



## Centro de Geofísica da Universidade de Lisboa

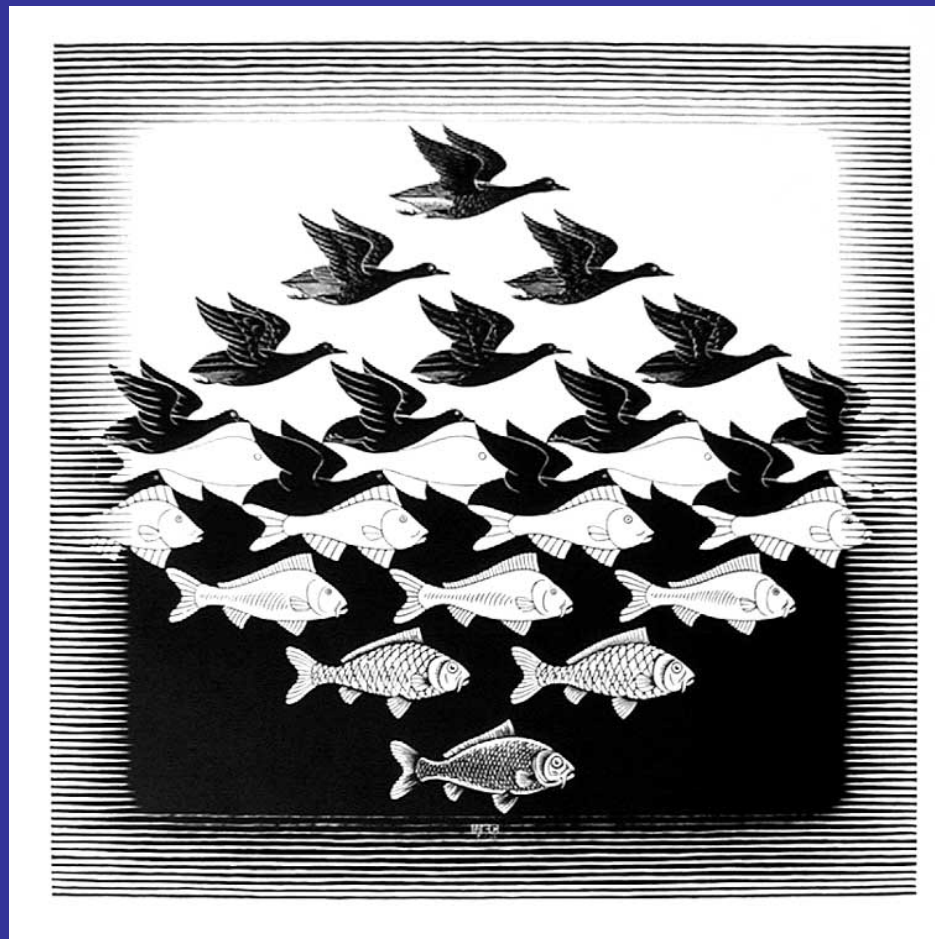


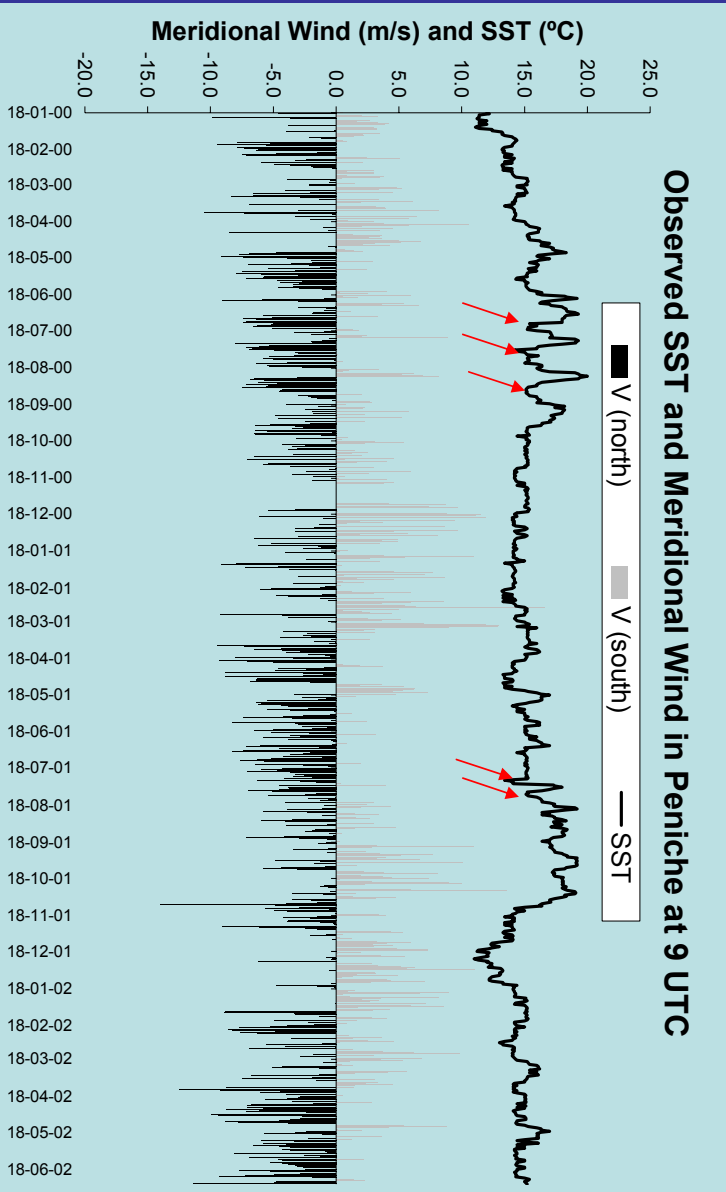
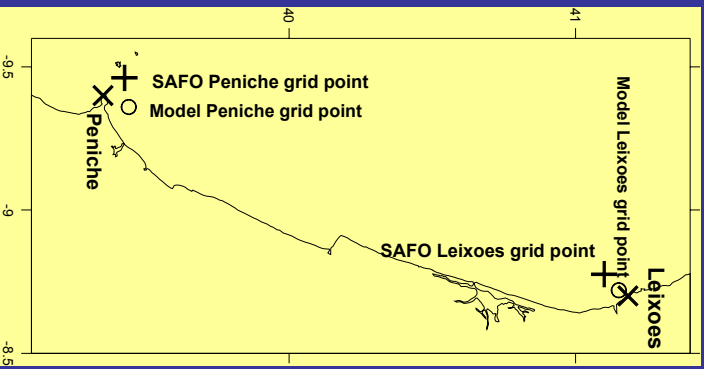
Pedro M A Miranda, João Ferreira, Paulo Costa, Carlos Ramalho,  
Ricardo Tomé, Carlos Antunes

