Status of the SRNWP-EPS II Project

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39th EWGLAM and 24th SRNWP Meeting
2nd - 5th October 2017 - ECMWF

Outline

- Status of the project (October 2017)
  - Application Task
  - Research Task

- The new SRNWP EPS Ph. III (2019-2023)

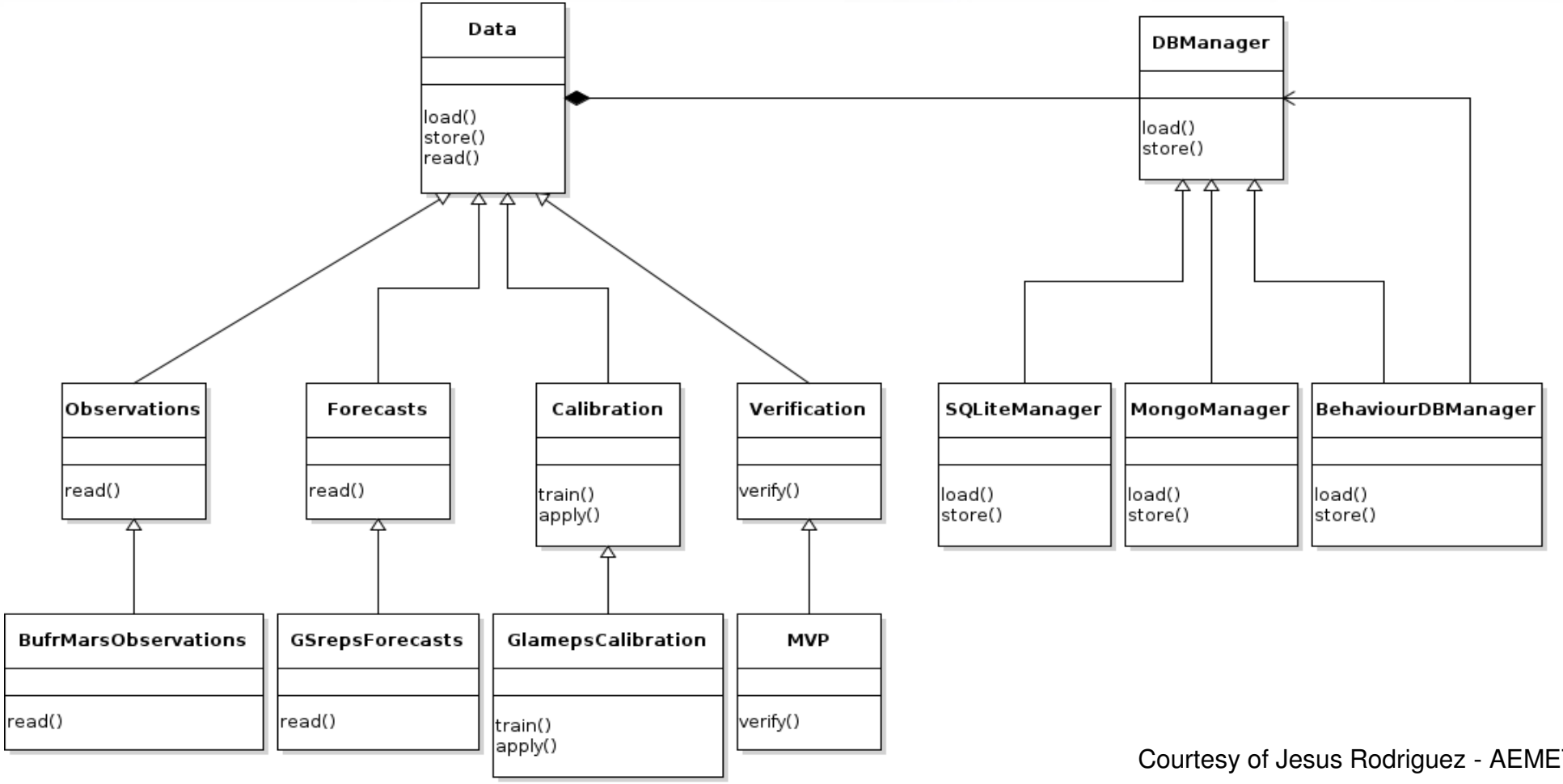
The SRNWP-EPS II Project

- The activity is organized as two complementary tasks:
  - An ***application task***, where new products and methodologies for calibration of LAM ensembles for surface parameters and for probabilistic prediction of thunderstorms and fog are developed
  - A ***research task***, where the sensitivity and complementarity of the models to soil conditions and PBL are studied on the basis of the forecast of selected phenomena (identified in the application task), on different areas with different LAM ensemble systems

Activities of the second year

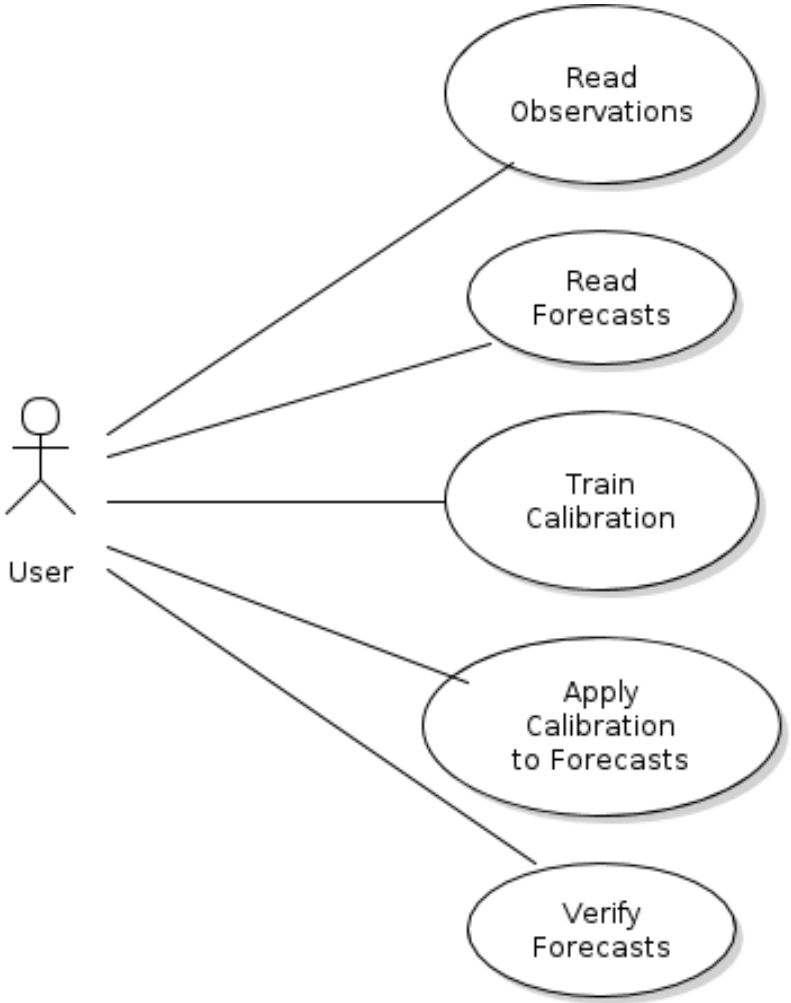
- Application Task:
  - Development of calibration software for T2m and v10m (from a basic software owned by HIRLAM and IRM)
  - Development of EPS post-process software devoted to probabilitisc forecasting of fog and thunderstorms.
  - Appliation to gribs from other NWP models
- Research task:
  - Organize common testing
  - Special Project proposal to ECMWF
- Coordination:
  - Workshop on “Probabilistic prediction of severe weather phenomena”, 24-26 October 2017, AEMET-Madrid
  - Talks and reports will be available soon after the workshop

