
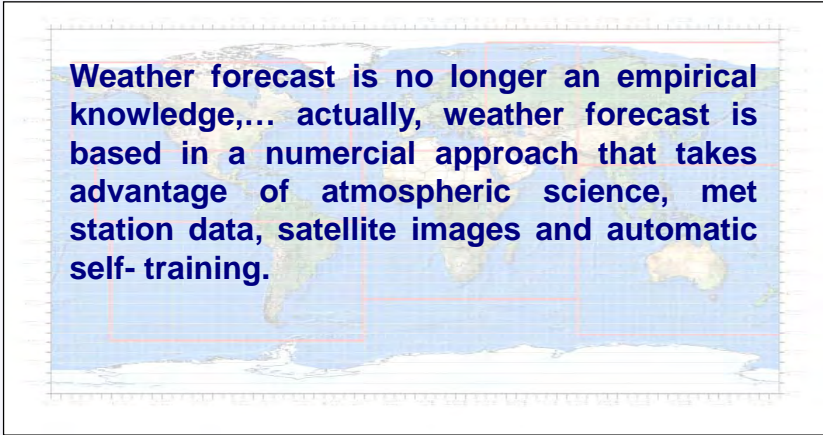



Numerical Weather Prediction Services
> Wind Forecast

Ankara, 5th march, 2010





Weather forecast is no longer an empirical knowledge,... actually, weather forecast is based in a numerical approach that takes advantage of atmospheric science, met station data, satellite images and automatic self- training.



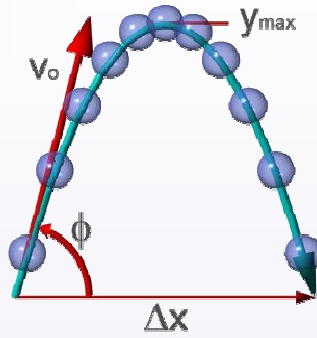


Can we anticipate the future ?

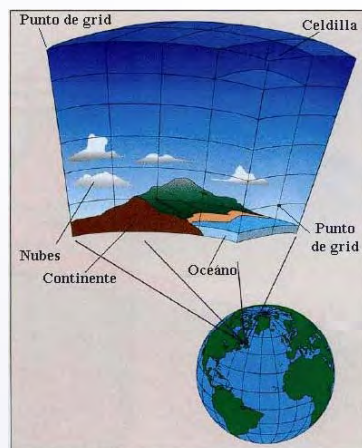
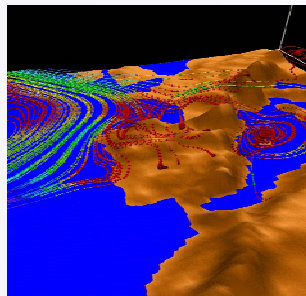
Yes, with physical laws of the atmosphere: with initial conditions, we can predict future conditions.

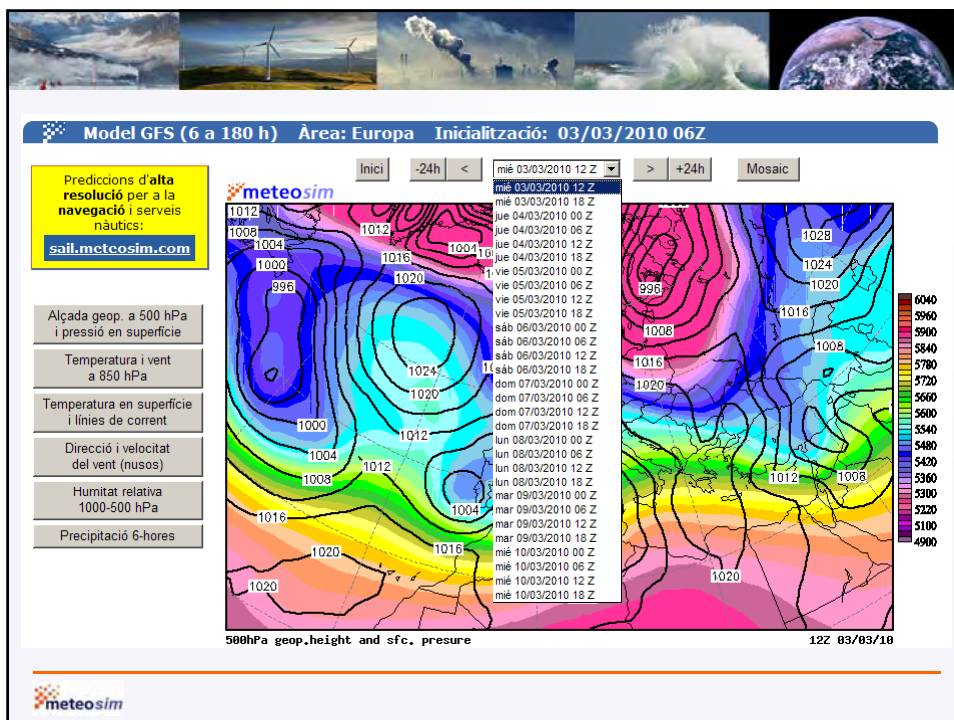
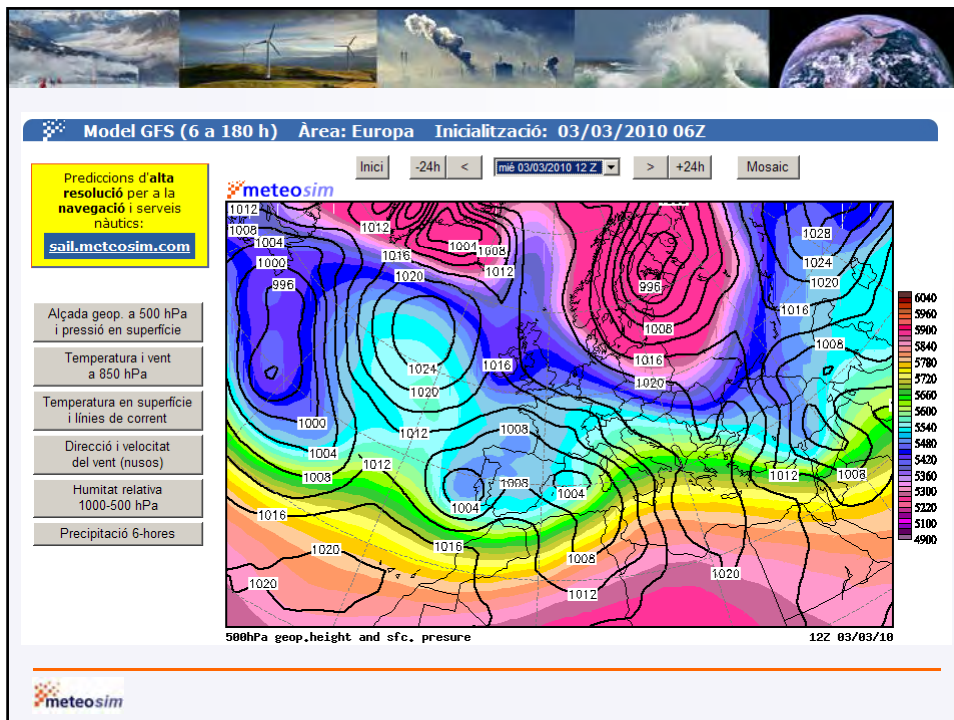
$$y = v_{0y} \cdot t - \frac{gt^2}{2}$$