### Projectos com MM5

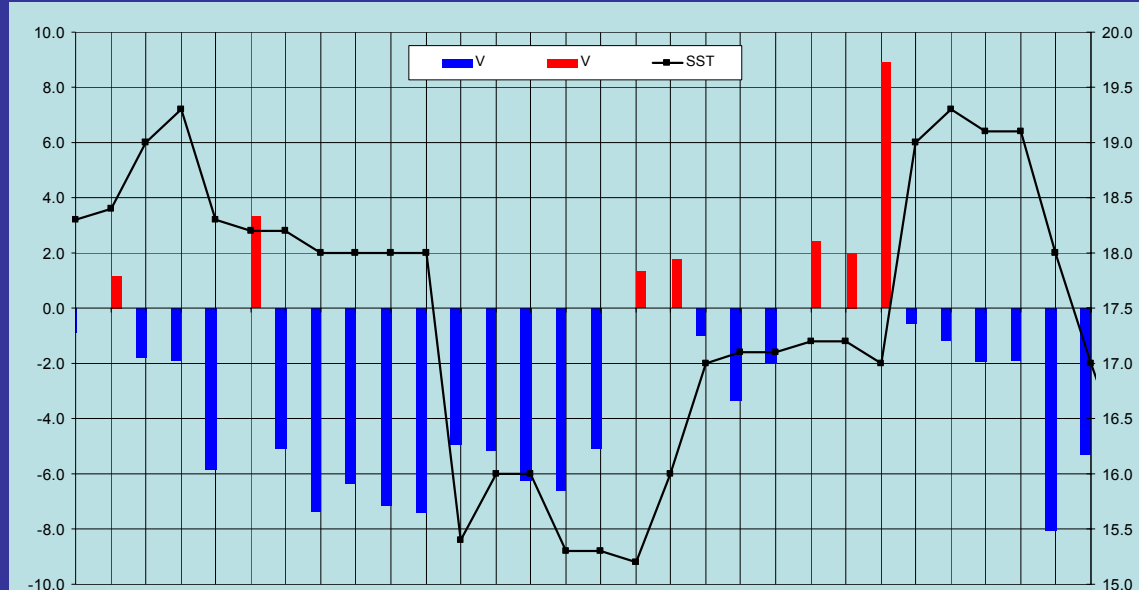
- Desenvolvimento do modelo acoplado MM5+HYCOM – upwelling (J. Ferreira, IM)
- Mapa do potencial eólico (P. Costa, Ana Estanqueiro, INETI)
- Previsão do tempo nos Açores (C. Ramalho, R. Tomé, C. Antunes)

Is it  
coupled?



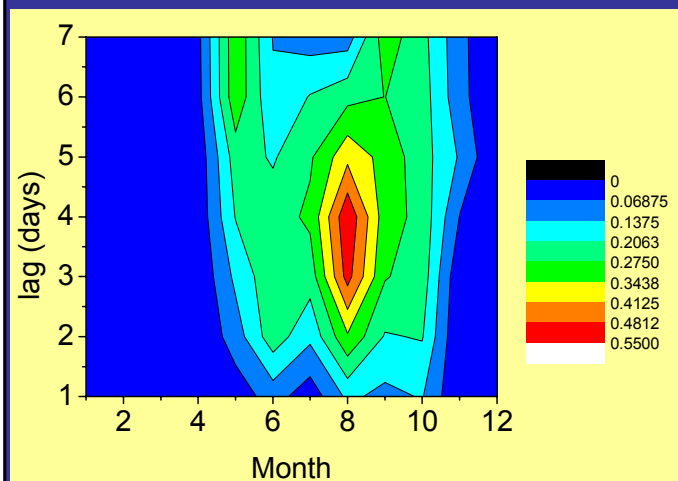


## Peniche: Meridional Wind and SST



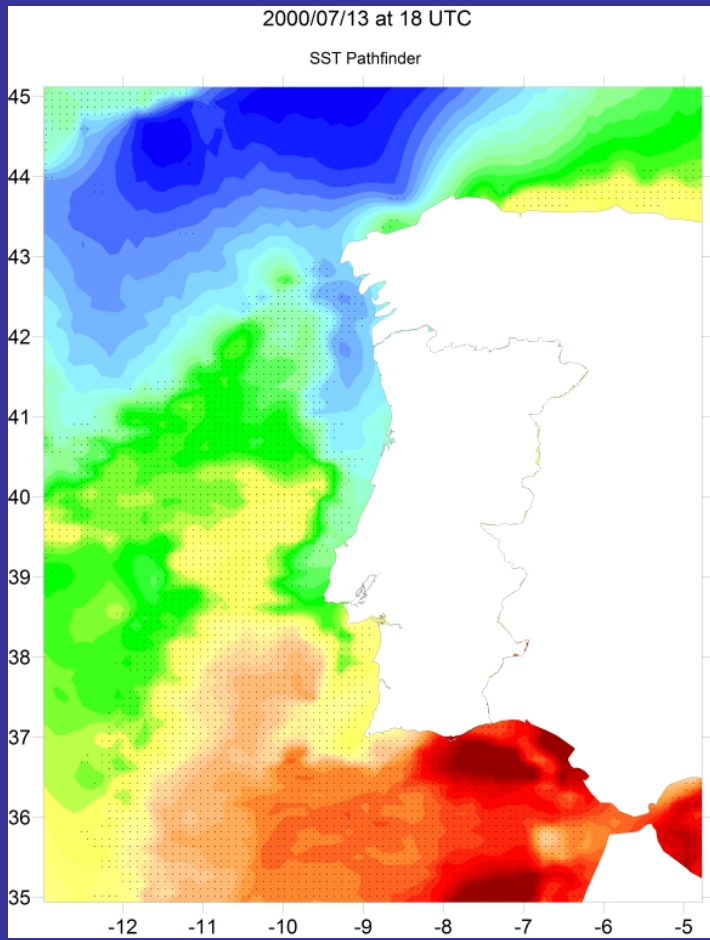
1 July 2000

31 July 2000



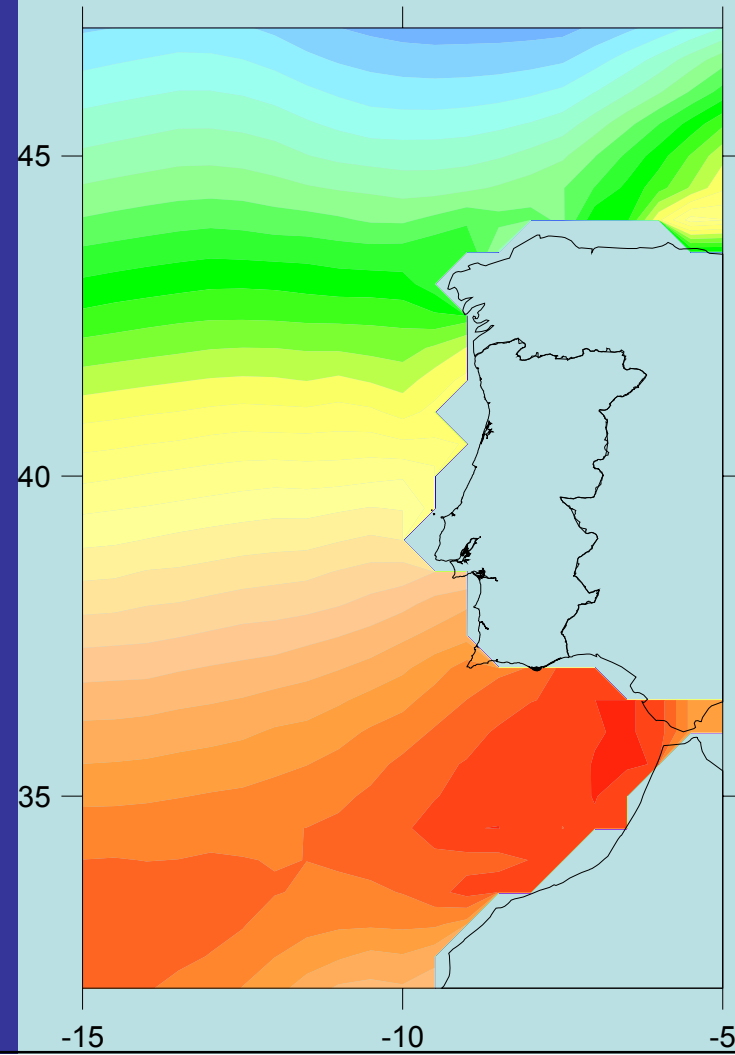
**Lagged Correlation between SST  
and Meridional Wind in Peniche at 9  
UTC**