Calibration components



Courtesy of Jesus Rodriguez - AEMET

Main need user of SRNWP-EPSII Framework



Courtesy of Jesus Rodriguez - AEMET

SRNWP-EPSII Calibration Framework status

	Implemented	Tested in AEMET	Setup on ECMWF	Tested on ECMWF
Bufr reader	✓	✓	✓	✓
Grib reader	✓	✓	✓	✓
Observation classes	✓	✓	✓	✓
Forecast classes	✓	✓	✓	✓
Calibration classes	✓	✓	✓	✓
Verification classes	↻	↻	↻	↻
Database Subsystem	✓	✓	✓	✓

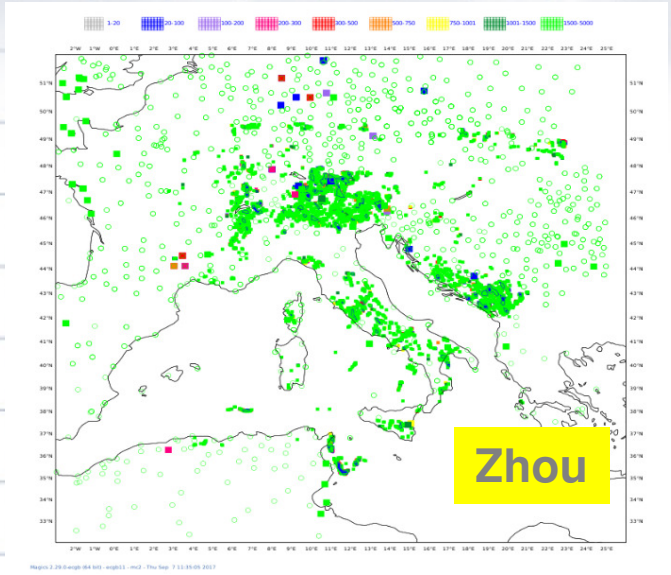
Courtesy of Jesus Rodriguez - AEMET

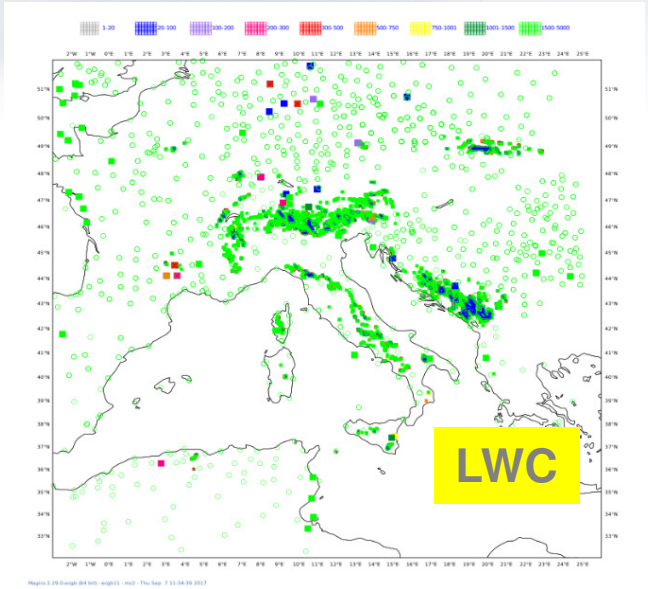
Fog forecasting tool

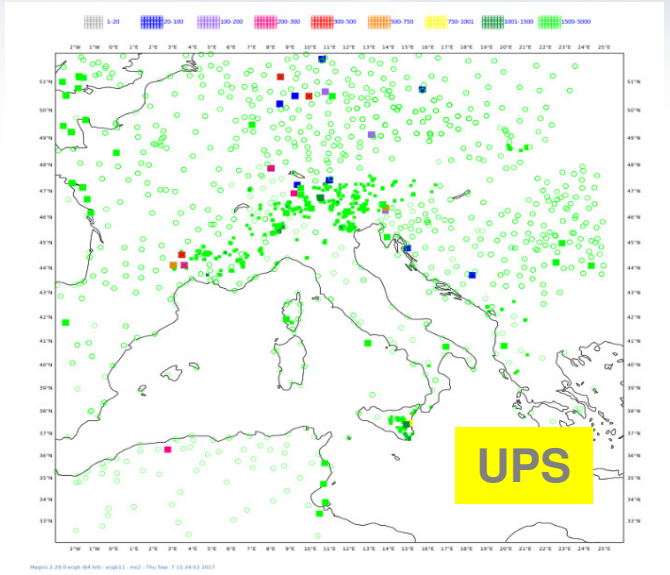
- Status: completed
- Input: standard GRIB1/GRIB2 from different models (defined by configuration namelist):
  - AROME from IPMA (thanks Joao Rio)
  - ALARO from Slovenia (thanks to Neva Pristov)
  - HARMONIE_AROME AEMET (thanks Antonio Manzano)
- Output:
  horizontal visibility [m] at surface computed with different algorithms
  + precipitation reduction (optional)
- Implemented Methods
  - Boudala et al., 2012 (minimum set of input parameters ... only surface fields T,Td,Ps,UV)
  - LWC (surface fields + T,Q,P,UV fields at lowest model level + qi,qc,qr,qs,qg)
  - Zhou, 2011 (surface fields + T,Q,P,UV vertical information at least in the first 500 m)
  - UPS approach (surface fields + T,Q,P,UV vertical information at least in the first 1200 m + 0-24 hours fcst of TD2m and T2m)
  - combined methods + correction for visibility reduction by precipitation