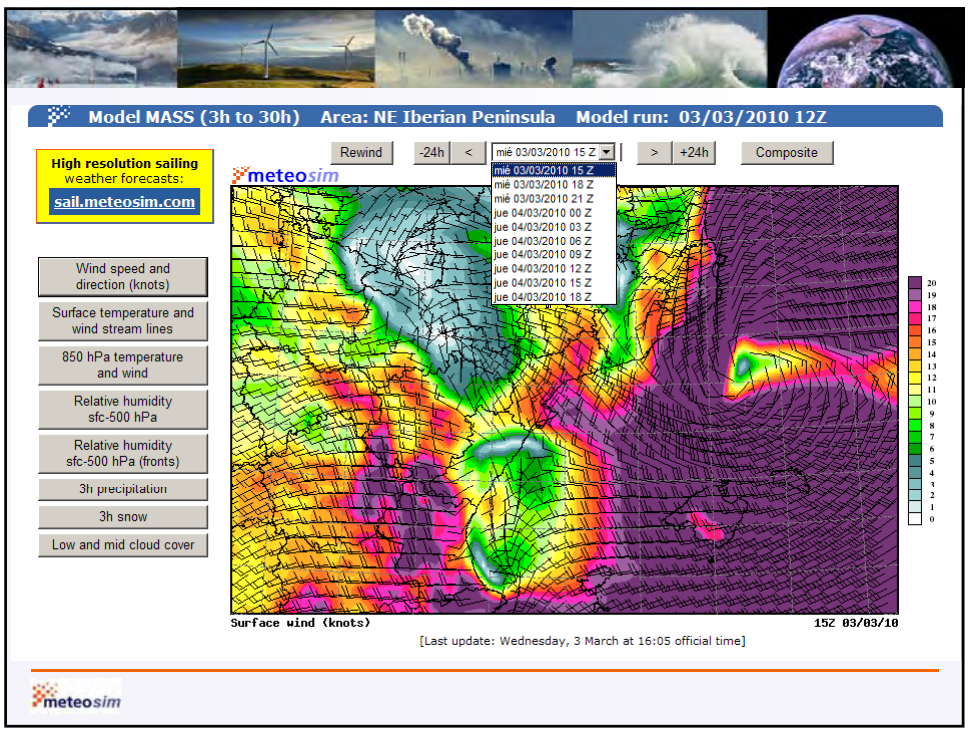
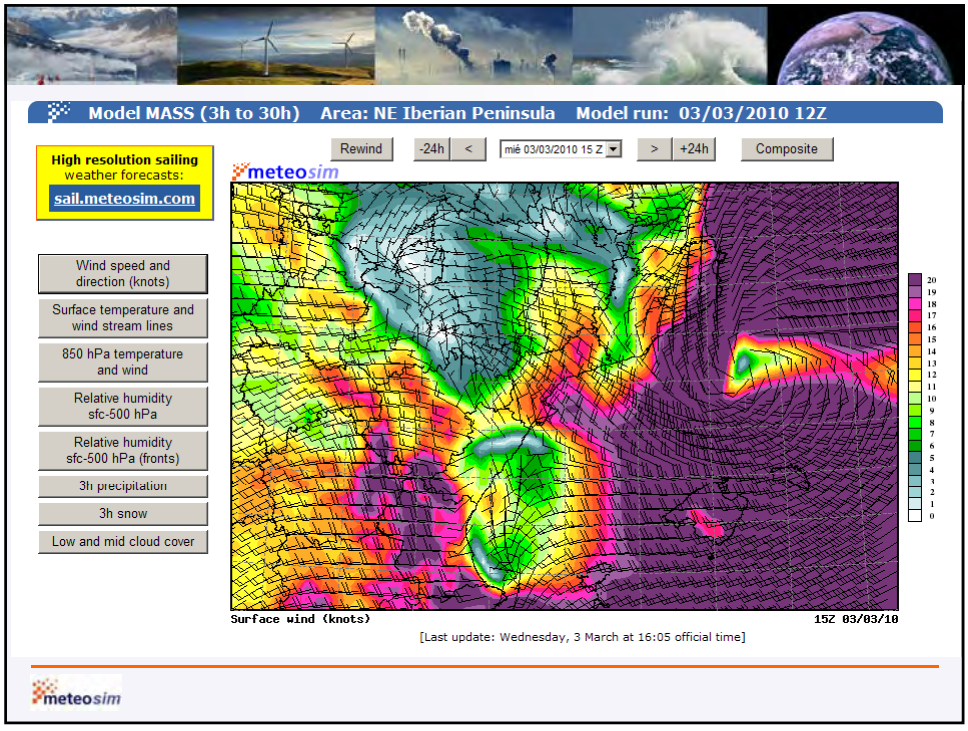
$$x = v_{0x} \cdot t$$




We need atmospheric data through a 3D grid: over the entire globe !

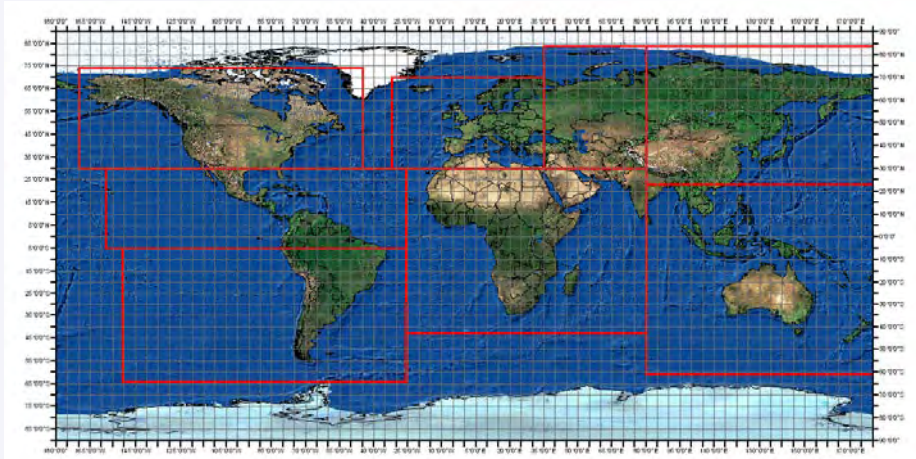








NWP: it is a world wide tool.