## Satellite SST (Observed)

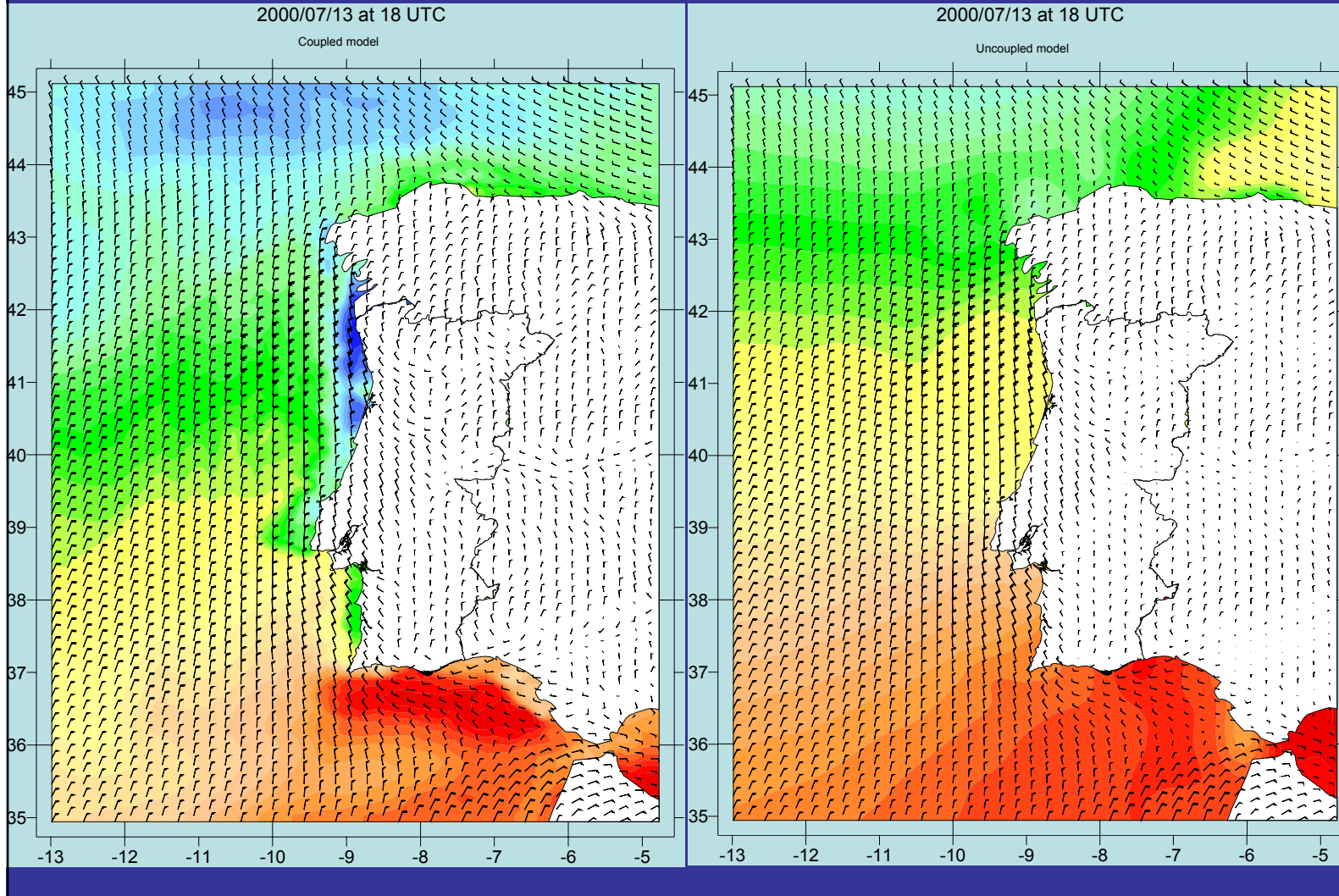


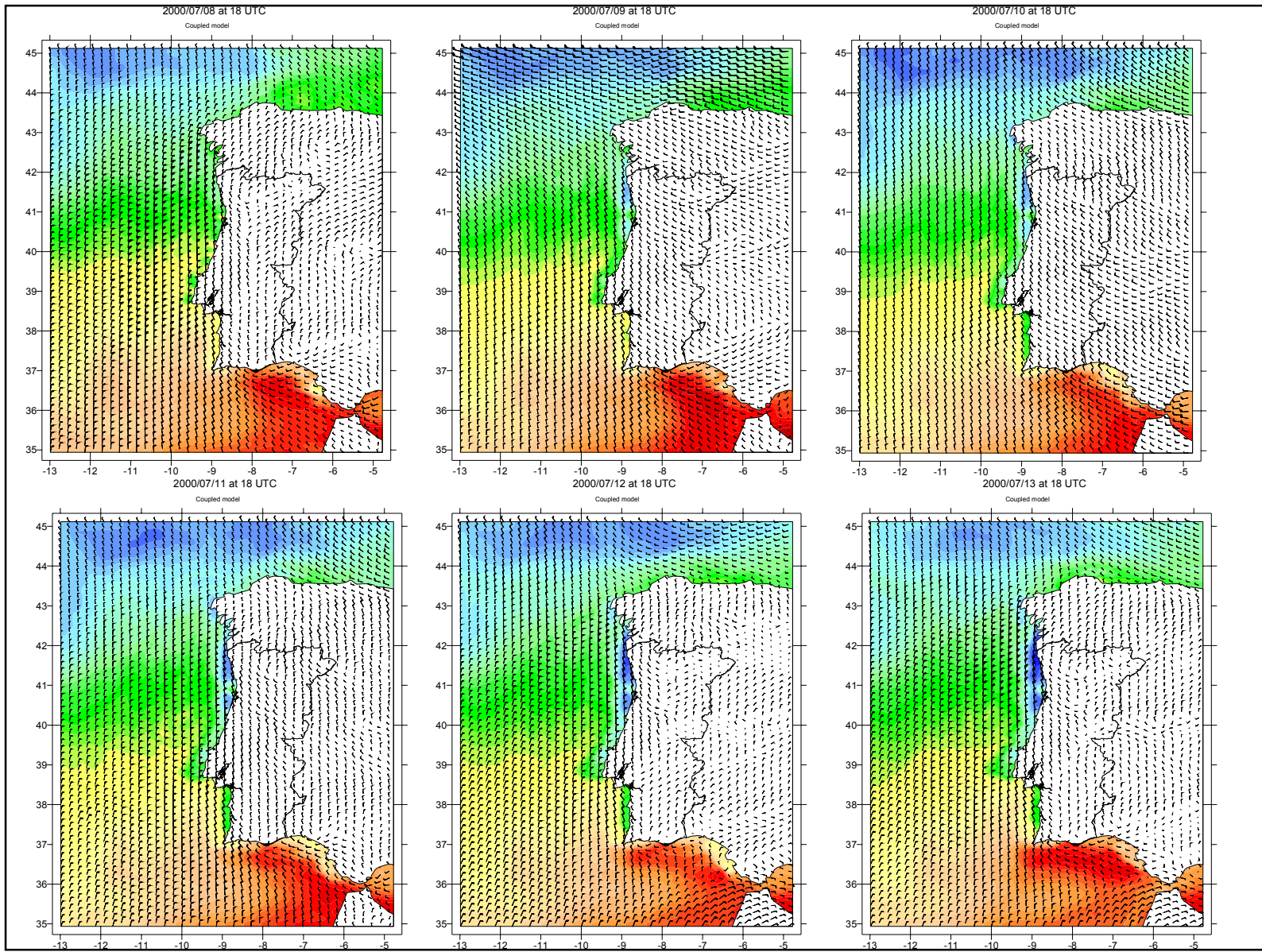
2000/07/13 at 00 UTC

ECMWF operational SST

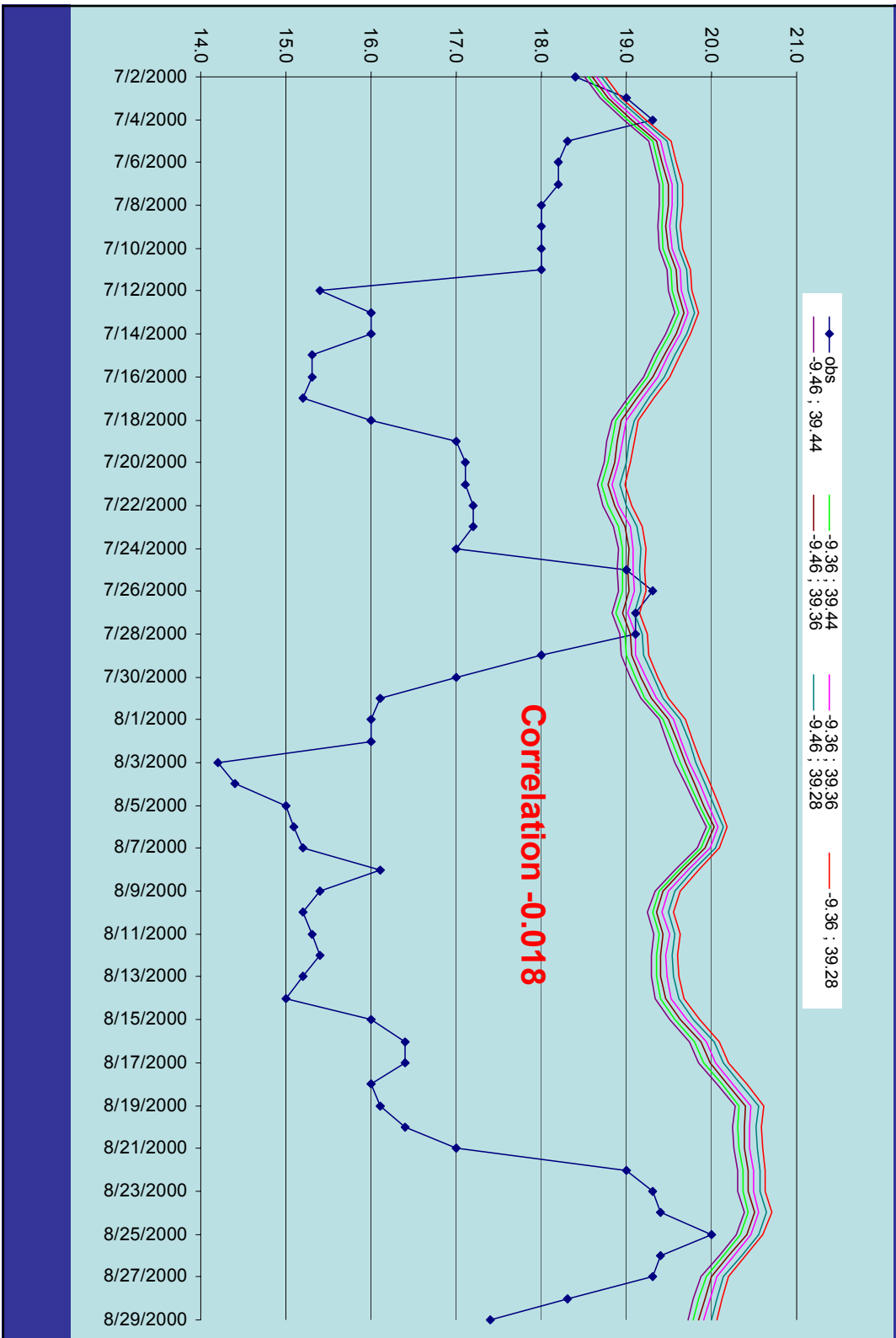


# Maximum upwelling



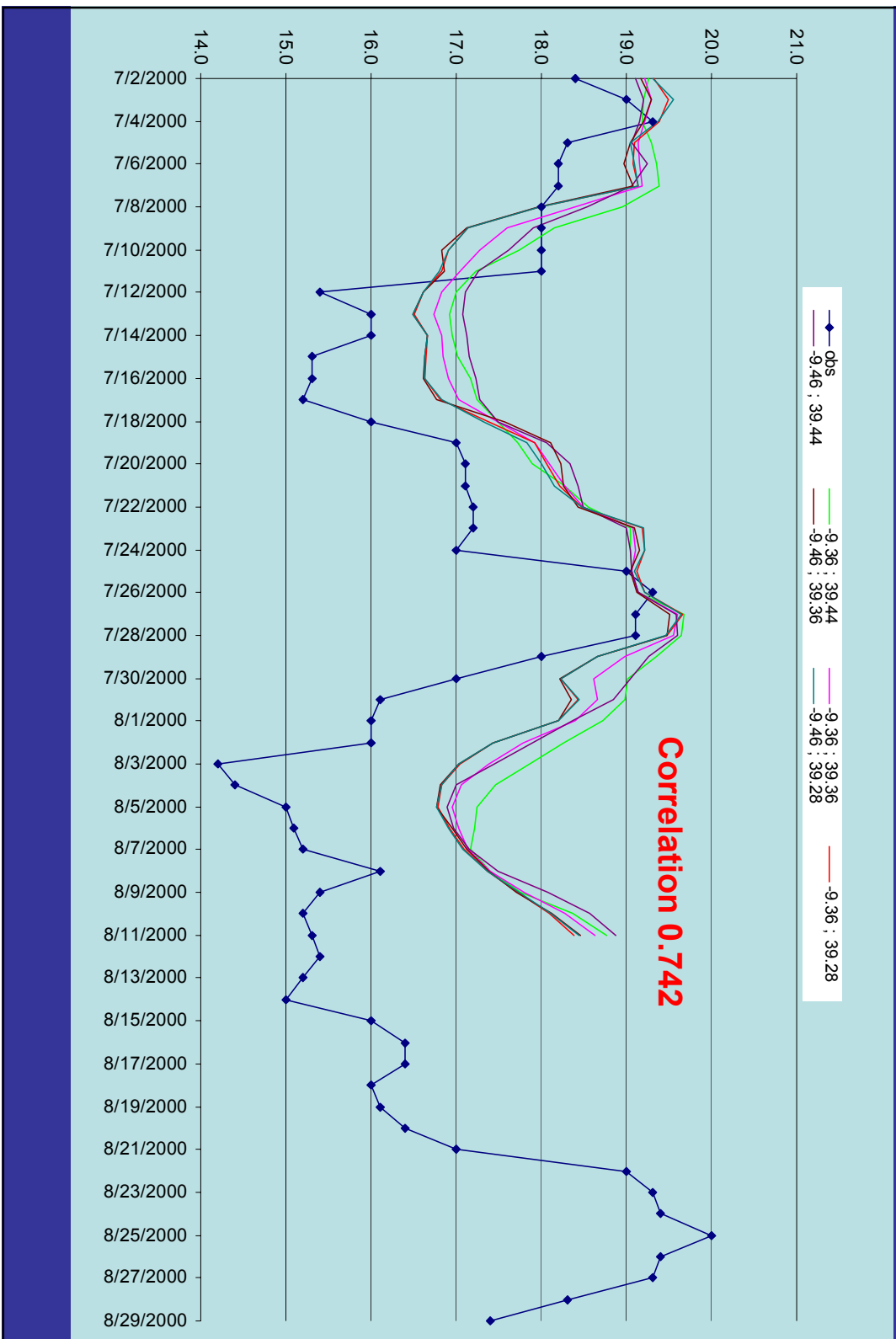


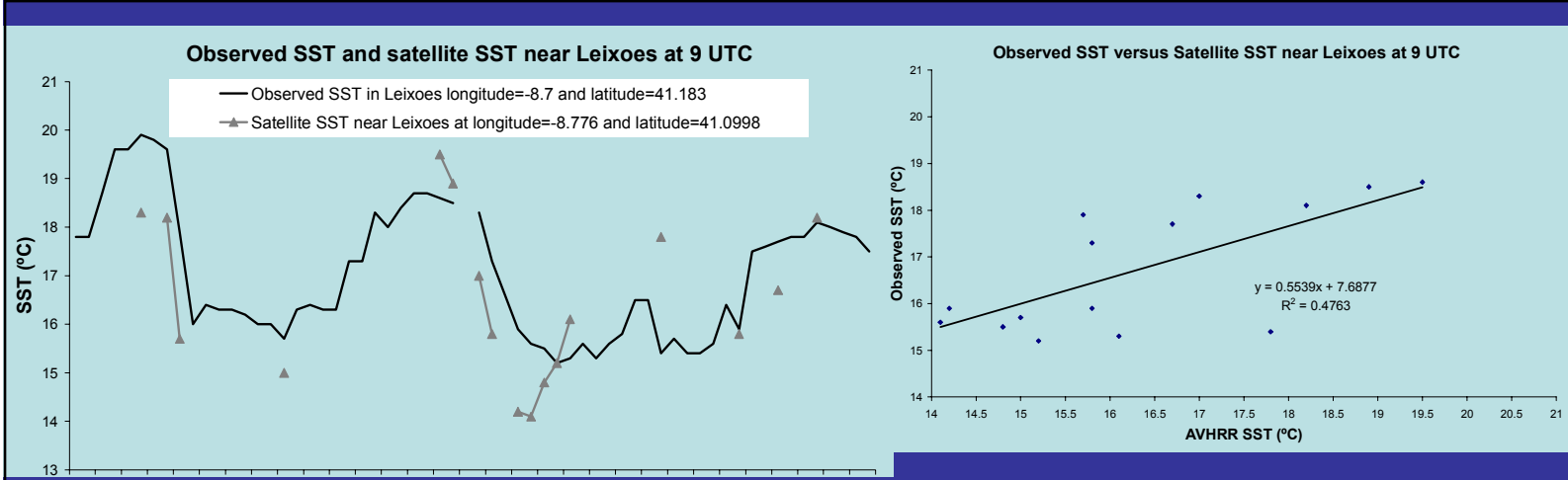
# Observed SST in Peniche and Uncoupled MODEL



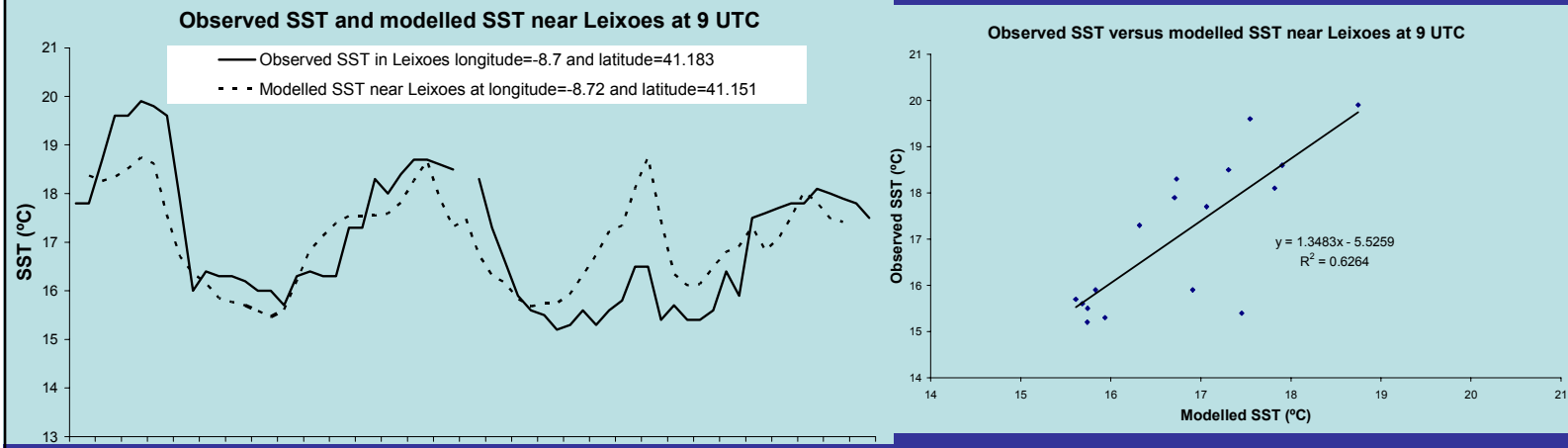