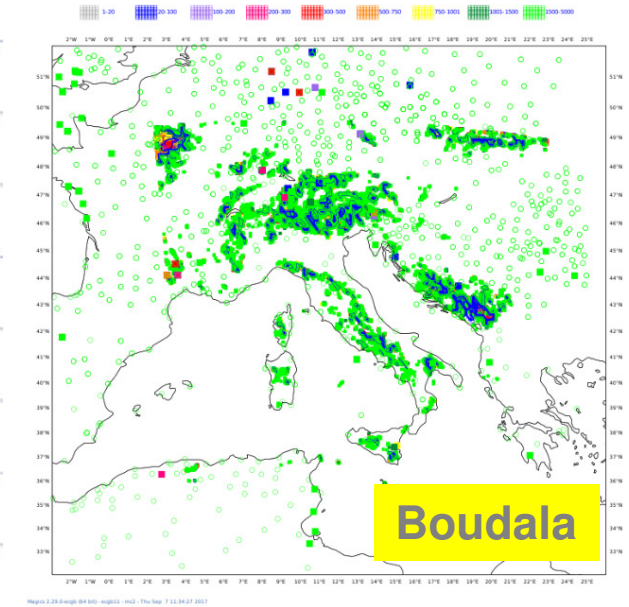
Courtesy of Mario Papa and Francesca Marcucci

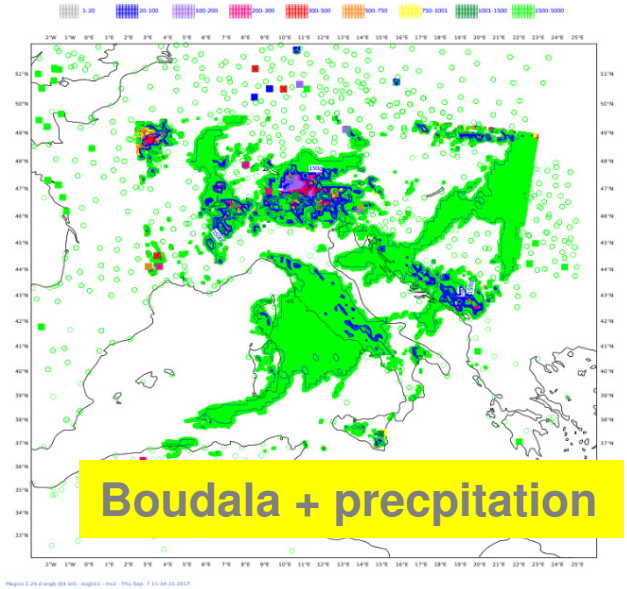
Test case of the 00UTC run 5th March 2017
T+6h visibility forecast using COSMO-IT (2.8 km)







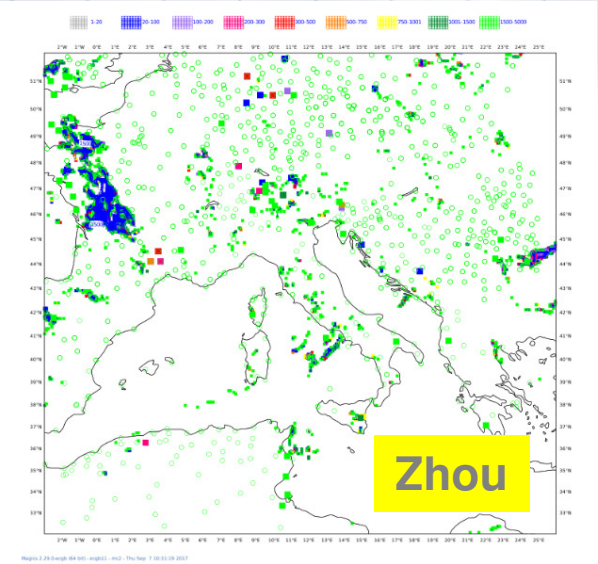


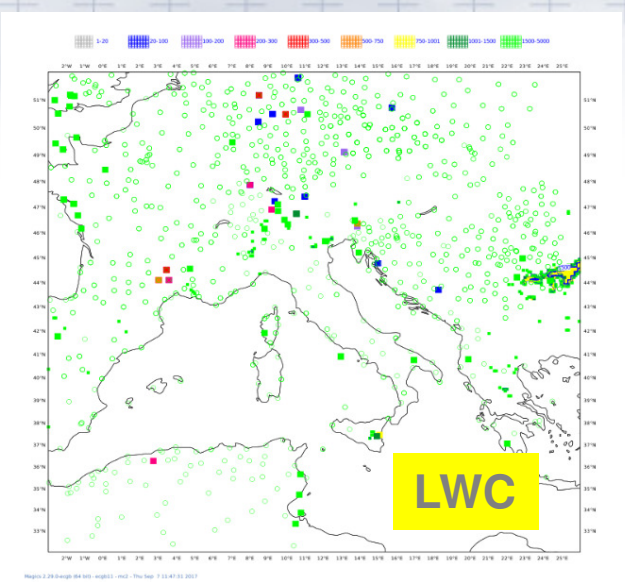


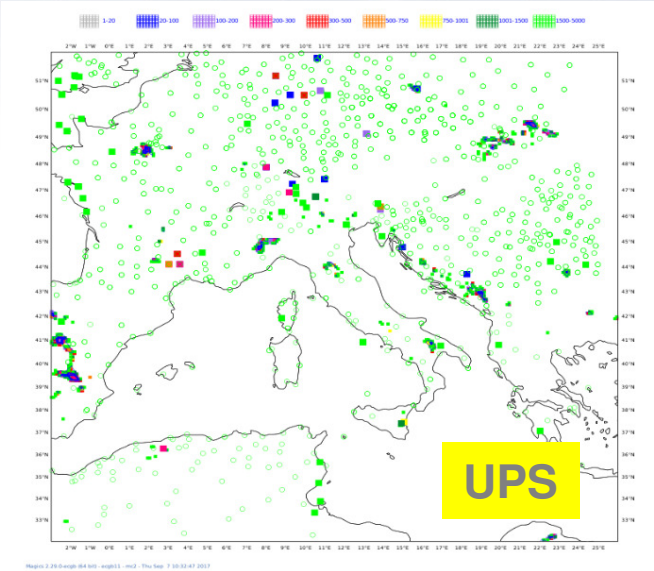
The visibility forecast output (contour shading with small boxes plot) is compared with observations from European synop stations (observation with visibility less than 5000 m are represented by big filled square, with the same colorbar used for forecast, while green circle represent observations with good visibility)

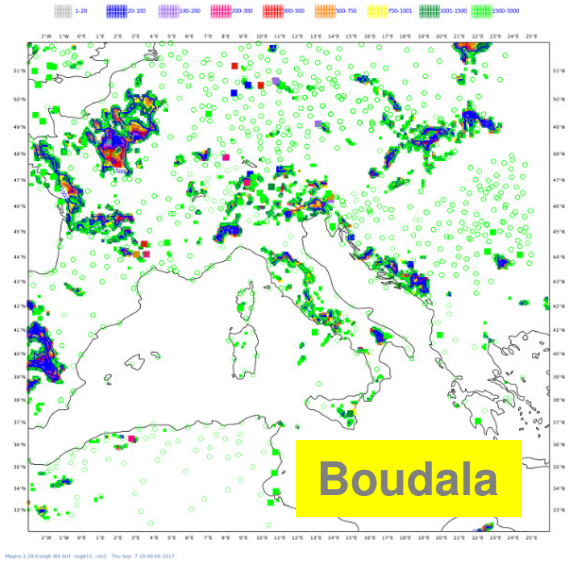
Courtesy of Mario Papa and Francesca Marcucci