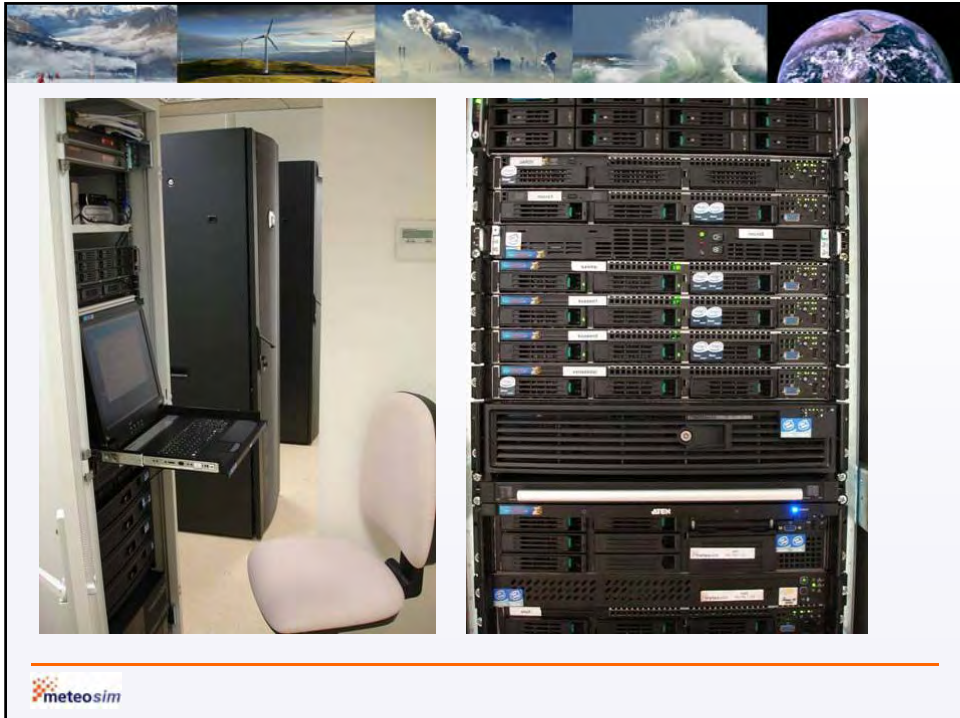
meteosim Numerical Weather Prediction Services



DIFERENTS ESCALES



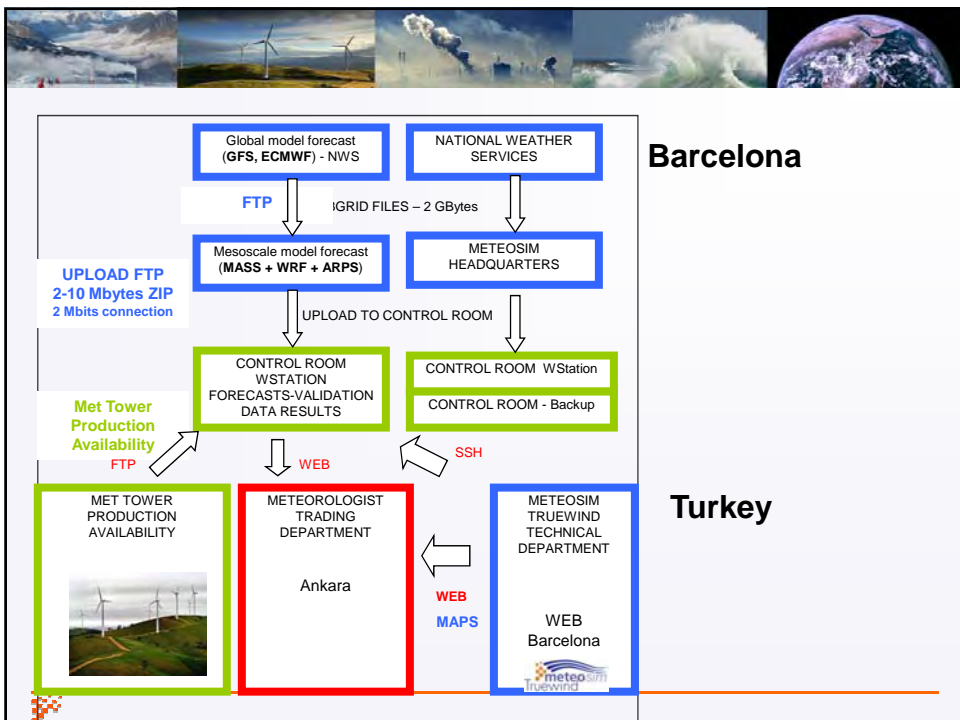
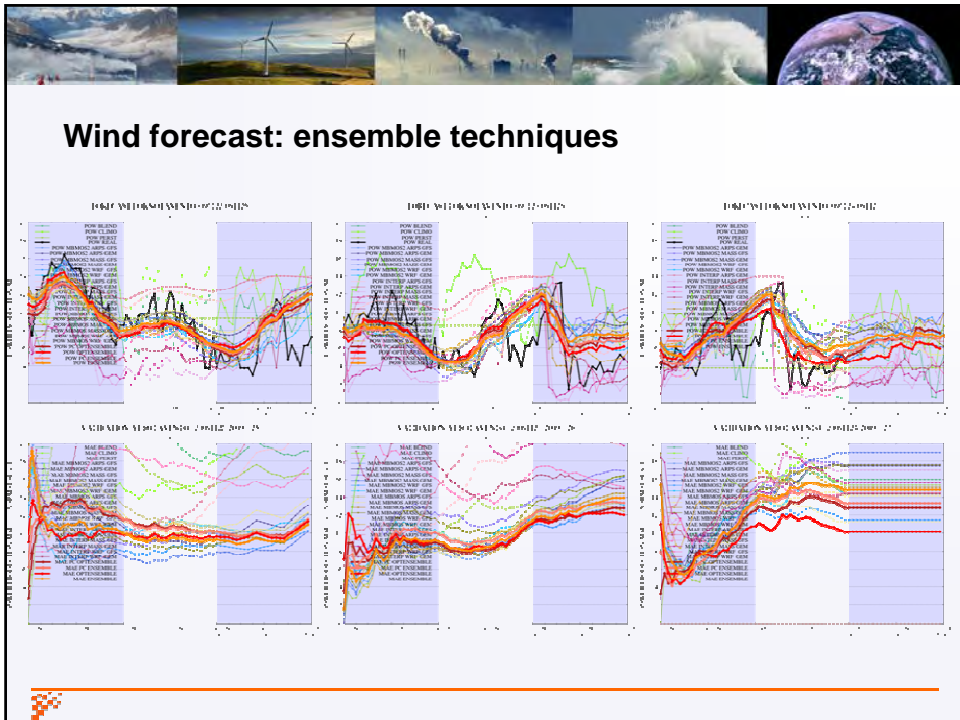
meteosim