# Observed SST in Peniche and Coupled MODEL





<b>Satellite</b>					
	<b>Bias</b>	<b>rmse</b>	<b>R<sup>2</sup></b>	<b>a</b>	<b>b</b>
	<b>-0.54</b>	<b>1.28</b>	<b>0.476</b>	<b>0.554</b>	<b>7.688</b>



<b>Coupled Model</b>					
	<b>Bias</b>	<b>rmse</b>	<b>R<sup>2</sup></b>	<b>a</b>	<b>b</b>
	<b>-0.31</b>	<b>1.05</b>	<b>0.6264</b>	<b>1.348</b>	<b>-5.526</b>

# Atlas do Potencial Eólico de Portugal Continental

Departamento de Energias Renováveis

Unidade de Energia Eólica e  
dos Oceanos

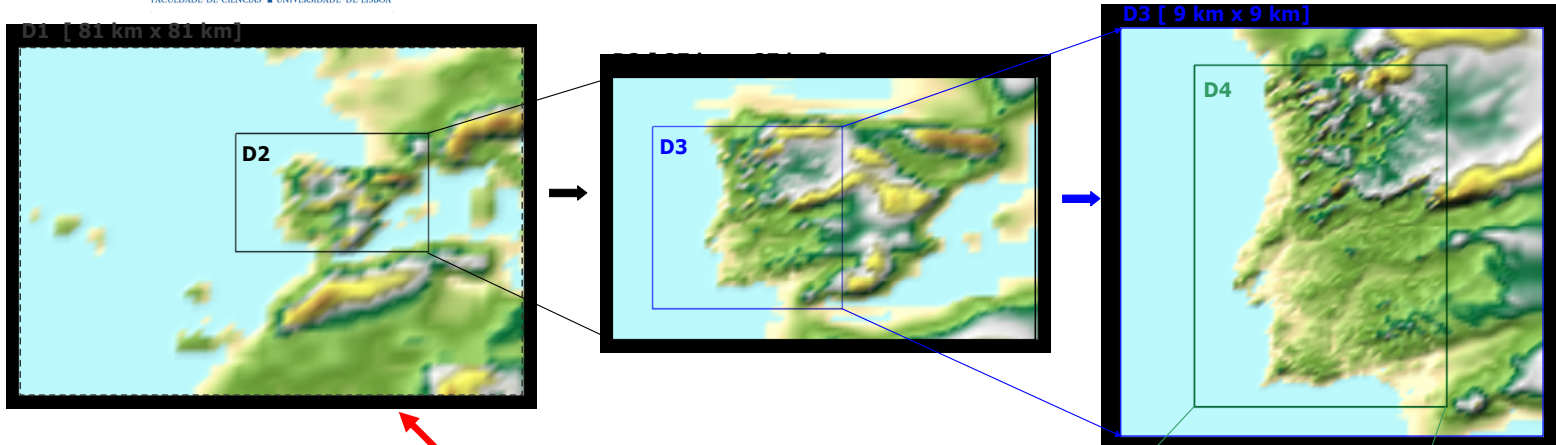
INETI



FACULDADE DE CIÊNCIAS UNIVERSIDADE DE LISBOA

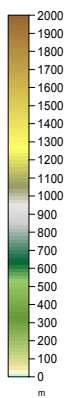
**Paulo Costa** (INETI-DER / FCUL)  
**Pedro Miranda** (CGUL / FCUL)  
**Ana Estanqueiro** (INETI-DER)