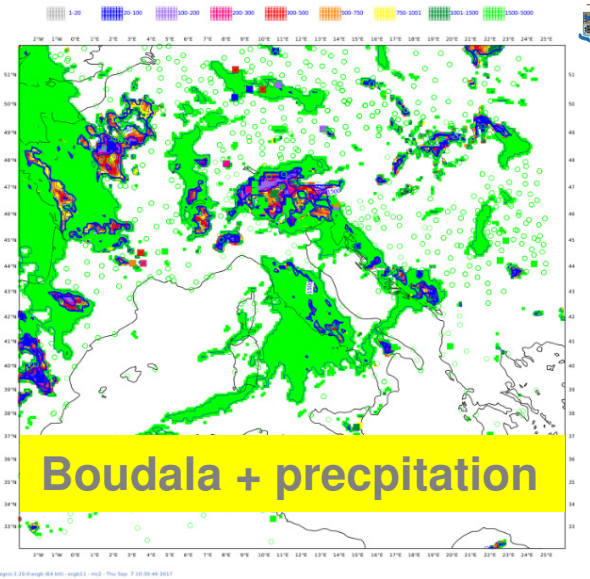
Test case of the 00UTC run 5th March 2017
T+6h visibility forecast using COSMO-ME (7 km)

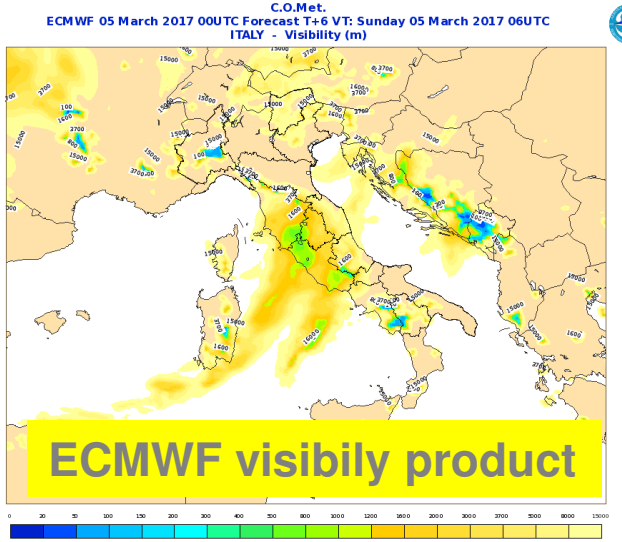






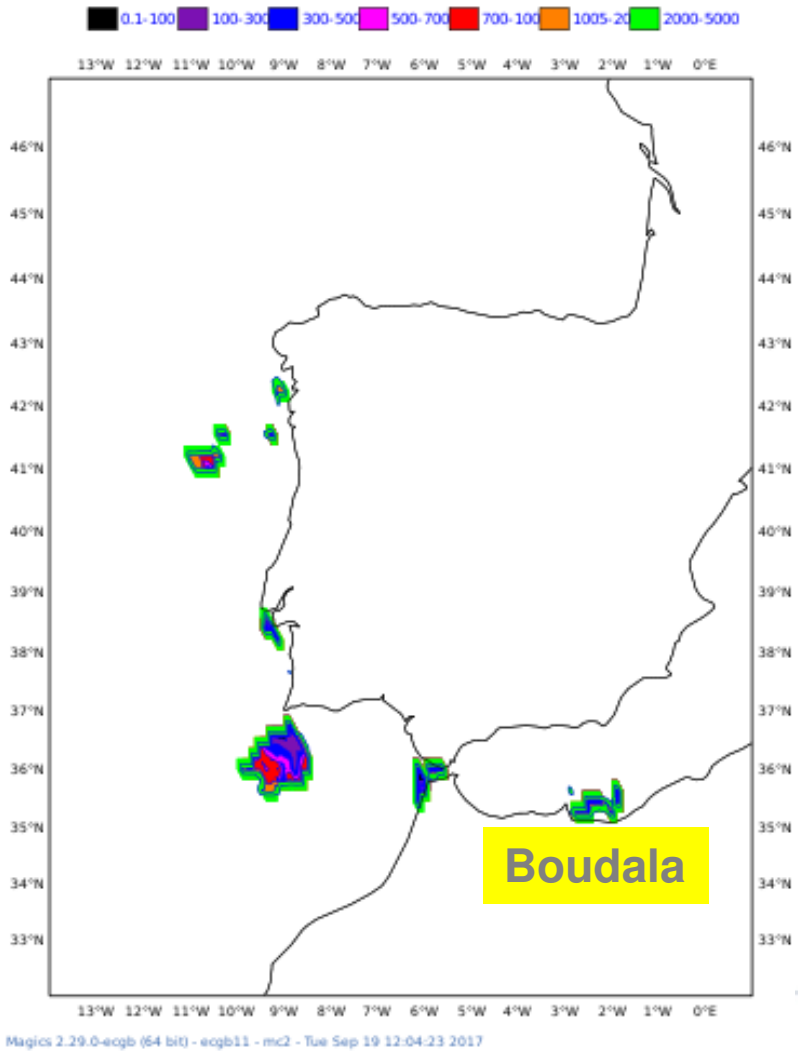


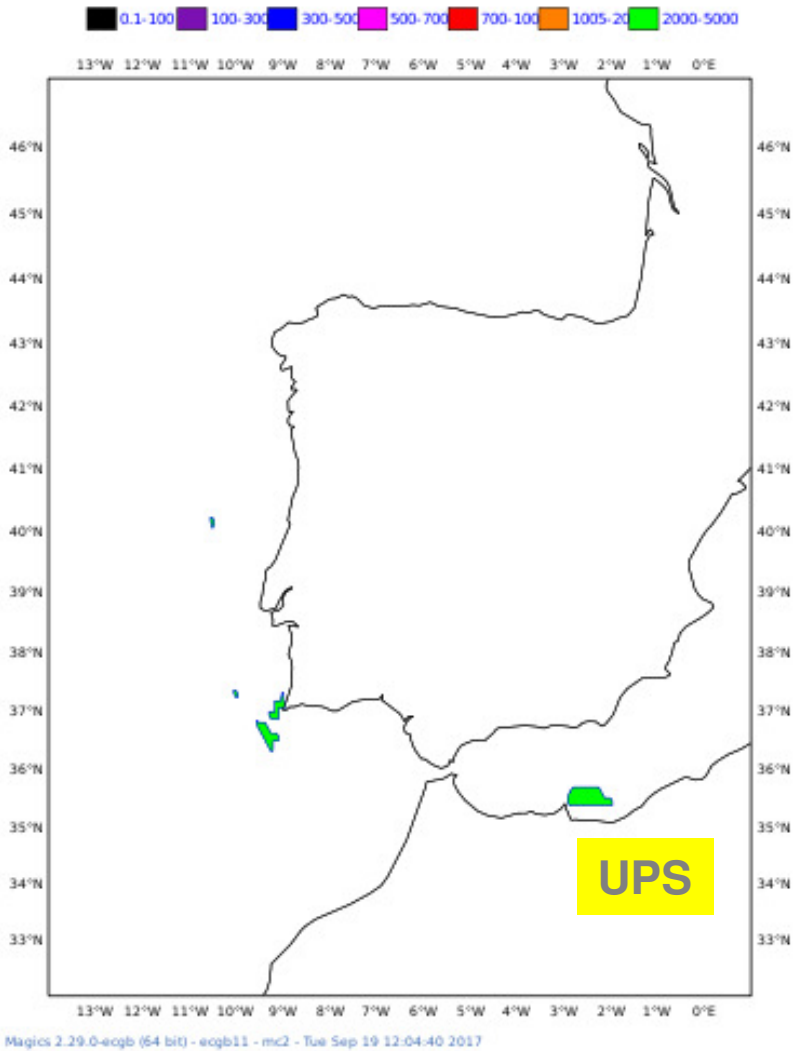




Courtesy of Mario Papa and Francesca Marcucci