INITIAL DATA NEEDED

- SAT
- Radar
- Buoys
- Rawsonda
- Met station data

Copyright EUMETSAT 2008 (<http://www.eumetsat.int>)



Ski resorts

perfil para La Molina.

El paso de malla de esta simulación es de 12 km, y el horizonte de predicción de 72 h. El horario de la hora oficial es UTC + 1 h y en horario de verano UTC + 2.

Velocidad del viento (km/h)	Dirección del viento	Nubes bajas (%)	Nubes medias (%)	Nubes altas (%)	Precipitación acumulada (mm)	
17	279°	→	0	36	99	0
7	326°	↙	0	7	59	0
13	291°	→	0	3	100	0
11	306°	↙	0	9	100	0
10	297°	↙	0	32	100	0
10	301°	↙	97	58	100	0
9	325°	↙	100	81	100	0
10	348°	↓	100	69	100	0
9	346°	↓	100	100	100	0
7	360°	↓	100	99	100	1
9	344°	↓	99	97	100	1
8	350°	↓	90	96	100	1
6	353°	↓	77	100	100	1
9	11°	↓	40	92	100	1
11	8°	↓	13	91	100	1
10	2°	↓	33	100	100	1
9	358°	↓	69	100	100	1
8	8°	↓	44	67	100	2
11	12°	↓	0	0	0	2
12	2°	↓	2	24	0	2

Numerical Weather Prediction Services

Lon term forecasts.

Previsión a largo plazo para La Molina.

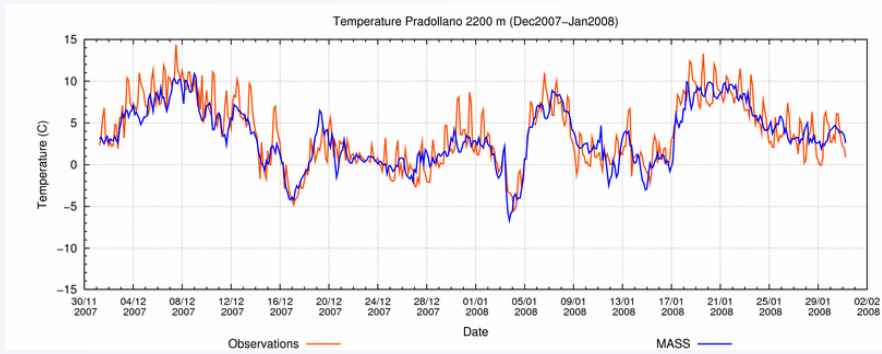
Valores obtenidos a partir de las salidas del modelo global GFS a 7 y 15 días. El paso de malla de las simulaciones es de 2 grados (~95 km) los 7 primeros días y de 2.5 grados (~240 km) para el resto de días. En el gráfico se representan las salidas de las 4 simulaciones más recientes. El horario está expresado en tiempo universal (UTC), en horario de invierno la hora oficial es UTC + 1 h y en horario de verano UTC + 2.

[Cerrar sesión](#) | [Contacto](#)

Numerical Weather Prediction Services



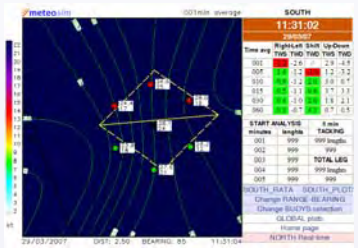
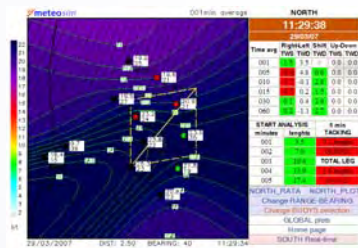
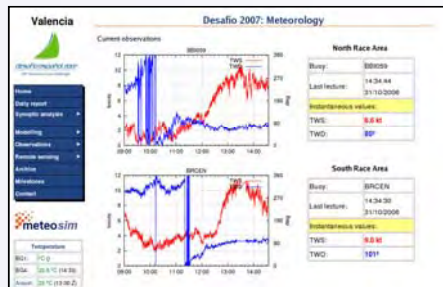
... and Real adjustment:



Numerical Weather Prediction Services



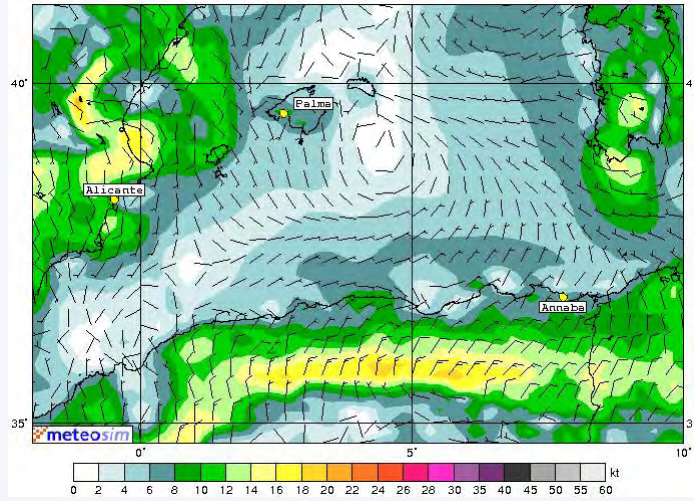
Sailing forecasts: tool decision based on wind



Numerical Weather Prediction Services



Wind forecasts onshore and offshore.



Numerical Weather Prediction Services



Automatic procedures: how to use numerical weather forecasts ?

