

MeteoRuta: An interactive weather forecasting WEBGIS for roads in Spain

(<http://meteoruta.aemet.es>)

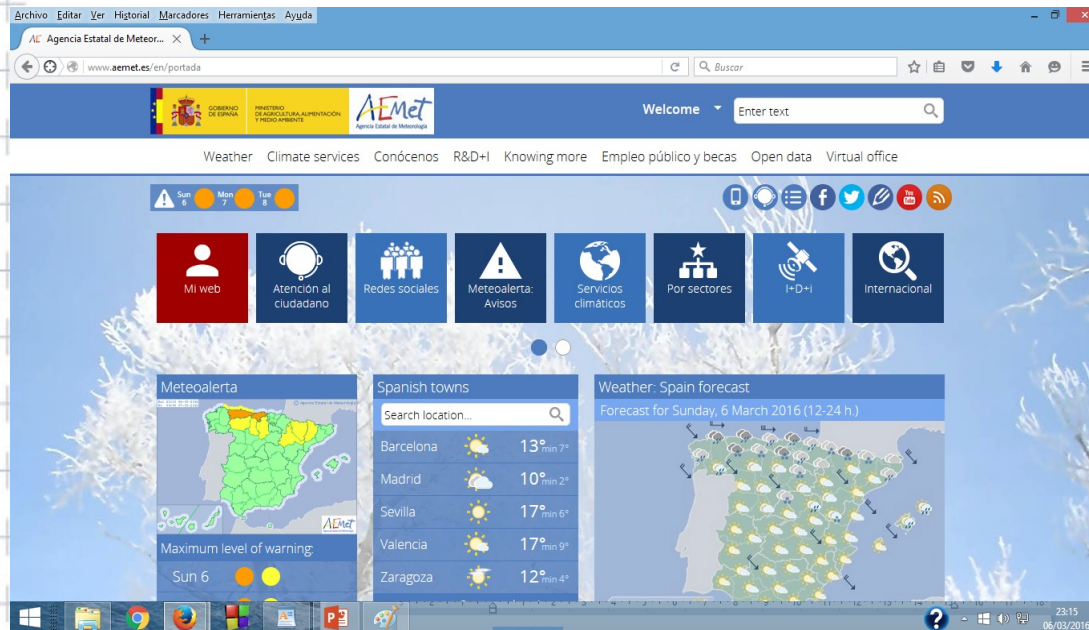
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Spanish Met Service - AEMET

2016 SIRWEC Conference, FORT Collins, Colorado

Who are we

<http://www.aemet.es>



AEMET is the meteorological authority in Spain , is a public agency under the spanish government It is responsible for meteorological observation, climatology and operational weather forecasting in all over the country.

Where



The Iberian Peninsula is located in southern Europe, near Africa Between the Atlantic Ocean and the Mediterranean Sea

It has a complex network of mountain ranges.

These geographical and topographical characteristics cause a climate with high frequency of severe weather conditions in every season



Why

20/04/16



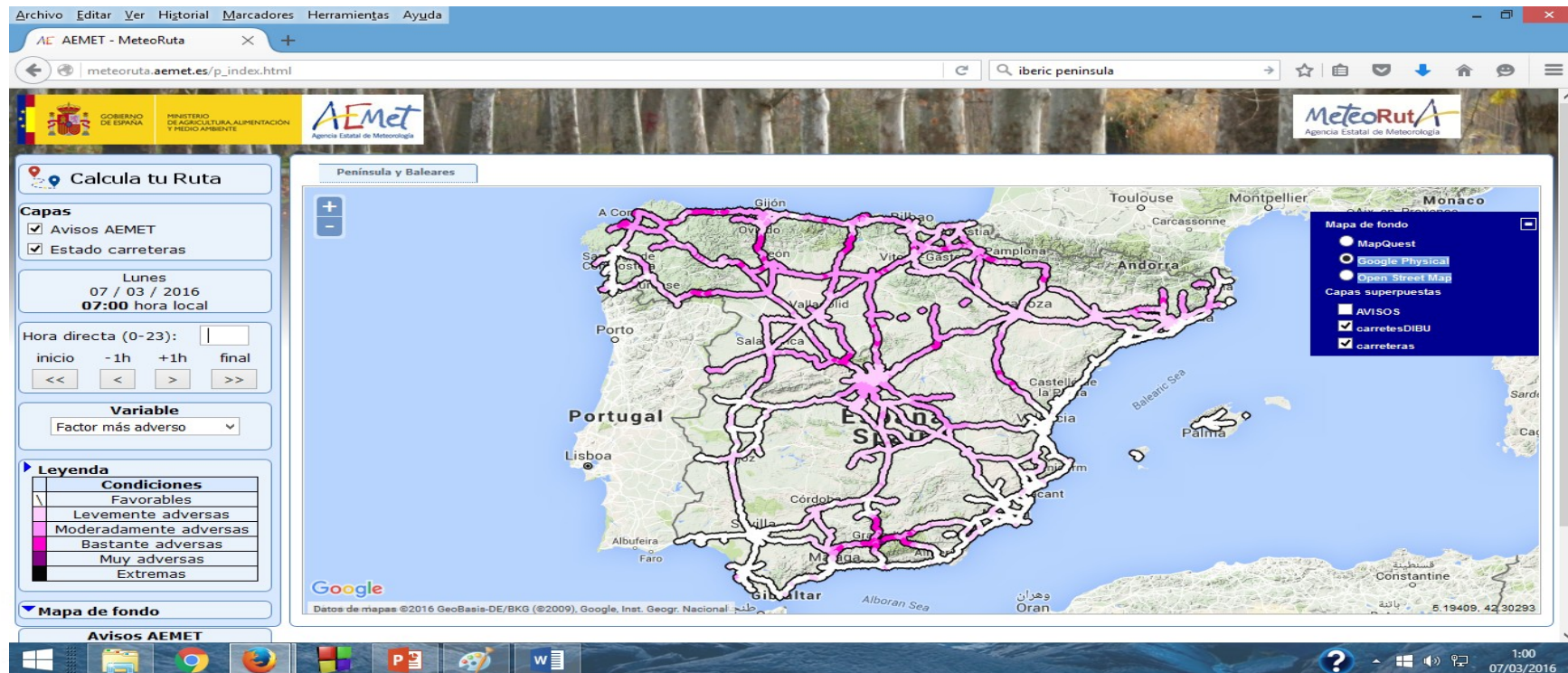
Severe rain and snow episodes, frost, fog, severe winds and even dust storms affecting road conditions are frequent in Spain