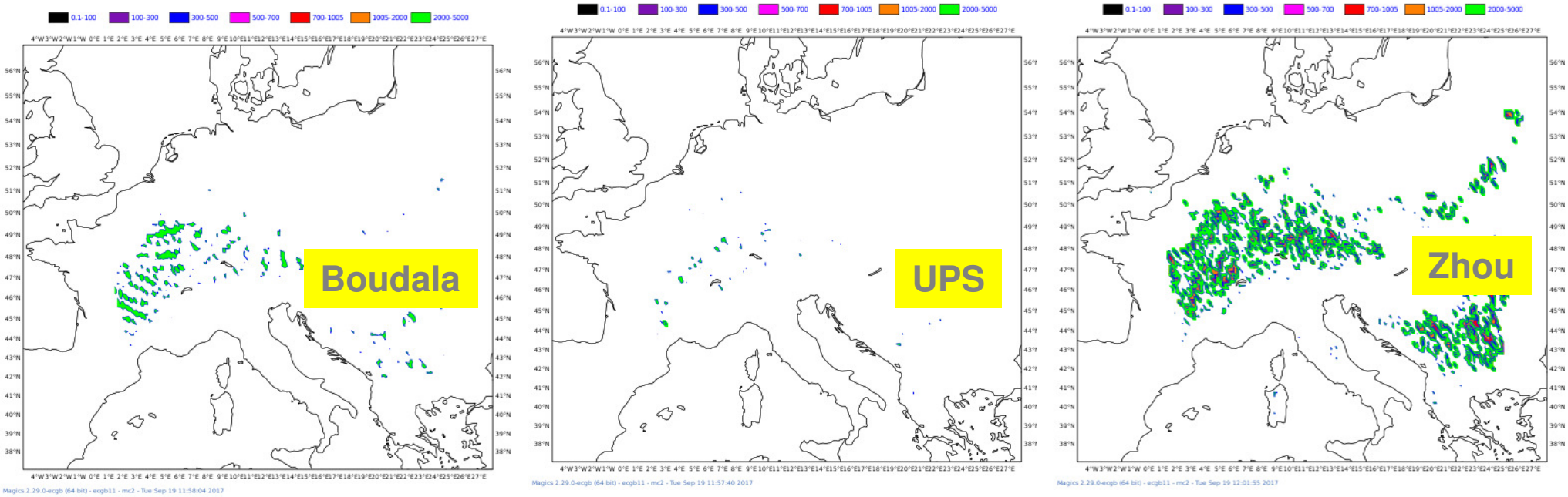
AROME from IPMA: 2017072800 at h+15 (thanks fo Maria Monteiro and Joao Rio





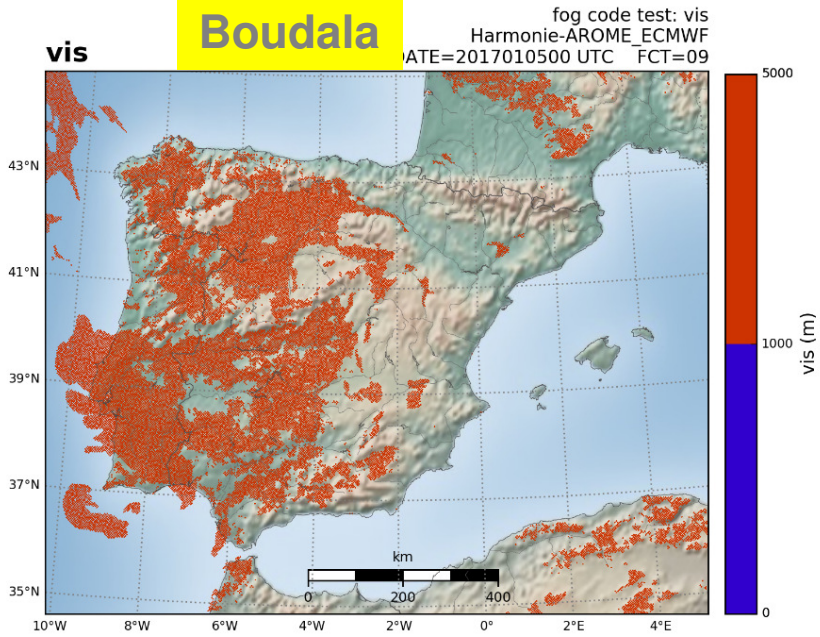
Courtesy of Mario Papa and Francesca Marcucci

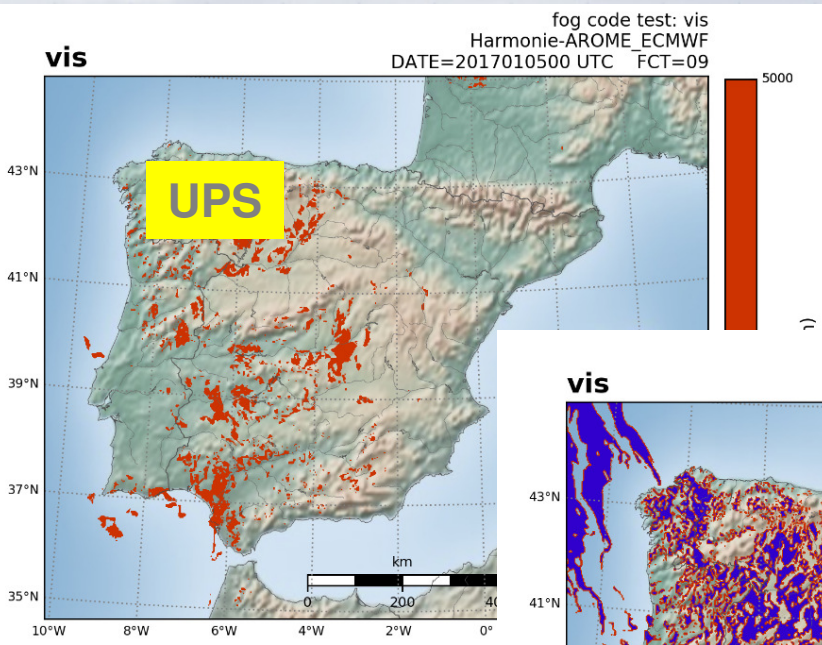
ALARO from Slovenia: 2017070300 at h+6 (thanks to Neva Pristov)

