**HARMONIE/AROME at ECMWF**

**Time Critical Application at ECMWF computers**
- HARMONE/AROME at 2.5 km based on cycle 38h1
- Run 4 times per day with a forecast length of 48 hours
- 2 geographical domains (Iberia and Canary Islands).

**Set up**
- NH dynamics and AROME physics
- 3DVar analysis with conventional obs 6hr cycle
- Cut-off time: 1:10 hours (Canary domain only with surface analysis)
- Boundaries: Direct nesting in ECMWF forecasts
- Unified schema shallow convection (EDWPM)
- Explicit deep convection

**Key aspects**
- Observations obtained from AEMET, GTS and pre-processing.
- Boundaries obtained through local dissemination.
- A selection of the results is sent to AEMET through dissemination.
- Boundaries: Direct nesting in ECMWF forecasts.
- (Only limited interaction with model tasks due to lack of help at task level)

**Verification against observations (Sep 2015-Feb 2016)**

**HARM/AROME**

**HIRLAM 0.05**

**ECMWF**

For upper level fields, error in HARM are lower than in HIRL 0.05 but worse than in ECMWF model.

**HARM/AROME**

**HIRLAM 0.05**

**ECMWF**

RMSD and BIAS of MSLP per forecast length

ETS for different wind categories (bottom) and precipitation categories. HARM shows clearly better scores for wind speed. In precipitation, despite double penalty issues, HARM verifies only slightly worse than ECMWF.

2m temperature: events observation-forecast for HARM (upper plot) and ECMWF with clearly better results for HARM.

**HARMONE/AROME e-suits in AEMET’s HPC**

**Set up**
- Based on cycle 48h (several versions are under test)
- 3DVar analysis with conventional obs 3hr cycle for both areas. (Iberia & Canary Islands)
- ATDOS and GNSS are in tuning phase (see poster Use of observations in AEMET HARMONIE suit by Sanchez at al)
- Cut-off time: 1:10 hours. Optimal time is under investigation
- Boundaries: Direct nesting in ECMWF forecasts.
- Enlarged domain for Iberian peninsula
- Routine monitoring of analysis and use of observations

Towards a s-gSREPS system at 2.5 km resolution based on a Multi-model and multi-BC approach: talk s-gSREPS: Mesoscale EPS in AEMET by Garcia-Moya et al.

- Multi-boundaries: ECMWF, GFS, CMC, JMA, ARPEGE
- Multi-model: AROME, ALARO, WRF-ARW, WRF-MMM
- Under test in the new Bulls computer

**Radar assimilation**
- The assimilation of reflectivity and Doppler wind data from the AEMET C-band radar network are assimilated in the HARMONE/AROME suites
- A parallel experiment H+12 is run daily
- The Field Alignment technique is under test

**Highlights**

**HARMONIE/AROME**
- The system is very stable in the new HPC system.
- Routine monitoring of analysis and use of observations.
- Significant increase in the number of observations assimilated
- Currently more used than HIRLAM in the Operational Prediction System.
- Clear improvement of fog forecast but with many false alarms.
- Improvement of wind forecasts
- Clear improvement of fog forecast but with many false alarms.
- Significant improvement of precipitation forecasts including spatial distribution and amount of precipitation but revealing uncertainty in the prediction of small scales.
- Complete results available 2:30 hours after the nominal time of the integration

**HIRLAM**
- Operational NWP systems in AEMET: Javier Calvo, Daniel Martin, Gema Morales and Daniel Santos

**ECMWF**
- The system will be kept as a backup system.
- Soon the HARMONE/AROME runs will be moved to AEMET computer but probably the ECMWF system will be kept as a backup system.

**HNR and CNN 0.05deg H+36 over a large domain
- O N R 0.16deg H+72 over a large domain**

**ALADIN / HIRLAM Joint 26th Workshop All-Staff Meeting, 4-7 April, 2016, Lisbon**

**Operational NWP systems in AEMET**

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**Lightning forecast compared with the obs (blue crosses).** The diagnostic based on vertical integrated graupel generally gives a good estimation of the electric activity.