1-THE APPLICATION

1.1 MODE 1, whole road-network viewer (<http://meteoruta2.aemet.es/sirwec.html>).

Forecasts up to 36 hours of hourly severe traffic conditions are displayed using vector-polylines in different colours classified by the weather severity, forecasts are updated 4 times a day.



The screenshot shows the AEMET MeteRuta web application interface. The main map displays the Iberian Peninsula with a network of roads overlaid in various colors, representing different levels of traffic severity. The interface includes a search bar at the top, a sidebar on the left with navigation options, and a legend for traffic conditions.

Capas

- Avisos AEMET
- Estado carreteras

Lunes
07 / 03 / 2016
07:00 hora local

Hora directa (0-23):
inicio -1h +1h final

Variable
Factor más adverso

Leyenda

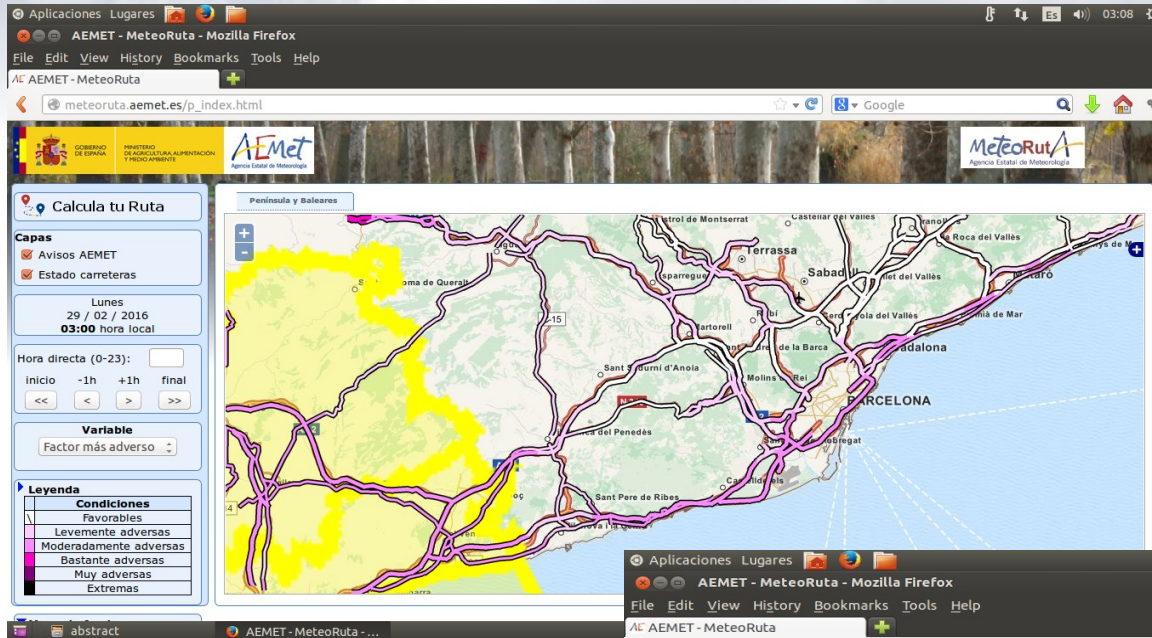
Condiciones	
█	Favorables
█	Levemente adversas
█	Moderadamente adversas
█	Bastante adversas
█	Muy adversas
█	Extremas