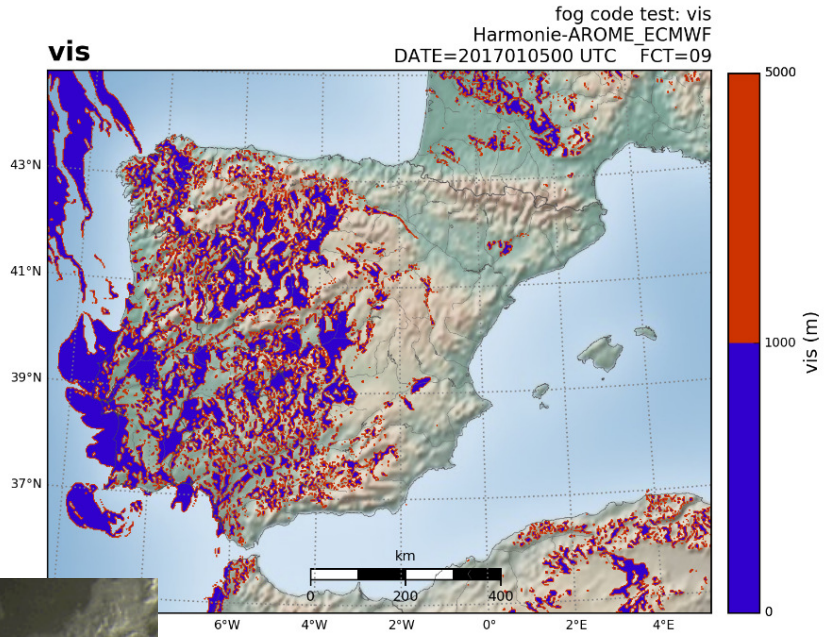


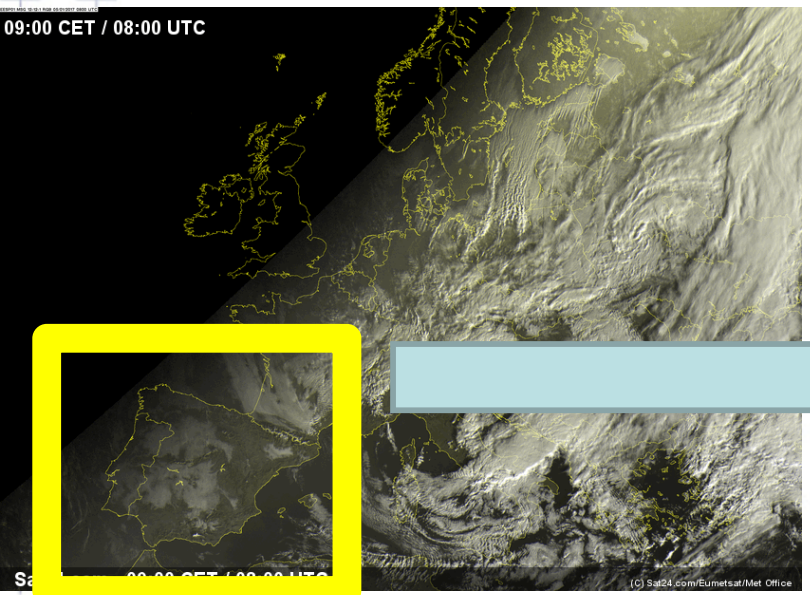
Courtesy of Mario Papa and Francesca Marcucci

