MM5 applications and studies inside IEEC

Group 3

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Overview

• Historical interest (GPS data assimilation).

• Past studies:
- • PBL studies by means of different MM5 parameterizations
- • MM5 simulation of severe weather. Comparison with radar data.

• Nowadays MM5 applications:
- • Complex topography
- • Coupling with photochemical models
- • Radiation budget (surface and TOA)

Historical work

• GOT inside IEEC has great experience in GPS data process used for positioning, sea state studies (wind retrieval and sea level), ionospheric information and atmospheric water vapor content:

> • Comparison of zenith wet delay (delay suffered by the GPS signal due to the atmospheric water vapor content), obtained with MM5 and GPS data for different atmospheric conditions and places.
> • 3D-VAR and 4D-VAR data assimilation of water vapor content, obtained by means of GPS signal delay, in the model. Improvement of the prediction (Cucurull PhD).
> • Comparison of wind speed above the sea surface between GPS measurements at 37 km altitude, satellite observations (ERS, QuickScatt, TOPEX) and MM5 predictions. Good agreement in non convective conditions.

Several papers exist on the web page on these subjects

## Winds regime in complex terrain (collaboration with group 20)

Objective:

> ➢ To obtain an accurate representation of the wind flow in a topographical complex area by means MM5
>
> ➢ We focus on two specific areas
>
> ➢ The simulated wind flow will be used as the meteorological input in a photochemical model

• **La Plana**, north of Barcelona. Pollutant problems:
  • During summer, this area suffers high levels of ozone due to advection effects (sea breeze).
  • During winter, stagnation effects produced high concentrations of pollutants (mountain winds).

TERRAIN HEIGHT IN COLOR
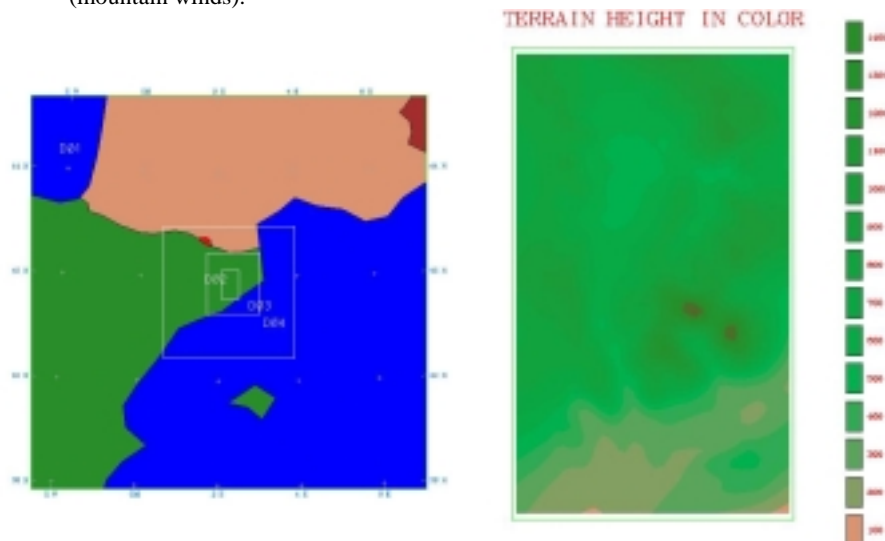
• **Cerdenya**, in the Pyrenees: pollution problems caused by a Thermal Power Station located south to the studied area..
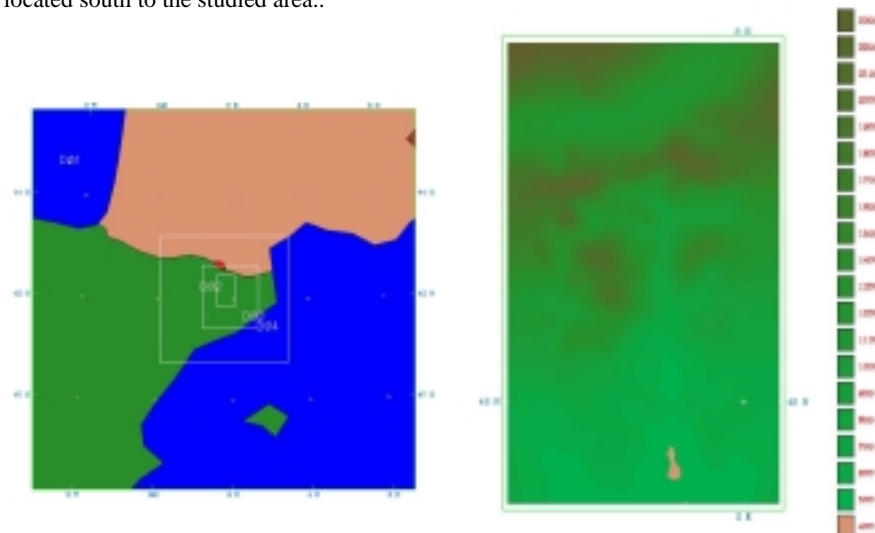
You can find several papers on the web page !!!