Mapa de fondo

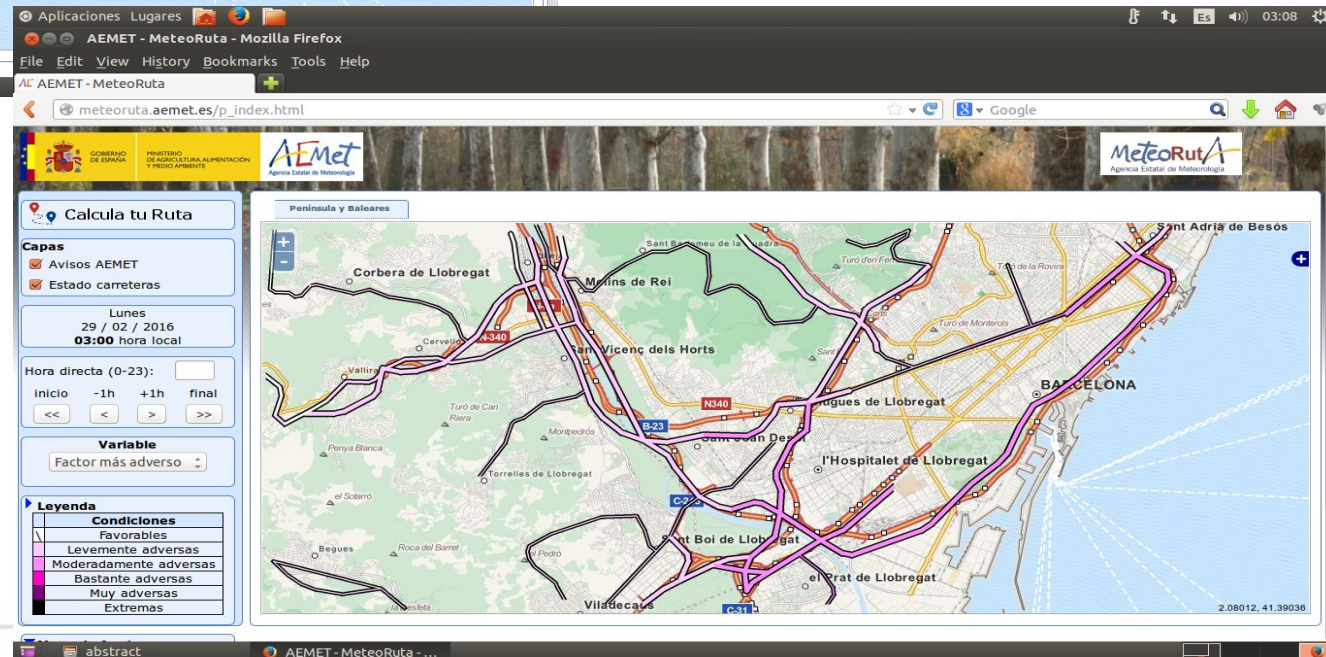
- MapQuest
- Google Physical
- Open Street Map

Capas superpuestas

- AVISOS
- carreterasDIBU
- carreteras



Variables such as air and soil temperature, wind speed average, wind gusts, visibility, rain and snow can be displayed one by one or all combined



For low zoom levels only highways are displayed, as the user moves to closer zoom levels, principal and secondary roads appear.

Users can click on the map

Calcula tu Ruta

Capas
 Avisos AEMET
 Estado carreteras

Lunes
 29 / 02 / 2016
 03:00 hora local

Hora directa (0-23):
 inicio -1h +1h final

Variable
 Factor más adverso

Legenda

Condiciones	
[Green]	Favorables
[Yellow]	Levemente adversas
[Orange]	Moderadamente adversas
[Red]	Bastante adversas
[Dark Red]	Muy adversas
[Black]	Extremas

Carretera B-10

Temperatura	T > 5°C
Viento	V > 25km/h
Precipitación	P < 0,2mm
Nieve	N < 0,2mm
Municipio	

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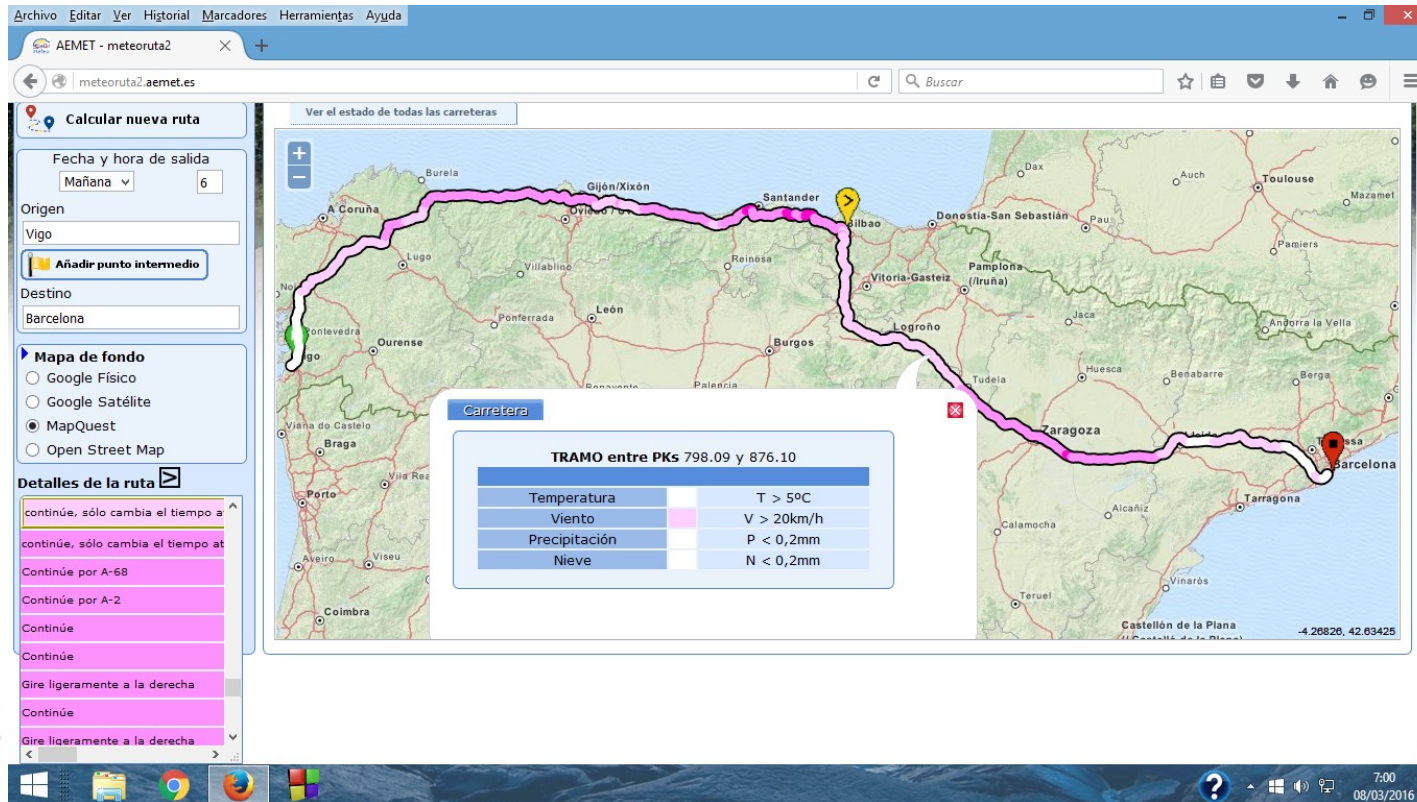
Velocidad del viento (km/h)