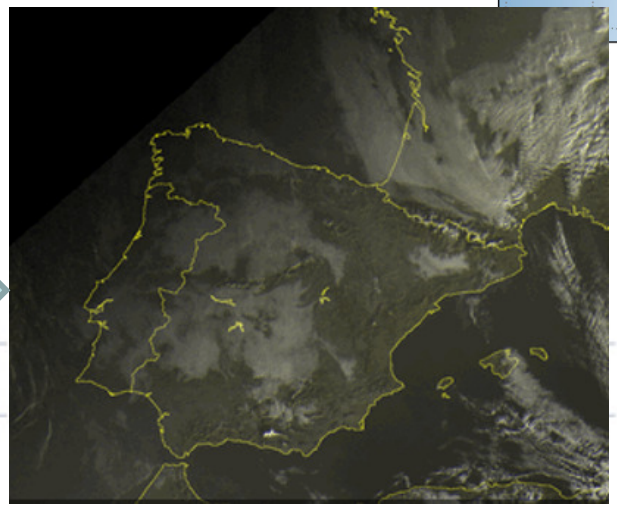
HARMONIE-AROME from AEMET







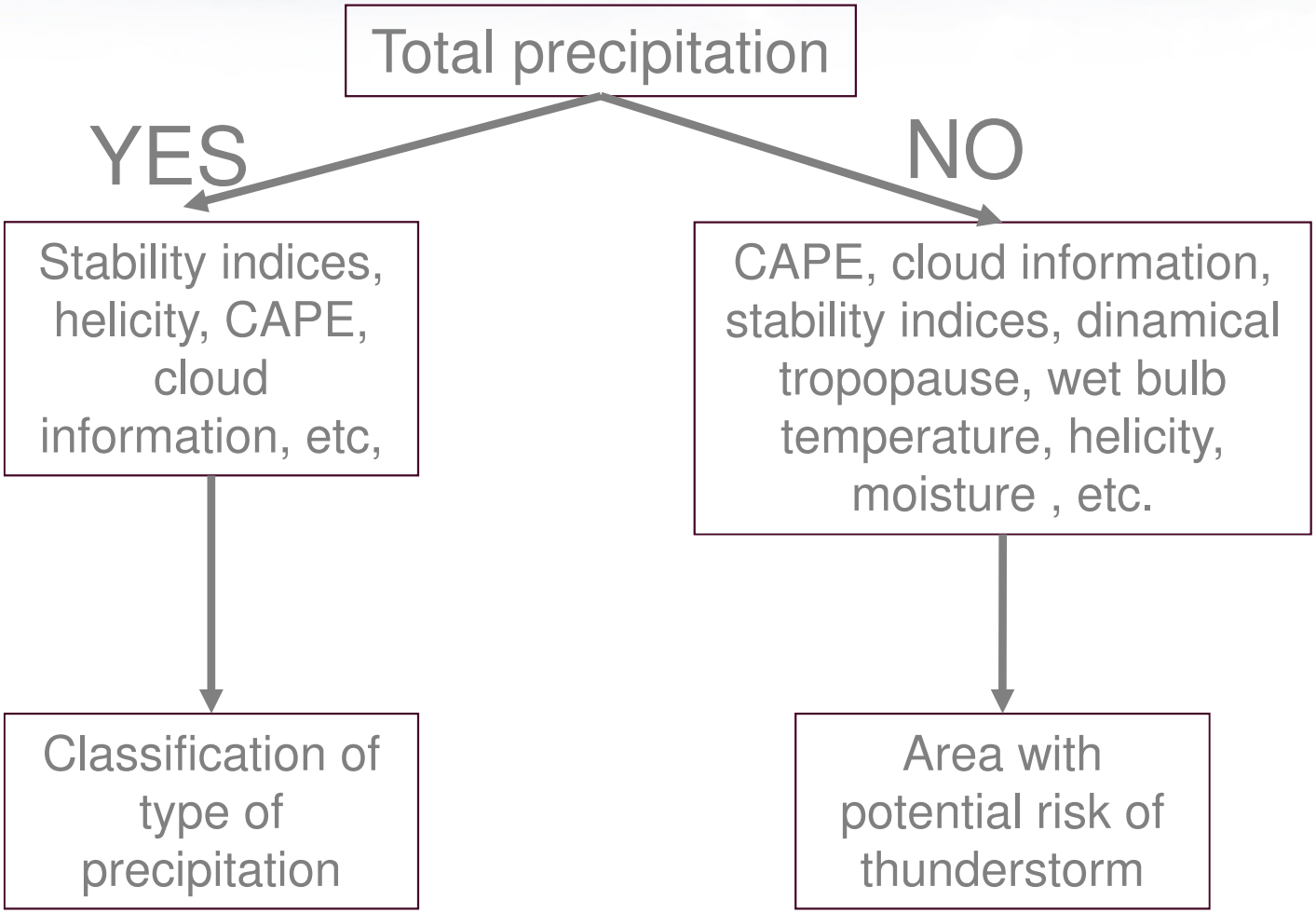




Courtesy of Antonio Manzano - AEMET

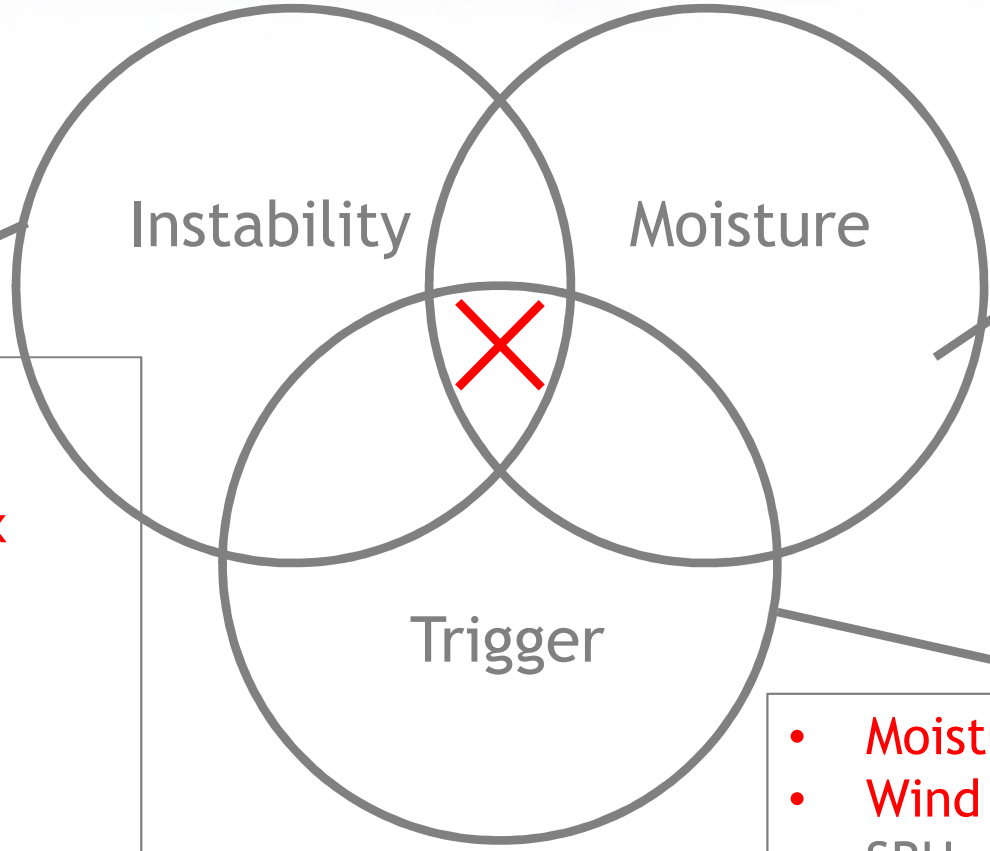
Thunderstorm code:

Status: Forecast tree: under development



Courtesy of Mario Papa and Francesca Marcucci

Thundestorm ingredients
(all already implemented in the code if not available as input)



- RH index
- RH 2m
- Wet bulb temperature@850 hPa

- CAPE
- CIN
- Total Totals Index
- K Index
- Jefferson Index
- Showalter Index
- KO Index
- Lifted Index
- Dynamical tropopause

- Moisture flux convergence
- Wind shear (0-3 km, 0-6 km)
- SRH
- Orography

Integrated graupel for lightning discharges information

Courtesy of Mario Papa and Francesca Marcucci

Research task

- This task is aimed at addressing uncertainties related to **surface and soil properties** and their relevance for convection-permitting EPS, as well as uncertainties associates to **PBL modeling**
- Research focuses on topics such as:
  - Assimilation of surface/soil property data, perturbations of soil scheme and PBL scheme parameters
  - Introduce uncertainty of land use data in the perturbations