# Domínios de Simulação

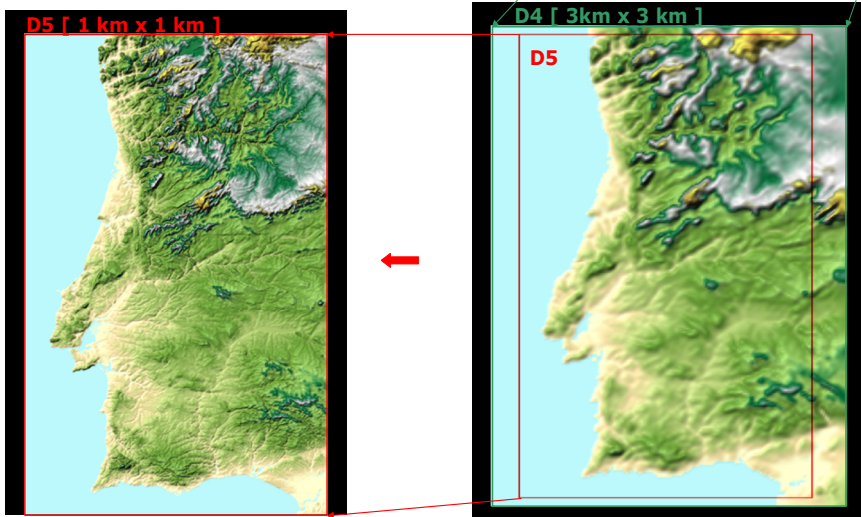


**NCEP Reanalysis**

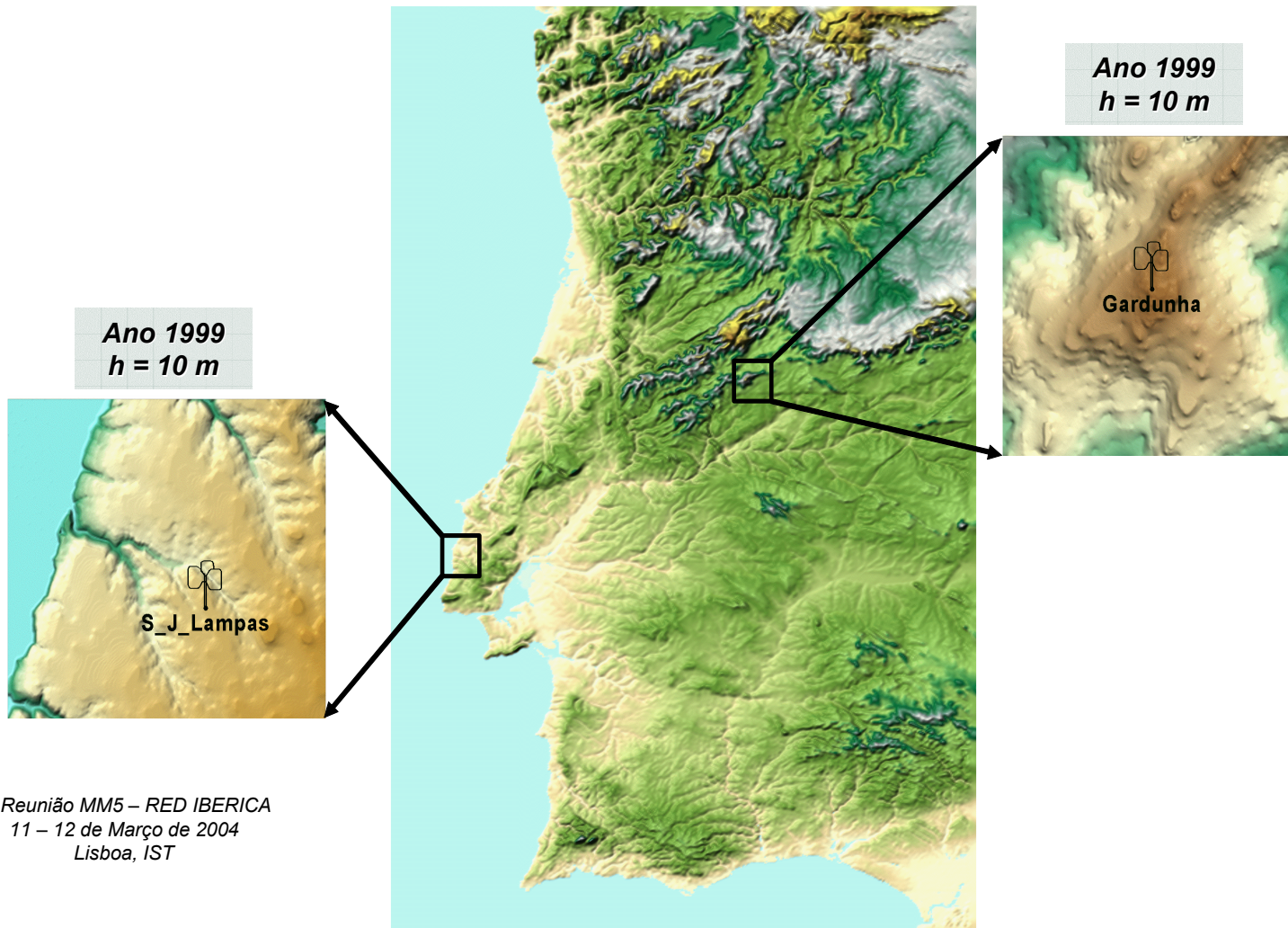
- $ny \quad nx \quad n\sigma$   
**D1 [ 52 x 63 x 32 ]**
- D2 [ 54 x 72 x 32 ]**
- D3 [ 111 x 96 x 32 ]**
- D4 [ 276 x 171 x 32 ]**
- D5 [ 795 x 420 x 32 ]**