32.1	30.7	30.0	25.4	26.8	34.1	32.7	30.1	31.5	30.8	27.9	31.2	20.9	31.1	29.6	30.1	34.7	22.5	22.5	31.9
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

to get additional information on weather conditions and evolution

1.2 MODE 2. pathfinding mode, (<http://meteoruta2.aemet.es/sirwecPATH.html>).

Users, from the client browser, may choose the departure time, and their own way from the starting point to final point, and one optional intermediate point. the server returns a vector-polyline fitting the shortest path, with route directions, timetables and forecast weather conditions



The screenshot shows the AEMET meteoruta2 web application interface. The browser address bar displays "meteoruta2.aemet.es". The main map shows a route from Vigo to Barcelona, with a popup window titled "Carretera" providing weather forecast details for a specific road segment.

Carretera

TRAMO entre PKs 798.09 y 876.10

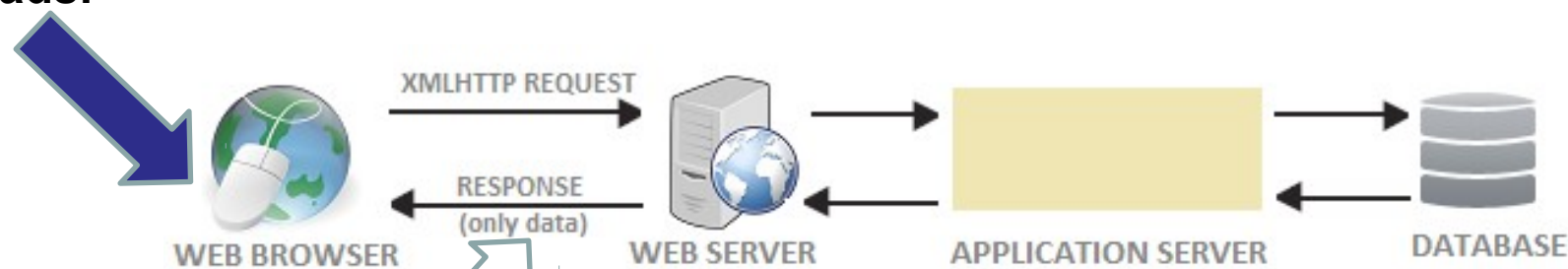
Temperatura	T > 5°C
Viento	V > 20km/h
Precipitación	P < 0,2mm
Nieve	N < 0,2mm

Additional interface elements include a sidebar for route calculation (Fecha y hora de salida: Mañana 6, Origen: Vigo, Destino: Barcelona), map background selection (Google Físico, Google Satélite, MapQuest, Open Street Map), and a list of route instructions (e.g., "Contínúe, sólo cambia el tiempo a...", "Contínúe por A-68", "Gire ligeramente a la derecha").

2-WEBGIS COMPUTING TECHNOLOGY

On the browser side, the application uses **OPENLAYERS 2.13** to display roads.

On the server side, we can use any web server and any CGI interface ...

