SIMULATION OF RADAR ECHOS WITH THE HIRLAM MODEL

JANA SÁNCHEZ ARRIOLA AND J.A. GARCIA MOYA.

Numerical Weather Prediction Departament, INM, SPAIN

MINISTERIO DE MEDIO AMBIENTE

•**PRECIPITATION** is the most difficult parameter to predict and **VERIFY** in **numerical models** . Because *observed precipitation* has not VERTICAL STRUCTURE , only accumulated ground precipitation can be verified. *Observations* have also low time resolution.

•**PRECIPITATION** computed from meteorological **RADAR reflectivities** IS a good way to validate VERTICAL STRUCTURE of model precipitation. It has also precipitation data very frequently.

•**RSM** is a tool to make possible to compare **PRECIPITATION from Hirlam** and **PRECIPITATION from RADARS**. It calculates reflectivities from precipitation Hirlam fields.

HERE it is showed how RSM works and a convective CASE STUDY results.

HIRLAM 5.1.3 (0.2º):

✓ 0.2 ° RESOLUTION (22.2 km)

✓INTEGRATION DOMAIN: 100x194 lat-lon

31 vertical levels

✓ AREA: 50.0N, 23.6W, 30.2N, 15.0E

✓ BOUNDARY COND. from Hirlam 0.5º (same area) and 31 vertical levels.

✓Eulerian leap-frog semi-implicit (Dt = 2 min)

✓Forecast Lengt up to 48 hours.

RSM

RADAR SIMULATION MODEL (DWD)

✓Calculates reflectivities from precipitation Hirlam fields.

SIMULATED REFLECTIVITY IMAGES: 0.2º (22km) resolution

STATISTICS

RADAR REFLECTIVITY IMAGES: 0.2º (22km) resolution

RADARS INM:

✓ 14 INM radars, located in : La Coruña, Santander, San Sebastián, Zaragoza, Barcelona ,Valladolid, Madrid, Valencia, Murcia, Badajoz, Sevilla, Almería, Málaga, Las Palmas.

✓Conic Lambert projection, isometrical between 33.5º N and 46.5 N, centered at Greenwich meridian.

✓ All radars work with 5620 MHz

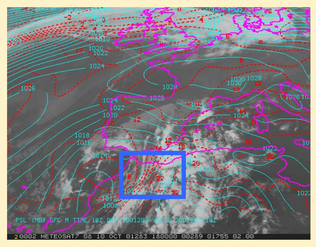
✓ Radius: 240 km, Resolution: 2km x 2 km (Normal mode) and 1km x 1 km (Doppler mode)

✓ 20 elevation angles: From 0.5º to 25.0º. Azimuth: 360º. And 12 CAPPIs (vertical levels).

REAL RADAR IMAGES:

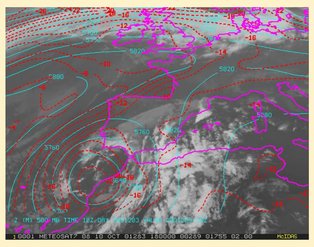
2 km resolution

CASE STUDY: October, the 10th 2001: A thunderstorm (supercell characteristics)developed over Murcia and Alicante. (SE Iberian peninsula).



Middle-upper levels:

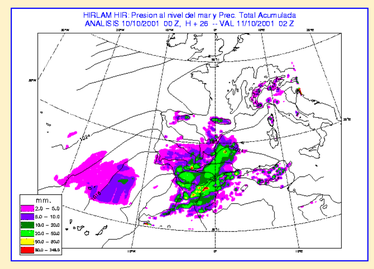
CUT-OFF low over Cádiz Gulf area.



Surface:

- Low level depression develops over Alboran Sea.
- Moist and warm eastern flow over the Spanish Mediterranean coast .

HIRLAM prediction up to 48 hours. Accumulated precipitation in 26 hours.

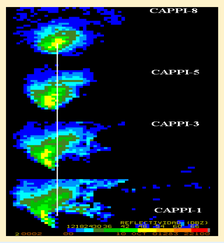


✓Radar data come from *Murcia radar* (C band), that is: 1270 m above sea level.

Resolution Normal mode : 2 km x 2 km. *Resolution Doppler mode* : 1 km x 1 km.

✓HORIZONTAL STRUCTURE: Supercell from 35 km from radar, to 120 km.