Weather Bulletin
24h weather forecast at Monte Carlo - Port Hercule
lat=43.7431°, lon=7.4297°

	Nov 24 Mon												Nov 25 Tue											
UTC time	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18				
WIND (km/h)	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75		
WIND (kt)	6.7	8.1	9.5	11.3	13.2	15.0	17.0	18.8	20.6	22.5	24.4	26.3	28.2	30.1	32.0	33.9	35.8	37.7	39.6	41.5	43.4	45.3		
WDIR	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90		
TEMP (°C)	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
TEMP (°F)	59	61	63	64	66	68	70	72	73	75	77	79	81	82	84	86	89	90	92	93	95	97		
PREC (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
LOW CLOUDS (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		
MID CLOUDS (%)	40	20	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		

Table 2. 24h Meteorological model data.


Weather Bulletin
24h weather forecast at Monte Carlo - Port Hercule
lat=43.7431°, lon=7.4297°

	Nov 24 Mon												Nov 25 Tue											
UTC time	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00	06		
WIND (km/h)	26	35	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	150	156		
WIND (kt)	14	19	23	26	29	32	36	39	42	45	49	52	55	58	62	66	69	73	76	79	83	86		
WDIR	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90		
TEMP (°C)	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38		
TEMP (°F)	63	64	66	68	70	72	73	75	77	79	81	82	84	86	88	90	92	93	95	97	99	100		
PREC (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
LOW CLOUDS (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		
MID CLOUDS (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		

Table 2. 24h Meteorological model data.

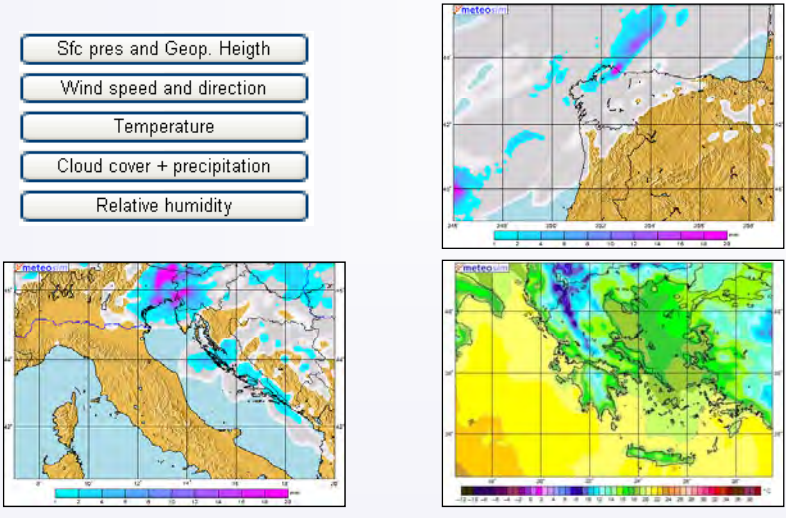


Numerical Weather Prediction Services




PREVISIONES NÁUTICAS: <http://sail.meteosim.com>

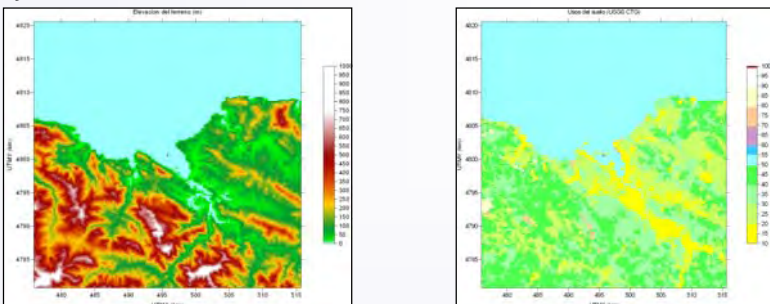

- Sfc pres and Geop. Heigth
- Wind speed and direction
- Temperature
- Cloud cover + precipitation
- Relative humidity



meteosim Numerical Weather Prediction Services



Air quality control: services based in wind forecasts.

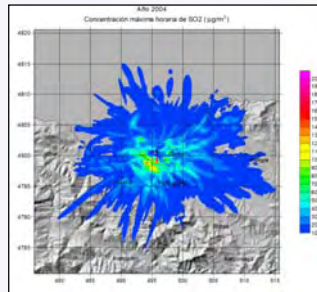



Los modelos de dispersión analizan el terreno en alta resolución.

meteosim Numerical Weather Prediction Services



Numerical forecasts can provide graphical plus tabular results.



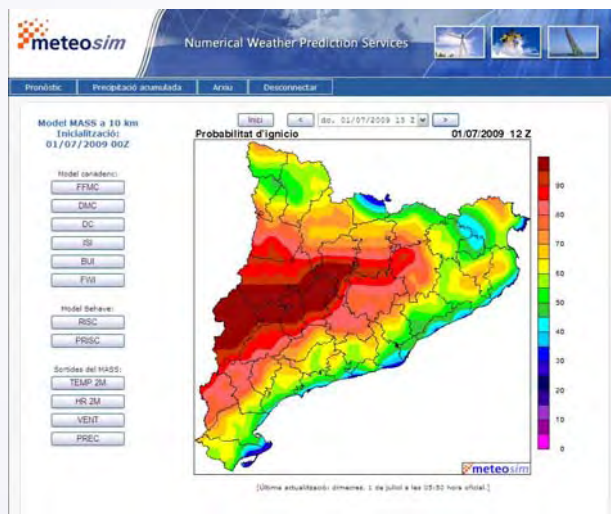
Patron con los 50 primeros máximos de SO2 (media horaria) para el año 2004:


Fecha y hora (UTC)	ENE (kg)	ENE (kg)	Concentración (µg/m³)
2004-04-08 14:00	495.878	4799.157	2.2291E+02
2004-08-08 14:00	495.878	4799.157	1.9012E+02
2004-04-26 22:00	495.878	4798.958	1.8698E+02
2004-04-26 22:00	495.878	4799.157	1.6413E+02
2004-08-08 14:00	495.878	4799.157	1.6428E+02
2004-04-26 22:00	495.878	4798.958	1.6211E+02
2004-07-26 22:00	494.278	4798.757	1.5412E+02
2004-07-26 22:00	494.078	4798.157	1.4499E+02
2004-08-07 22:00	494.278	4798.958	1.4491E+02
2004-09-29 18:00	495.078	4798.157	1.4464E+02
2004-11-08 17:00	494.878	4798.157	1.4259E+02
2004-08-09 02:00	494.878	4799.157	1.3779E+02
2004-04-26 20:00	495.878	4798.958	1.3409E+02
2004-07-17 22:00	496.078	4798.958	1.3399E+02
2004-08-09 02:00	494.878	4799.157	1.3248E+02
2004-08-03 22:00	494.078	4798.757	1.3159E+02
2004-04-26 22:00	495.878	4798.757	1.3052E+02
2004-09-19 18:00	496.078	4798.757	1.2713E+02
2004-12-06 06:00	495.278	4798.157	1.2654E+02
2004-04-26 20:00	495.878	4799.157	1.2628E+02
2004-04-26 20:00	495.878	4799.157	1.2454E+02
2004-11-09 17:00	494.878	4797.958	1.2212E+02
2004-07-17 22:00	496.078	4798.757	1.2017E+02
2004-11-29 12:00	495.878	4799.157	1.2019E+02



Fire risk based in NWP.