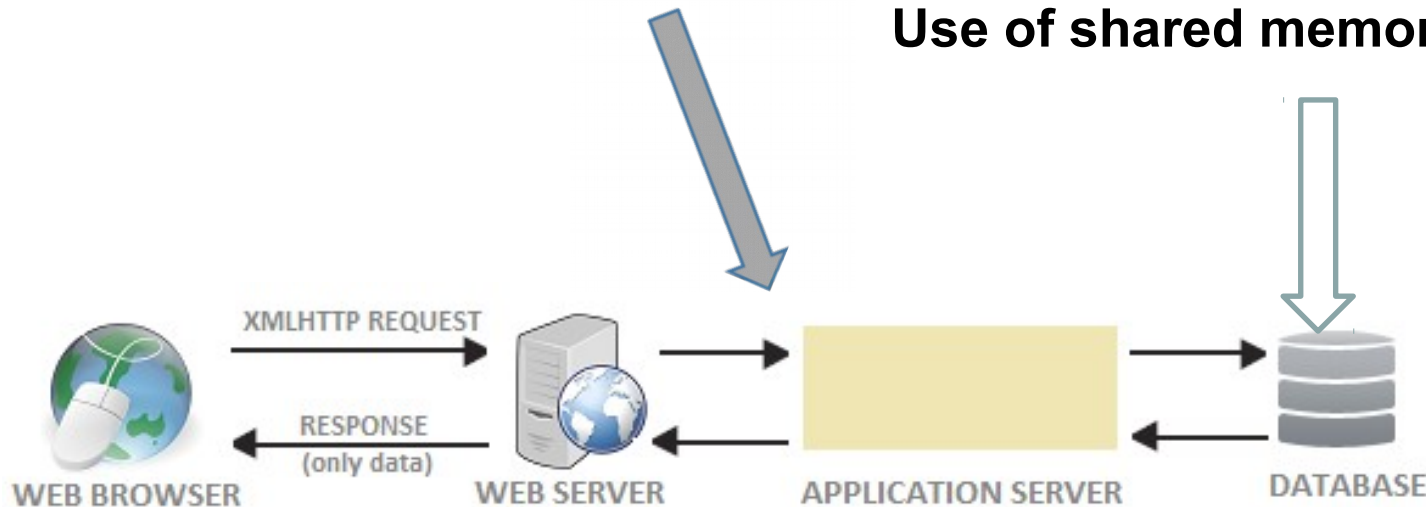


Roads are requested using the **AJAX** object , and served in real time in response to move and zoom events, or in response to any change in variables, time or route selected

KEY FACTORS TO SAVE PROCESSING TIME

Use of own C and C++ programs

loading the road weather information into binary random databases.
Use of shared memory



Use of the Douglas–Peucker algorithm for reducing the number of vertex points.

Use of OpenSourceRoutingMachine (contraction hierarchies) for the shortest path calculus

3-NUMERICAL MODEL



| Weather forecast information comes from AEMET operational numerical weather prediction models:

| Hirlam 005 (0-36 hours)

□ ECMWF (36 hours - 5 days)

| **ECMWF:** <http://www.ecmwf.int>

□ **Hirlam** (<http://hirlam.org>):

| Spatial Resolution: 0.05° (around 5 Km.)

□ Domain: 35°N to 45°N and 5°E to 10W (Balearic Islands and the Iberian peninsula).

□ Runs: 00 and 12 UTC.

□ **Next future - NWP model Harmonie (0 - 36 hours)**
(<http://hirlam.org>):

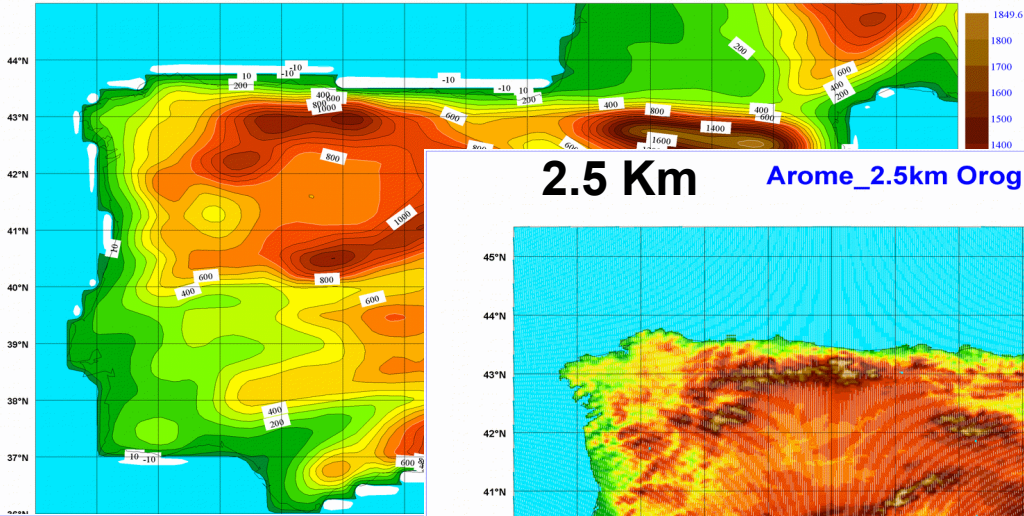
□ Spatial Resolution 2.5 Km.

□ Runs: 00, 06, 12 y 18 UTC.

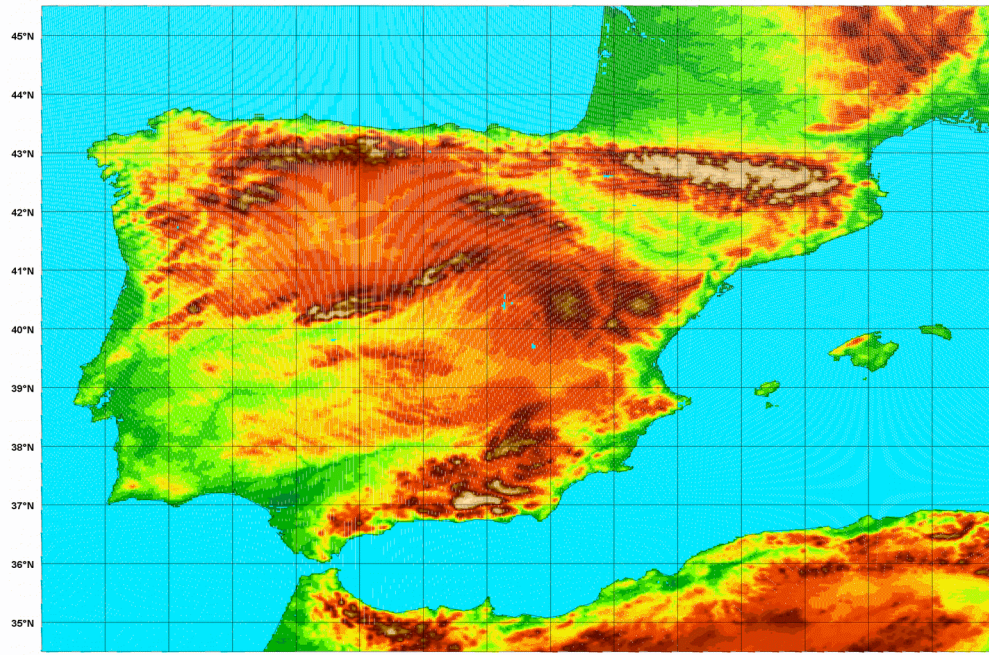
□ New orographic database.