✓Minimum reflectivity : 12 dbz and Maximum reflectivity : 70 dbz



RADAR IMAGE

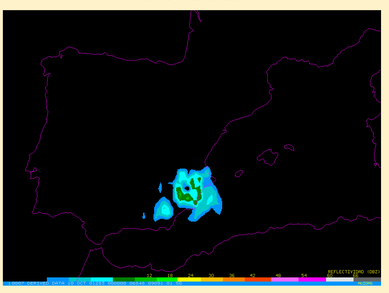
4 different CAPPIS

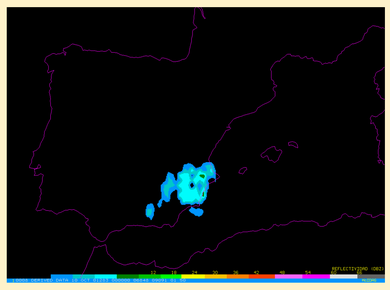
CASE STUDY IMAGES:

CAPPI 1 (1800 m)

SIMULATED RADAR IMAGES:

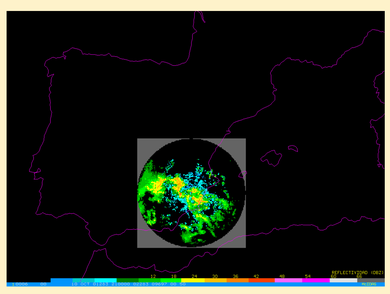
10/21 h 10/22h

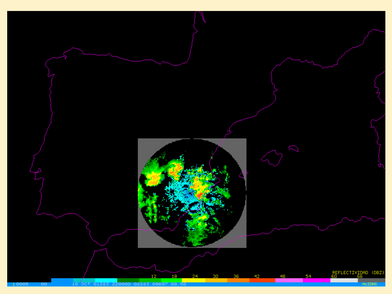




REAL RADAR IMAGES:

10/21h 10/22h

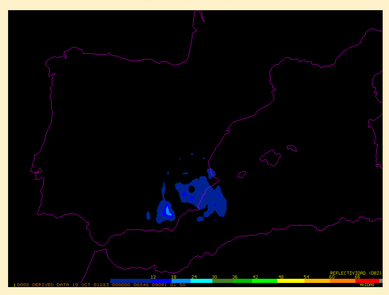


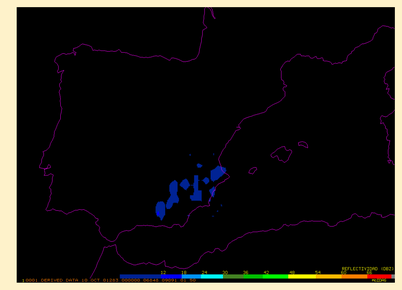


CAPPI 3 (3500 m)

SIMULATED RADAR IMAGES:

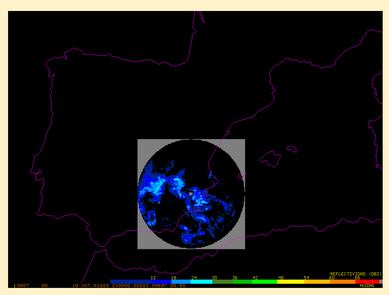
10/21 h 10/22 h

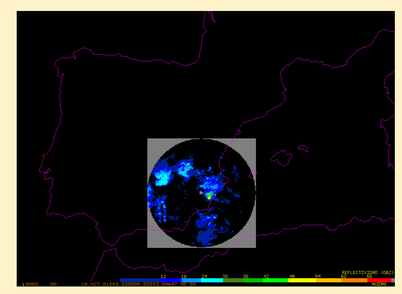




REAL RADAR IMAGES:

10/21 h 10/22 h





RSM makes possible :

✓Improve HIRLAM verification.

✓Use simulated-radar imagery for operational weather watch.

CONCLUSIONS

I. Although simulated images have very different resolution than radar ones (20 km simulated and 2 km from radar), it is possible to notice the general motion and the structure of the supercell in simulated images.

II. Anyway, more experimentation with model resolution higher up (similar to observed radar reflectivities) is needed to validate this tool, before use both of them for model validation and for operational weather forecast.

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Jana Sánchez Arriola, jana.sanchez@inm.es Numerical Weather Prediction Department. INM.

J.A. Garcia – Moya, j.garciamoya@inm.es Numerical Weather Prediction Department. INM.