Coupling MM5-chemistry model (collaboration group 20)

Objective:

➤ To develop a model for providing pollution forecast in Catalonia

Method:

➤ MM5 will be used as meteorological input for a photochemical model (UAM-V)
➤ To model will be tested on several areas in Catalonia
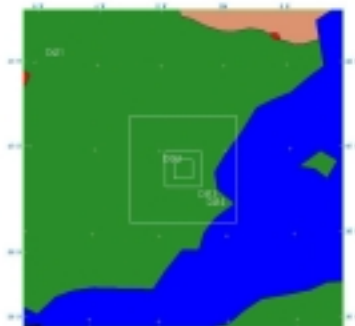
See presentation of group 20

SEVIRI- and GERB-MSG validation-calibration (collaboration with group 32)

Objective:
➤ To validate GERB (Geostationary Earth Radiation Budget), on board MSG, radiances

Method:
➤ By working in an specific area (*Valencia Anchor Station*)

where a great variety of in-situ and remote measurements and different simulations products for the two campaigns performed are available:

> ➢ Surface: one permanent and two movile meteorological and radiation stations.
> ➢ Radiosounds
> ➢ Lidar data
> ➢ Satellite data at the top of the atmosphere (CERES-NASA measurements)
> ➢ INM HIRLAM simulations
> ➢ TOA and surface MM5 products
> ➢ MM5 3D data to be used in a radiative transfer model

➢ By means of the radiative transfer model the measured fluxes (radiances) can be extrapolated to the surface or TOA.

See presentation of group 32

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Longwave radiation out, TOA   Longwave radiation down, surface
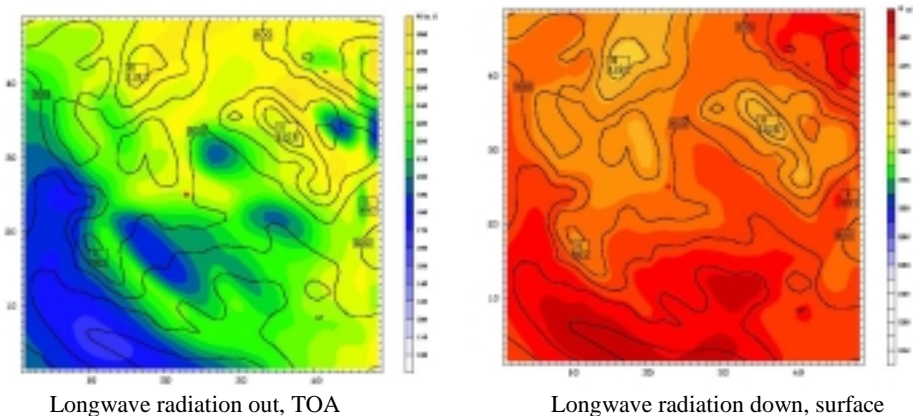
Contributions of the group to RED IBÉRICA MM5

➢ Vertical profiles of the variables in an specific grid point obtained directly from the MM5 output:

  ➢ Full radiation budget at the surface.
  ➢ MLH obtained by means of critical Richardson number (group 4).

➢ Fortran program for changing the orography, SST, and land-use characteristics in the TERRAIN module (group 4).

➢ Expertise on high horizontal resolution simulations, PBL, severe weather simulations.