25 KM

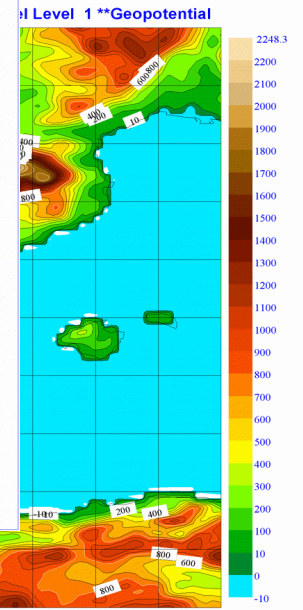
Monday 15 March 2010 00UTC ECMWF EPS Control Forecast t+24 VT: Tuesday 16 March 2010 00UTC
Model Level 1 **Geopotential



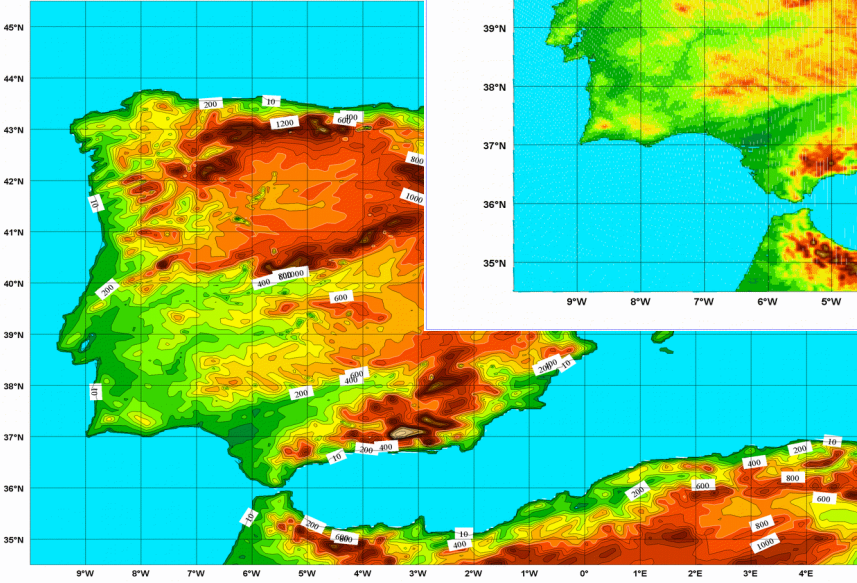
2.5 Km Arome_2.5km Orografia (grid [m])