2ª Reunião MM5 – RED IBERICA  
11 – 12 de Março de 2004  
Lisboa, IST

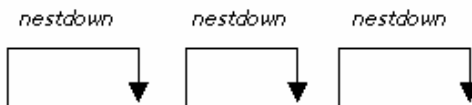


## Validação 2 Estações



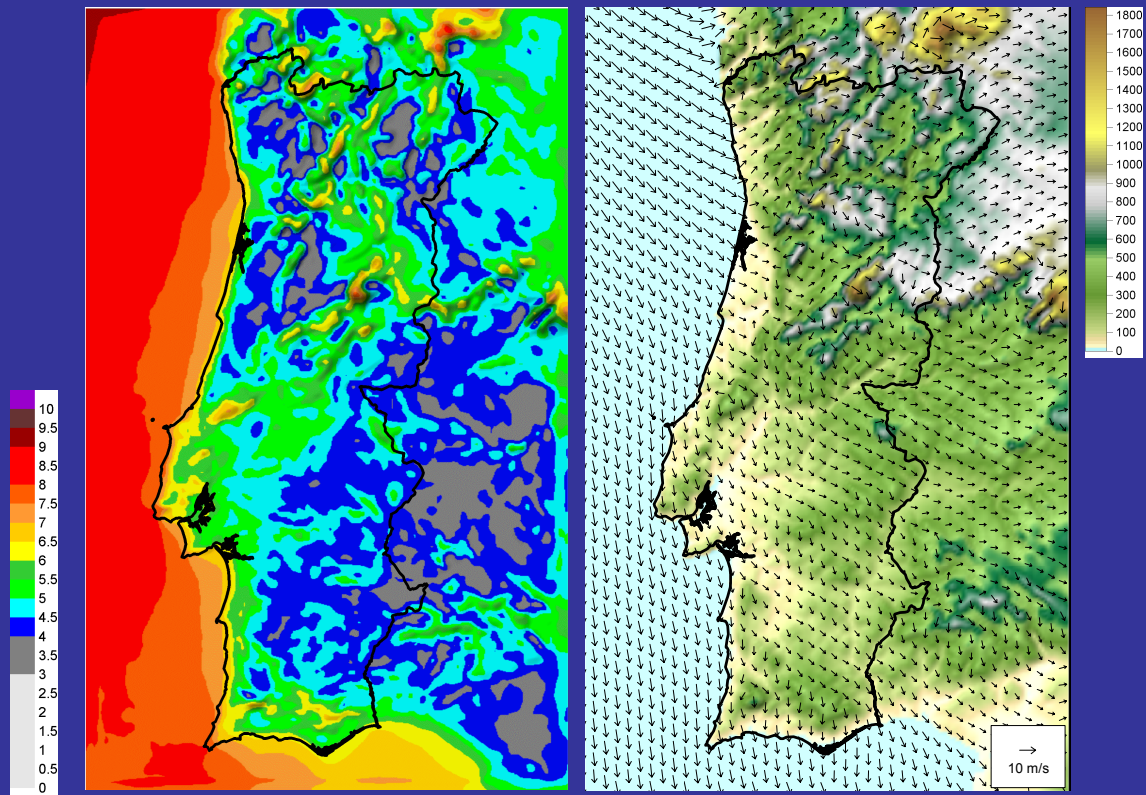
2ª Reunião MM5 – RED IBERICA  
11 – 12 de Março de 2004  
Lisboa, IST

<b>1ª FASE</b> <b>MM5 ver. 3.6.0</b>	<b>4-one-way-nesting</b>			
	<b>D1</b>	<b>D2</b>	<b>D3</b>	<b>D4</b>
	<b>81 km</b>	<b>27 km</b>	<b>9 km</b>	<b>3 km</b>
<b>Terreno</b>	USGS	USGS	USGS	USGS
<b>Rugosidade</b>	USGS (24 cat.)	USGS (24 cat.)	USGS (24 cat.)	USGS (24 cat.)



<b>Dados 3D</b>	NCAR [2.5°x2.5°]			
<b>Dados superfície e solo</b>	NCAR [2.5°x2.5°]			
<b>Parametrização Cúmulos</b>	Grell	Grell	Grell	-
<b>Microfísica</b>	Simple Ice	Simple Ice	Simple Ice	Simple Ice
<b>PBL</b>	MRF	MRF	MRF	Gayno-Seaman
<b>Radiação</b>	Cloud-Radiation	Cloud-Radiation	Cloud-Radiation	Cloud-Radiation
<b>Modelo Solo</b>	NOAH	NOAH	NOAH	NOAH
<b>FDDA</b>	-	-	-	-

**Intensidade e direcção do vento**  
D4 -> 3 km x 3 km ; h=80m

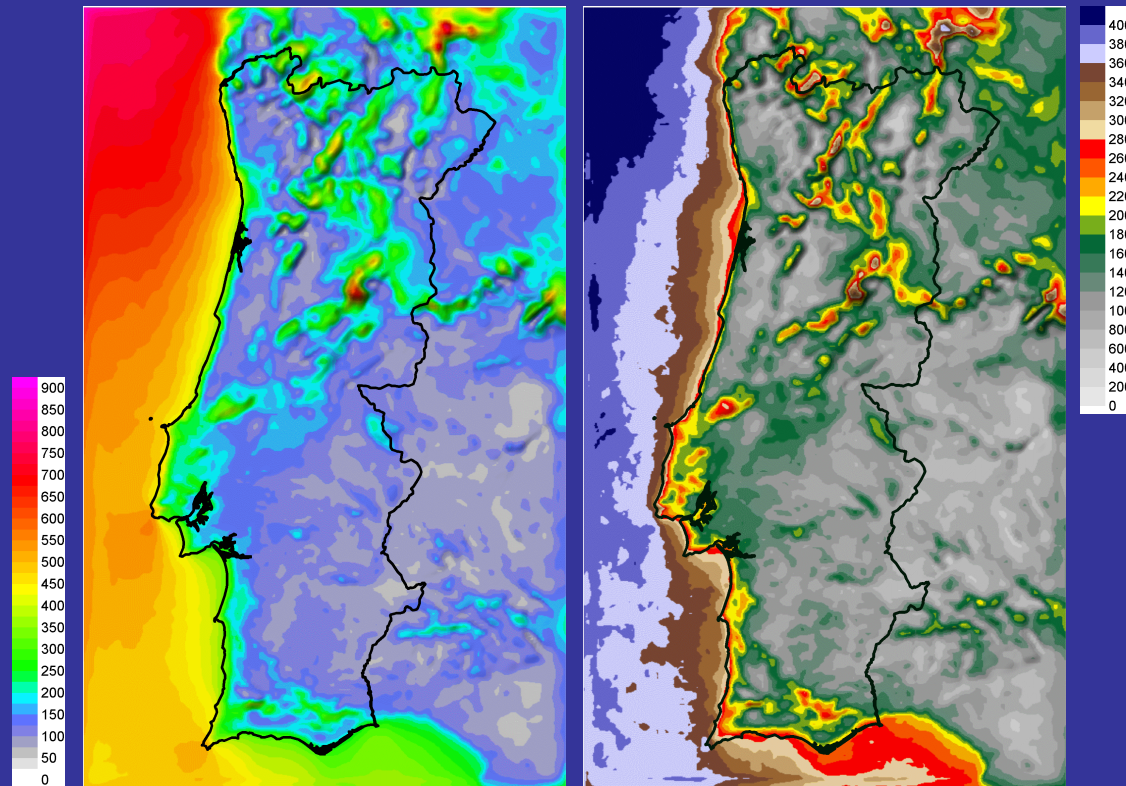


**Intensidade do vento (m/s)**

**Direcção do vento (°)**

## Avaliação do Potencial Eólico

D4 -> 3 km x 3 km ; h=80m



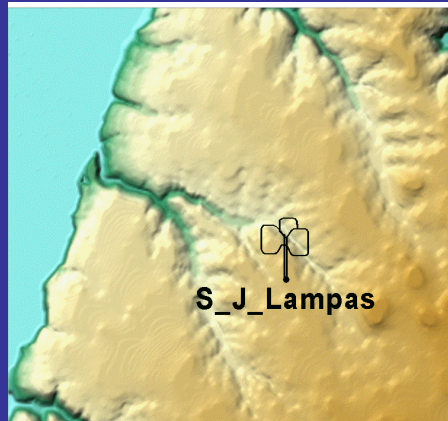
**Fluxo de Potência (W/m<sup>2</sup>)**

**NEP'S\* (h/ano)**

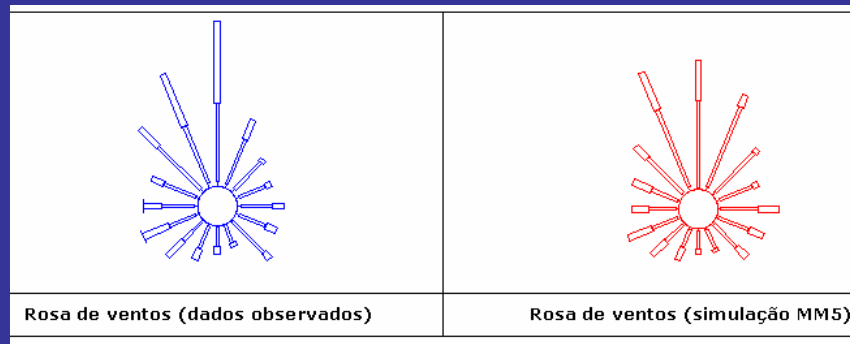
\*NEP'S = Número de horas anual de funcionamento à potencia nominal  
**Aerogerador simulado : NORDEX N90 – 2300 KW**



