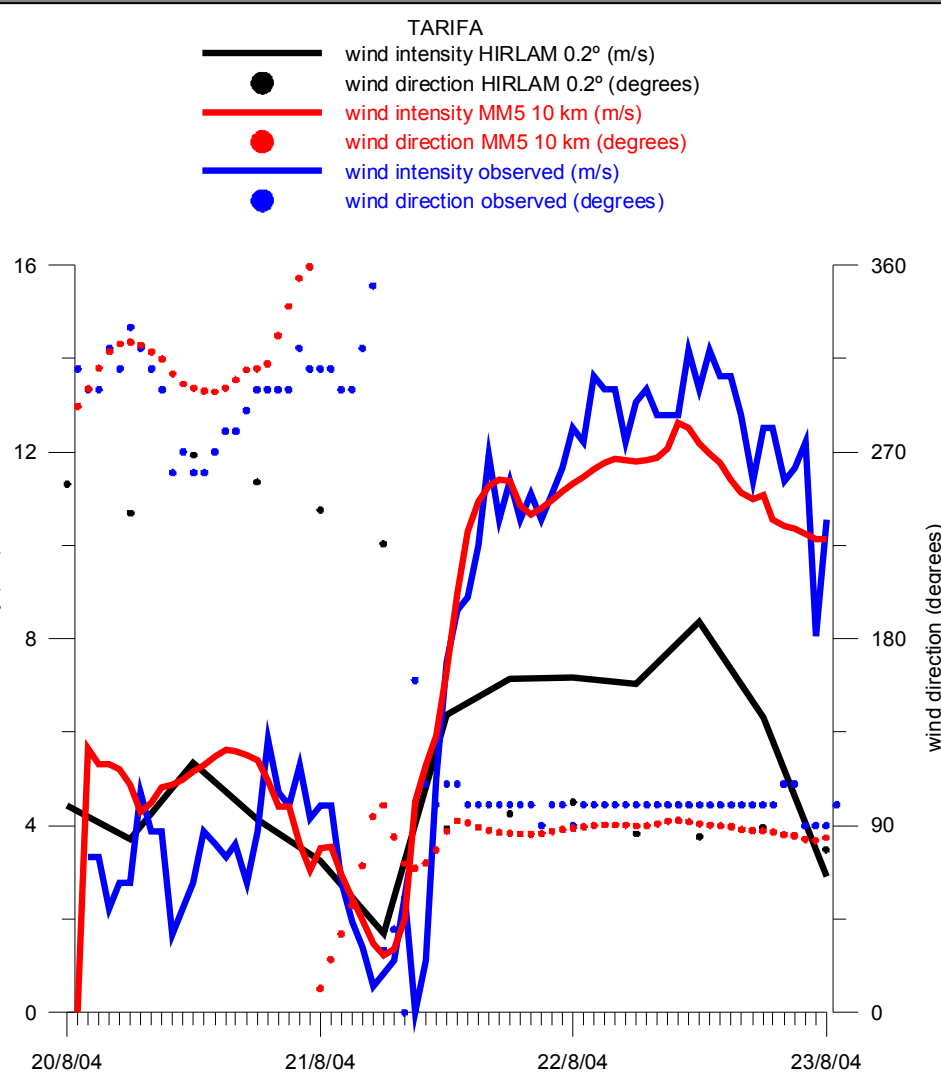
PRELIMINARY RESULTS

EVALUATION OF THE 10 m WIND SPEED (m/s) MM5 (10 km) vs. HIRLAM (0.2°)



PRELIMINARY RESULTS

EVALUATION OF THE 10 m WIND SPEED (m/s) MM5 (10 km) vs. HIRLAM (0.2°)



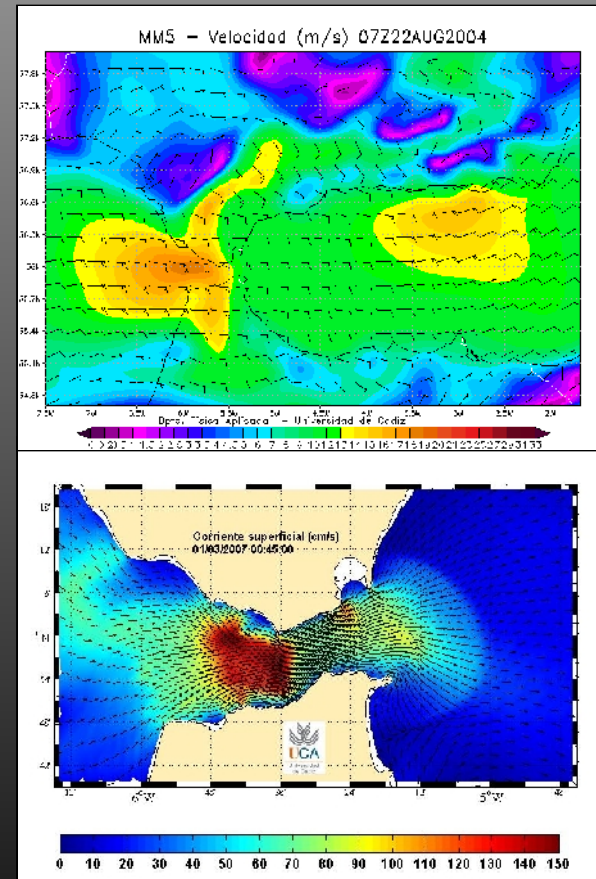
CONCLUDING REMARKS

- Wind direction field is well simulated for the MM5 model.
- Model may capture the magnitudes of the wind intensity changes
- The atmospheric simulation improves after the increase of the grid resolution in the case of the 2 m temperature, sea level pressure and 10 m wind speed.
- A quantitative analysis is necessary to obtain better conclusions.
- A web site with atmospheric and hydrodynamic forecast (72 hours prediction horizon) for the Strait of Gibraltar and Algeciras Bay has been developed.
<http://vinniuca.rshu.ru/prediccion>
<http://150.214.84.40.rshu.ru/prediccion>

1. Evaluation MM5 vs. observations

2. Atmosphere-ocean model

3. Evaluation atmosphere-ocean model



Atmospheric regional model MM5 (3.3 km)

↓ forcing

UCA2.5D (Izquierdo *et al.*, 2001)

3. Evaluation of all variables (T_a , pressure, wind, etc.) of the atmospheric model vs. observations in the marine area, Strait of Gibraltar and satellite data over the ocean) and vs. other models independently developed

- **MeteoGalicia group for his invaluable help, kind collaboration and boundary conditions providing.**
- **INM for the data support and A.M.S. maintaining**
- **Red Ibérica MM5 for making easier and better the work of the MM5 beginner.**

THANK YOU VERY MUCH!!!



**I can not change the wind direction but
I can adjust the sails to come always to my destination**