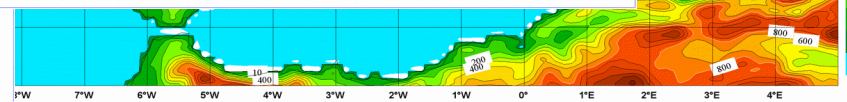
16 Km



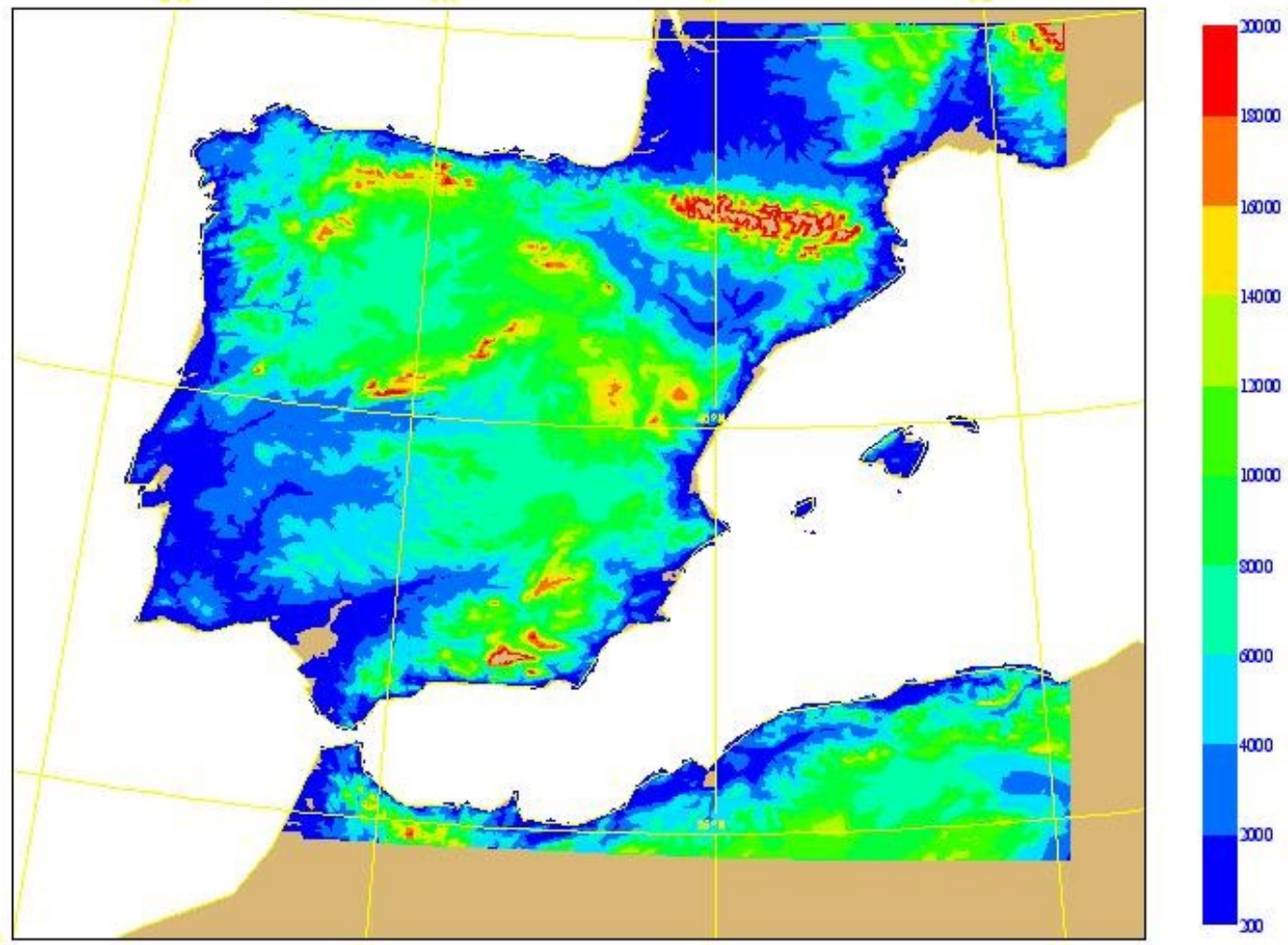
HIRLAM_0.05 (HNR)