Fire Weather Index

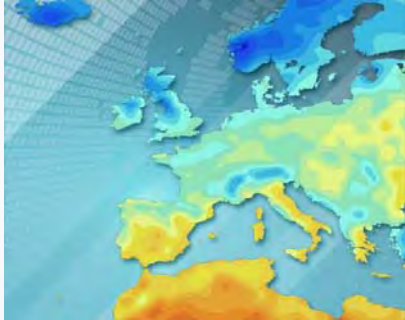






Media forecasts...


SAN ROQUE

VIERNES 17° 28°	MAÑANA ☁️	
	TARDE ☀️	
	NOCHE ☁️	
SÁBADO 21° 30°	DOMINGO 23° 32°	LUNES 19° 26°





 Numerical Weather Prediction Services



SCREEN...

MADRID


MÁX. MÍN.
19° 14°



LUNES ☁️ MÁX. MÍN. 19° 14°	MARTES ☁️ MÁX. MÍN. 20° 15°	MIÉRCOLES ☀️ MÁX. MÍN. 22° 18°	JUEVES ☀️ MÁX. MÍN. 24° 16°
-------------------------------------	--------------------------------------	-----------------------------------------	--------------------------------------

PREVISIÓN **MADRID**



 Numerical Weather Prediction Services



... and others: take care with quality

Versión BETA: Predicción automática por ciudades

Versión BETA: [Ver el Mapa de predicción global](#)

Predicción para los próximos días en: BARCELONA

Población: 1595110
 Coordenadas: 41.4020 , 2.1535
 País: ESPAÑA

Modelo de 12km | Modelo de 36km

Friday 20 February		Saturday 21 February		Sunday 22 February	Monday 23 February
Mañana	Tarde	Mañana	Tarde		
8°C	6°C	4°C	9°C	11°C	10°C
12°C	12°C	12°C	14°C	14°C	14°C
5 km/h	0 km/h	10 km/h	5 km/h	5 km/h	5 km/h
72%	60%	77%	74%	66%	69%

Intervalos de actualización: mañana de 07:00 - 07:30 y tarde de 16:25 - 16:55

Numerical Weather Prediction Services



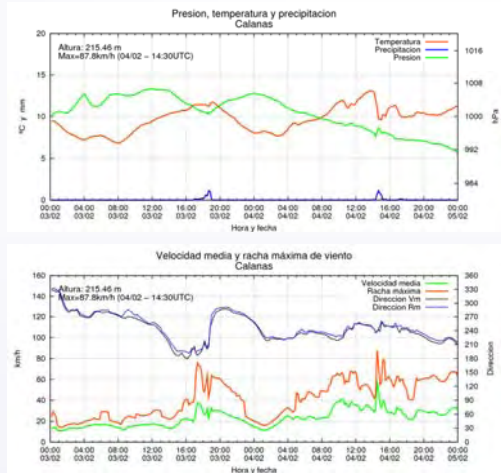
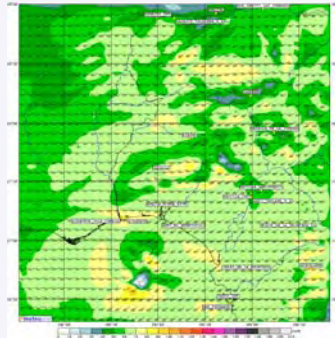
Final weather forecasts seems the similar !



Numerical Weather Prediction Services



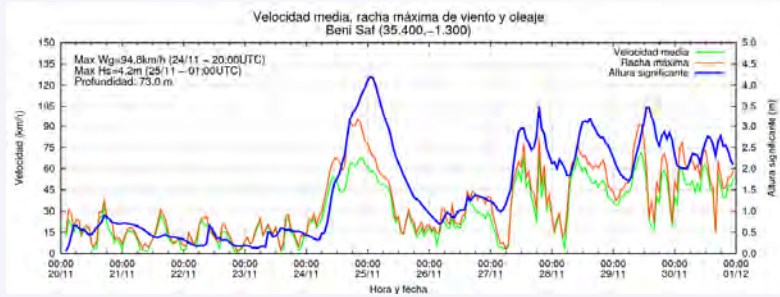
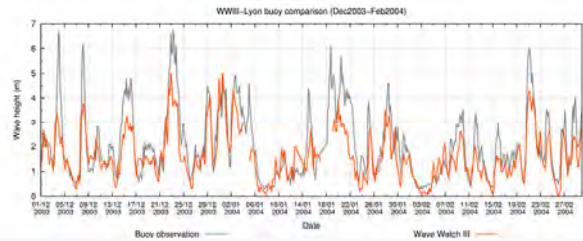
Wind forecasts is applied in forensic analysis.



meteosim Numerical Weather Prediction Services



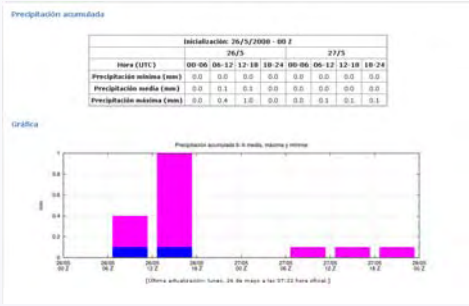
Wind wave forecasts...



meteosim Numerical Weather Prediction Services



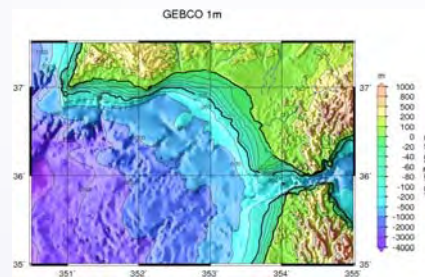
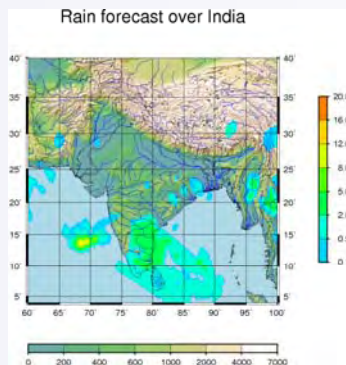
Even rainfall forecasts: not the same error




Ejemplo de aplicación de modelos de simulación numérica para previsión de lluvias en puntos concretos.