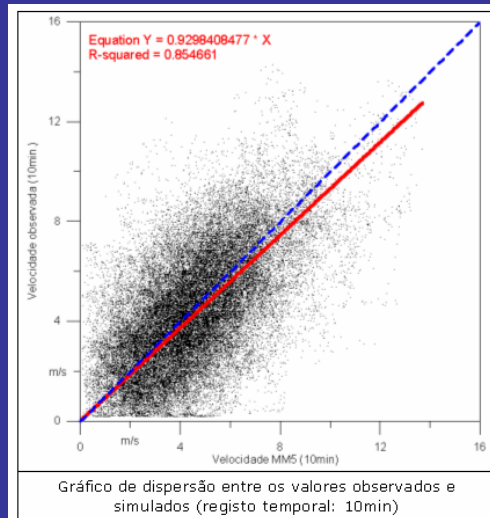
**Validação com D4 -> 3 km x 3 km  
registo temporal de 10 min; h = 10m**



**Rosa de Ventos**



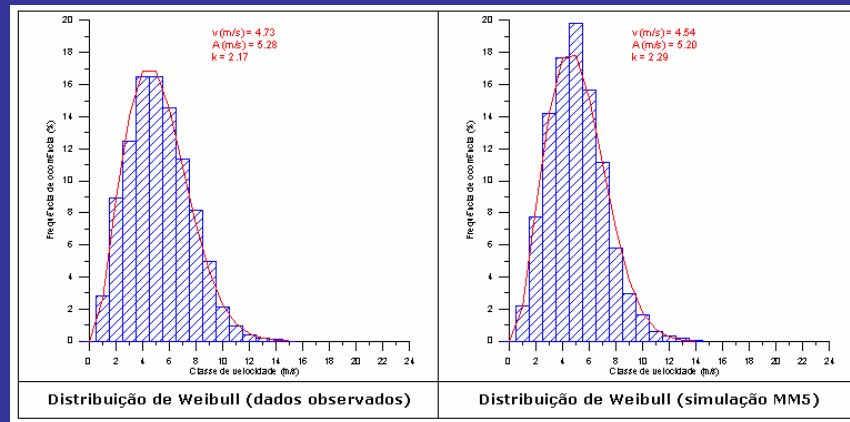
**Gráfico Dispersão  
Observados vs. MM5**



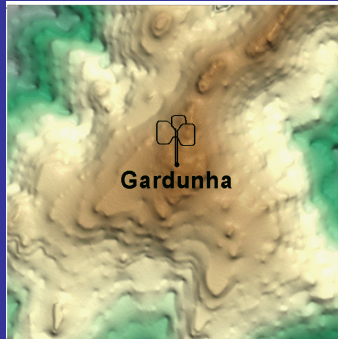
**Valores  
Observados**

**Simulação  
MM5**

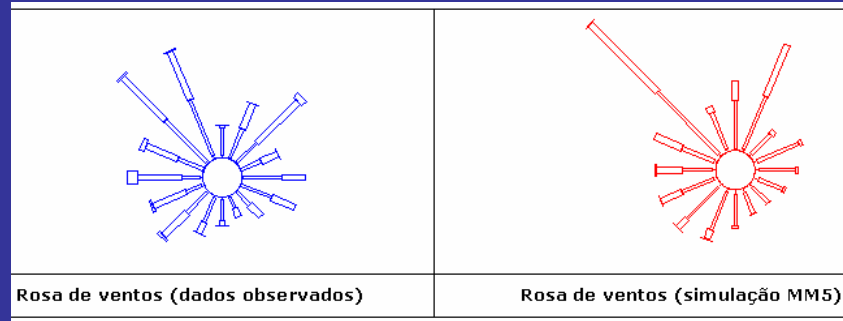
**Distribuição Weibull**



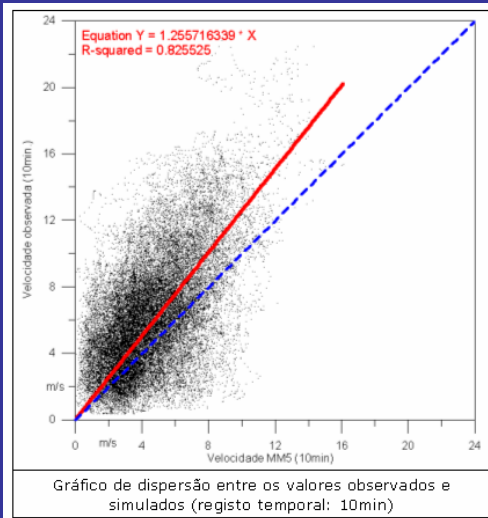
**Validação com D4 -> 3 km x 3 km  
registo temporal de 10 min; h = 10m**



**Rosa de Ventos**



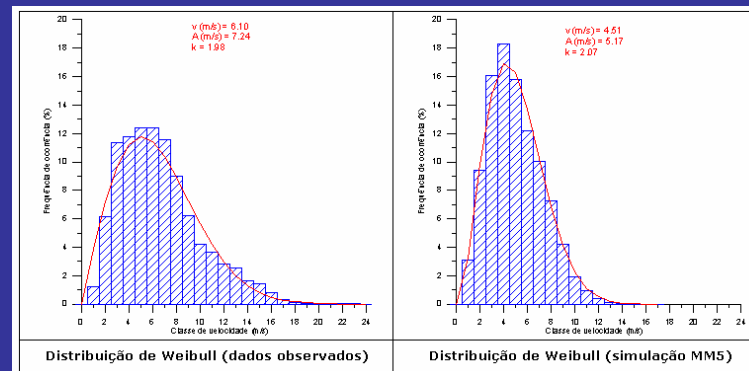
**Gráfico Dispersão  
Observados vs. MM5**



**Distribuição Weibull**

**Valores  
Observados**

**Simulação  
MM5**



The END

## PLANEAMENTO DE SIMULAÇÕES – MM5

### **1ª fase – completa!!**

- Dados NCAR 3D (campos meteorológicos - pgb3d\*) e dados 2D (dados de superfície e solo - grb2d\*) para o ano de 1999.
- O Atlas (3km x 3km) é corrigido por um factor médio de desvio da variabilidade interanual com base em quatro estações de referência do INETI (10 anos de dados).

### **2ª fase – em simulação...**

- Dados NCAR para os anos de 1992,1994,1998, 2000,2001,2002, seleccionados com base numa classificação de regimes de tempo (26 tipos de classificação).
- O Atlas (1km x 1km - em decurso) será corrigido pelo peso das frequências de ocorrência dos regimes - classificação efectuada com 52 anos de dados (1951-2002) - projecto Reanalysis – NCAR.