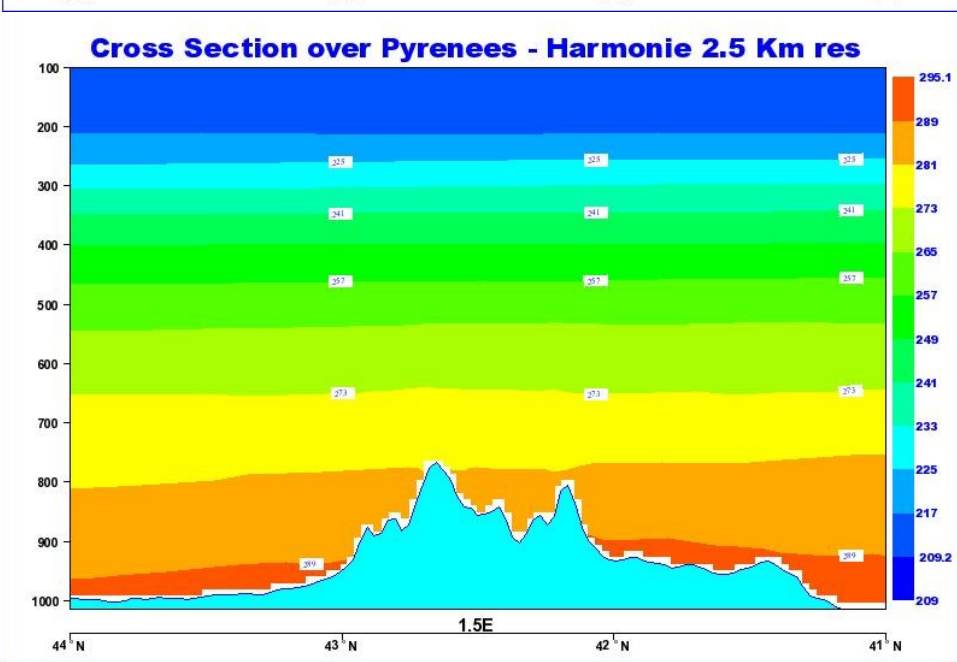
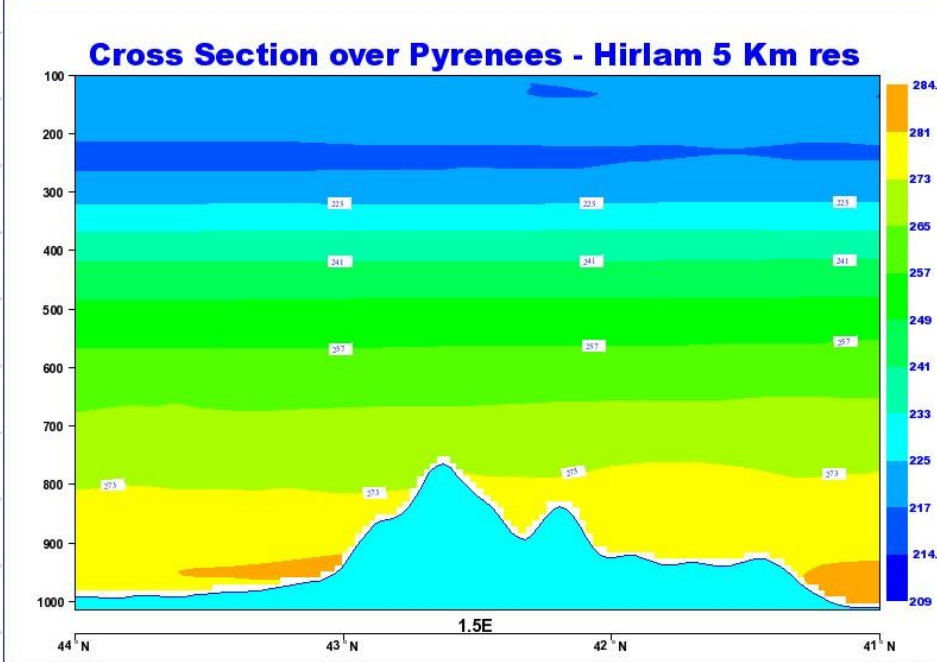
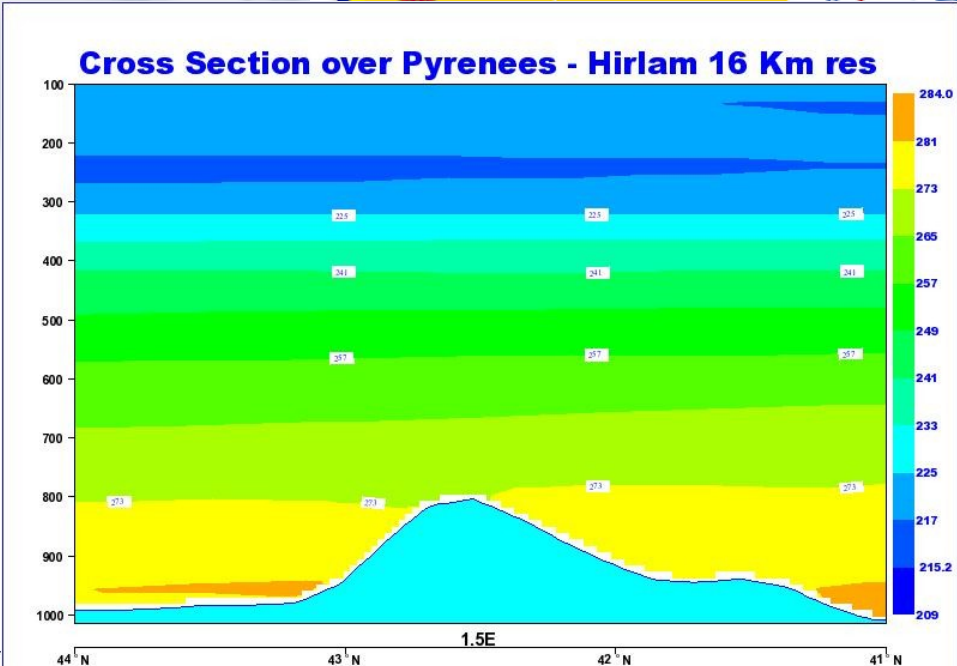
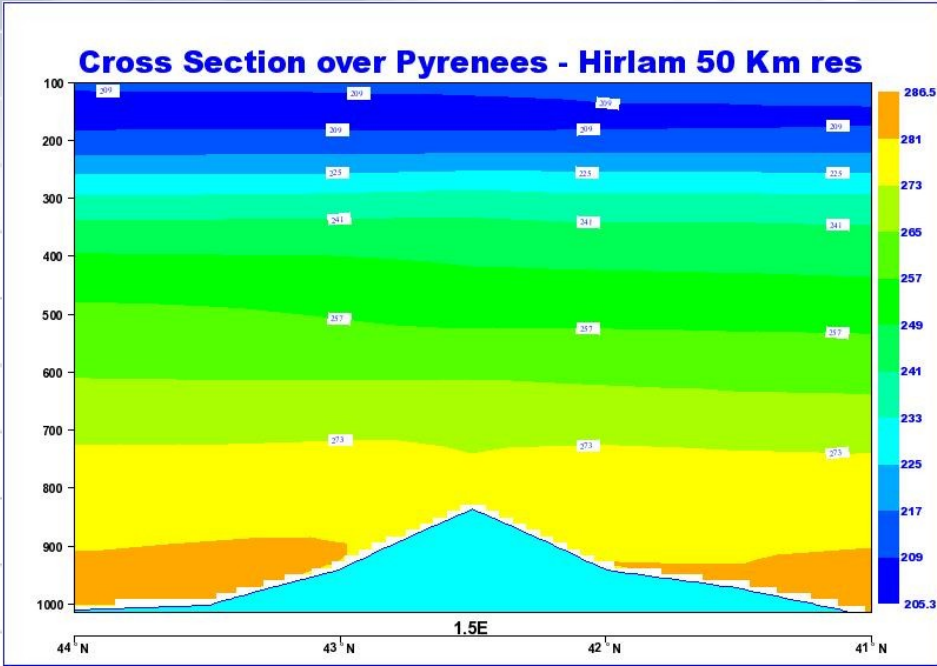


5 Km



Thursday 27 September 2012 00UTC t+36 VT: Friday 28 September 2012 12UTC Surface:





CONCLUSIONS

Road users, road management services and Spanish Road Authorities are using this tool, to get road weather forecast conditions in a friendly way.

The tool can be easily adapted to be used in any country or region, and the weather information can be obtained from any forecast model.

We are developing a new branch with present weather information (radar, satellite and lightning) and real time traffic information.

Thank you
Questions?