PREDICCIONES PERSONALIZADAS: modelización en todo el mundo a las resoluciones necesarias





Samples: climatic database management.

See:
<http://www.meteo.ad>



meteorologia

Govern d'Andorra

Presentació
 Previsió meteorològica
 Estat de la neu
 Temps actual
 Climatologia
 Enllaços

Àrea de Transport i Energia
 Servei de Transport per cable i telefèric


Avans meteo

Dijous 25.05 Tempestada	Divendres 26.05 Pluja	Dissabte 27.05 Tempestada	Diumenge 28.05 Variable	Dilluns 29.05 Tempestada
mín 7° màx 14°	mín 7° màx 16°	mín 6° màx 14°	mín 6° màx 15°	mín 6° màx 12°

Risc d'allaus

Dilluns 26.05
 Estimació risc properes 24 h

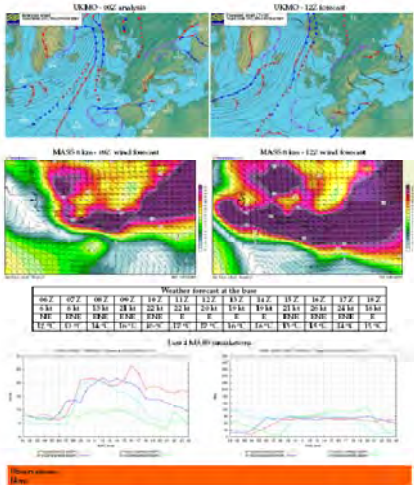
meteosim Numerical Weather Prediction Services



SERVICIOS GENERALES

Numerosos y variados clientes requieren boletines de predicción objetivos y sintéticos.

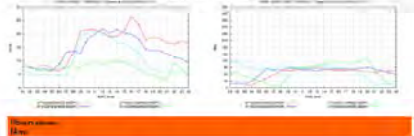
La toma de decisiones debe partir de informaciones objetivas, elaboradas por expertos y con la información justa y necesaria.



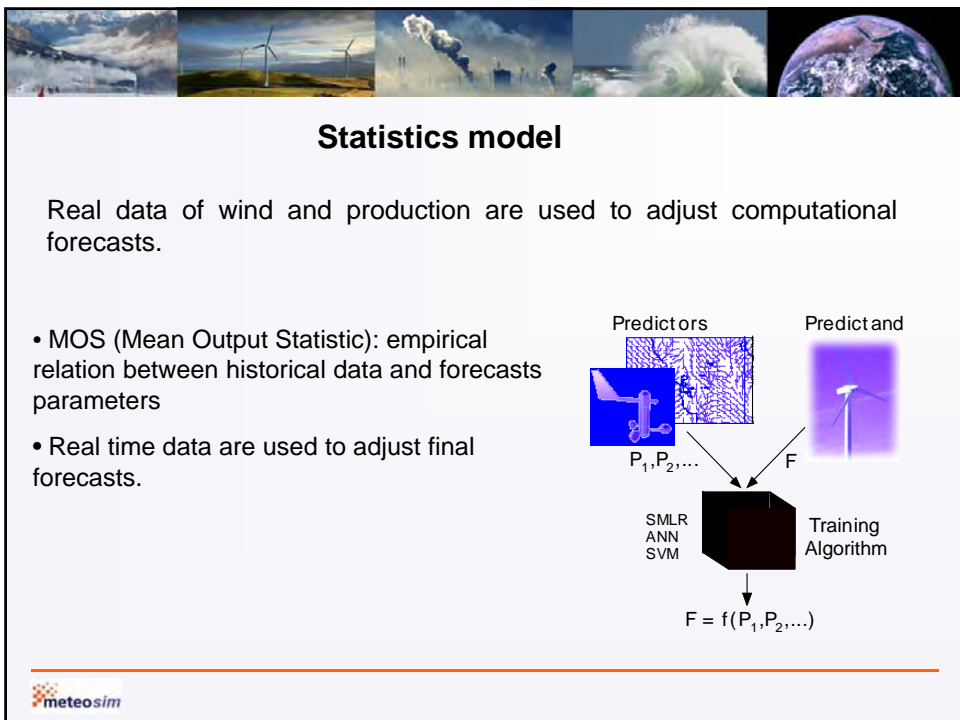
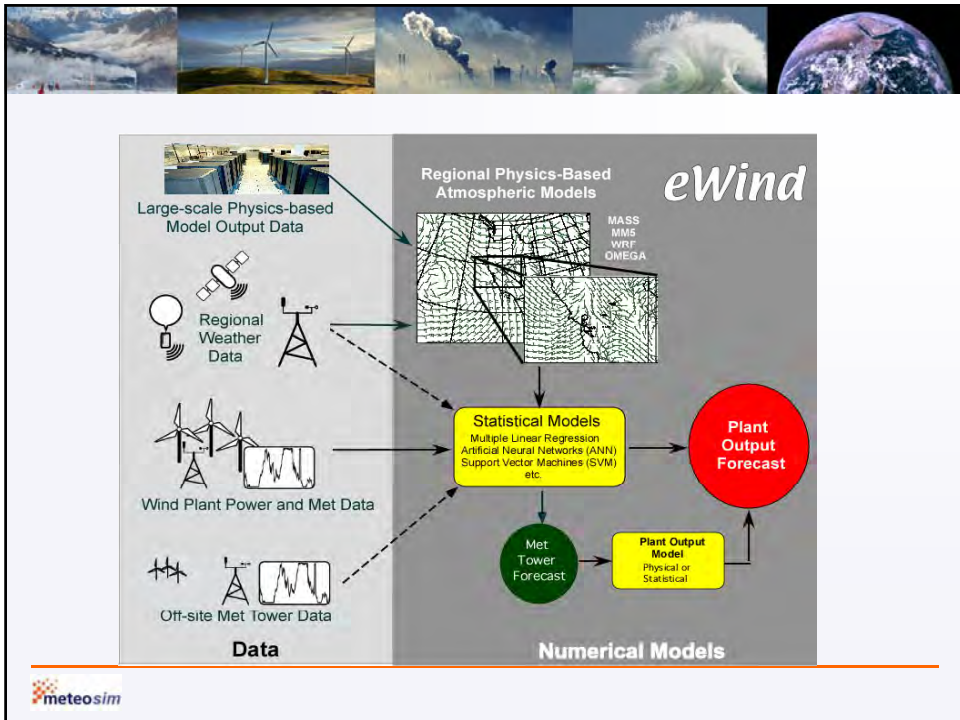
Weather forecast at the base

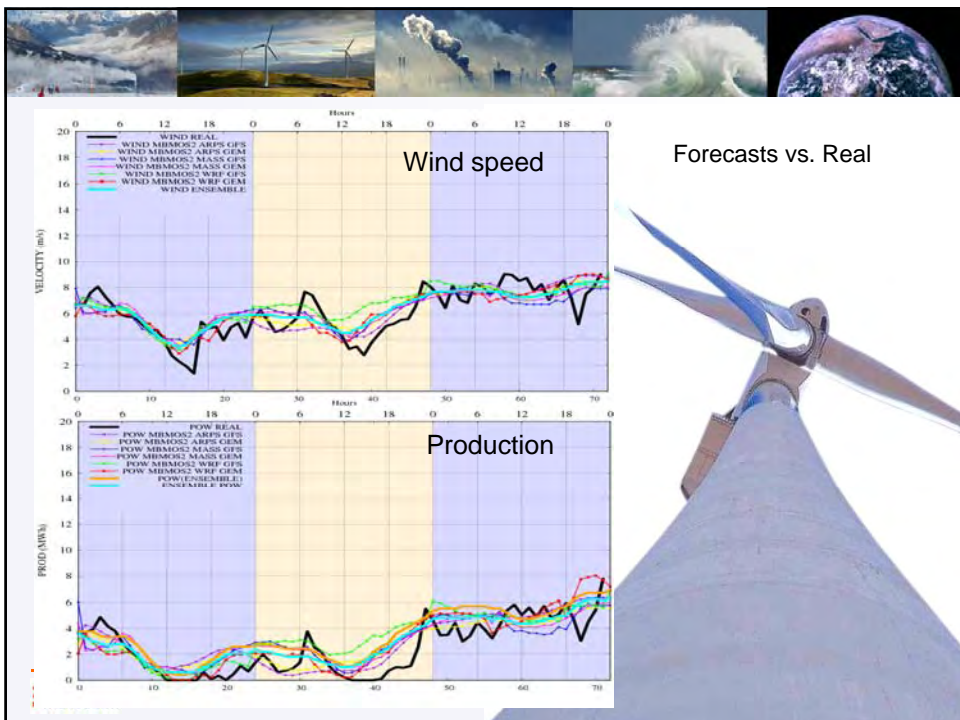
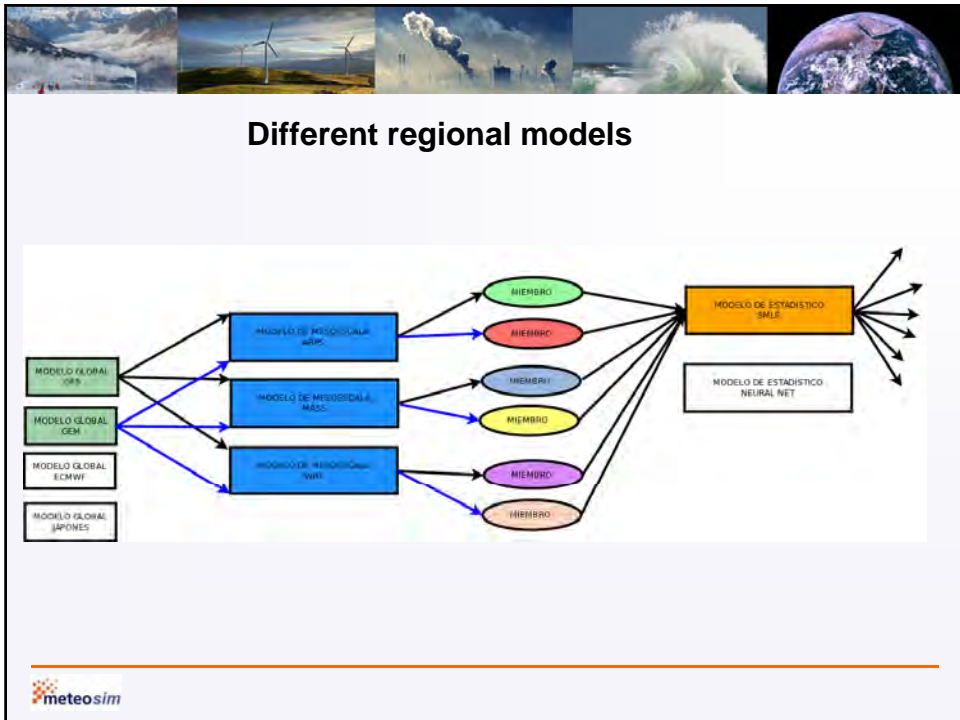
06Z	09Z	09Z	12Z	12Z	12Z	15Z	15Z	18Z	18Z
03°	03°	03°	03°	03°	03°	03°	03°	03°	03°
18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
10%	10%	10%	10%	10%	10%	10%	10%	10%	10%


Evol 4 MARS-6 km-102



meteosim Numerical Weather Prediction Services

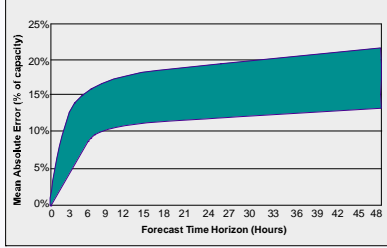


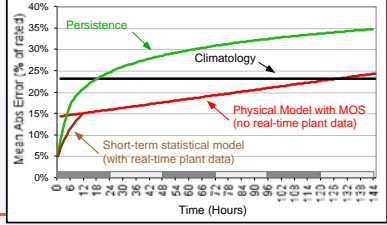





Typical forecasts adjustment (Single Wind Plant, 1h time step)

- Absolute mean error increase quickly during first 6 hours.
- Statistical NWP adjusted it's better than climatological values during 5 – 7 days.
- Wind farm data required to improve persistence based forecasts











THANKS !

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SPAIN