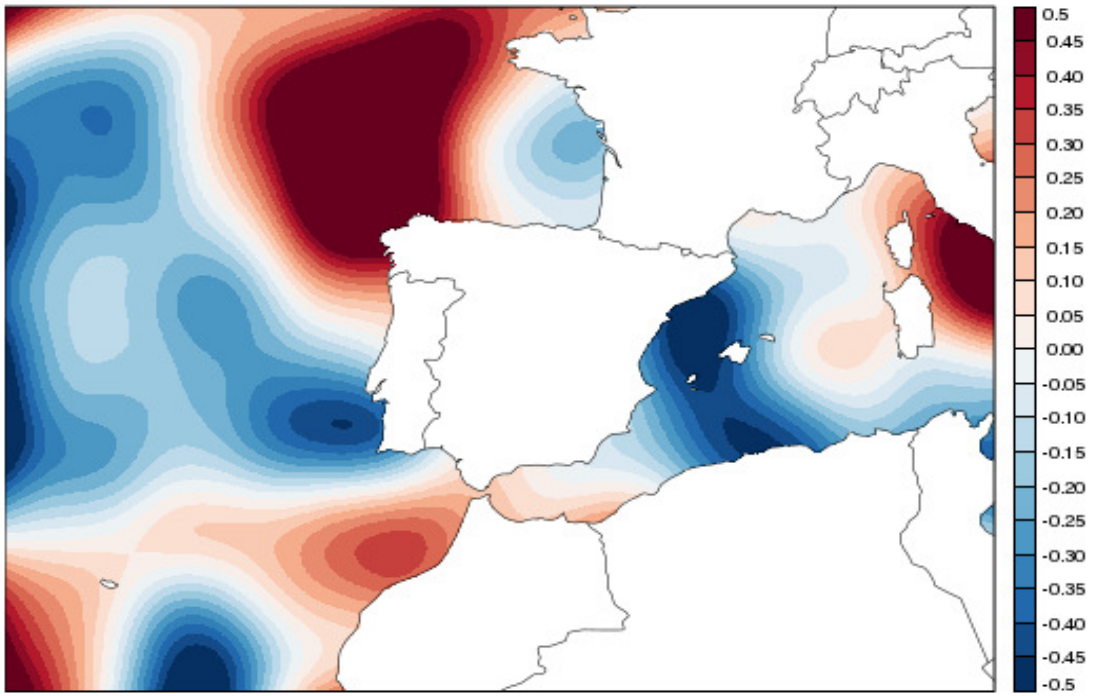
NMSS activities

- Most of the information and results will be shown in the workshop in Madrid (24-26 October).
- HIRLAM activities in Inger-Lise's presentation

Surface Perturbation in HarmonEPS over the Iberian Peninsula

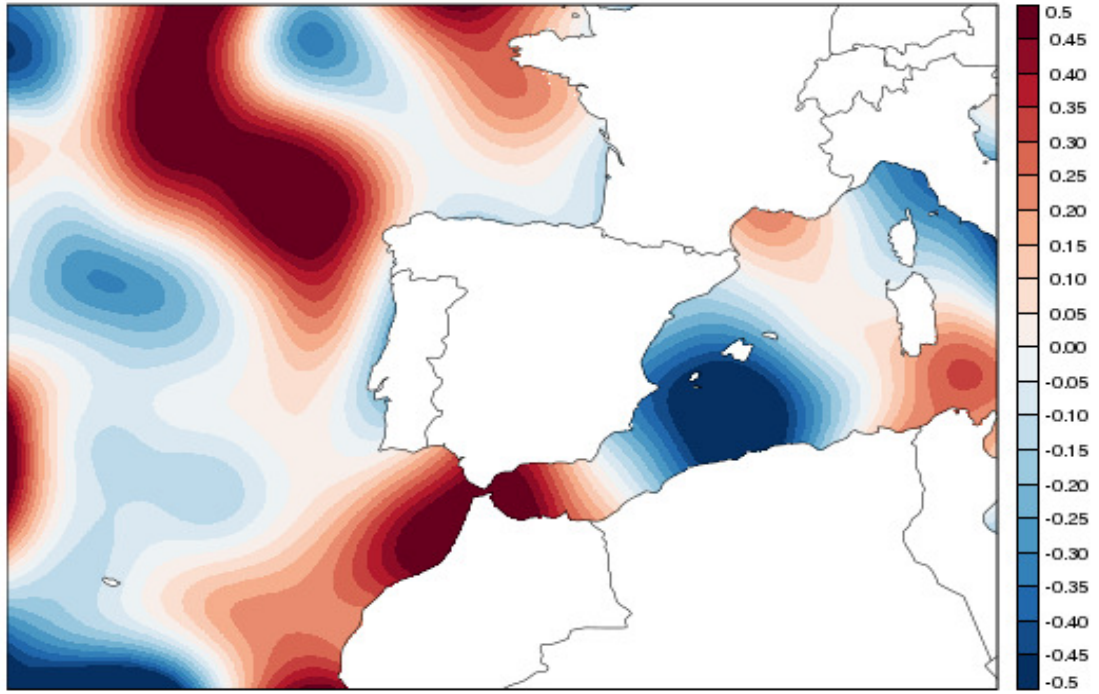
Example of the perturbation pattern:

Parameter	Standard Deviation (Additive)	Clip Min. Value [K]	Clip Max. Value [K]
SST	1.5 +	272	350

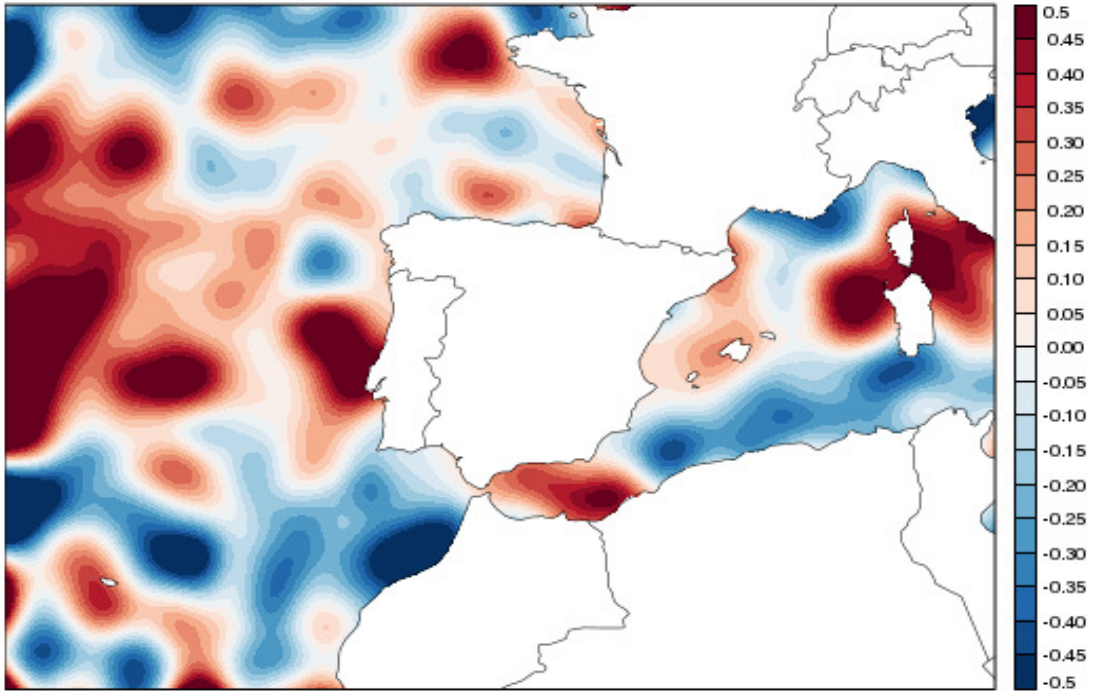


Sensitivity to correlation length scale

300 km

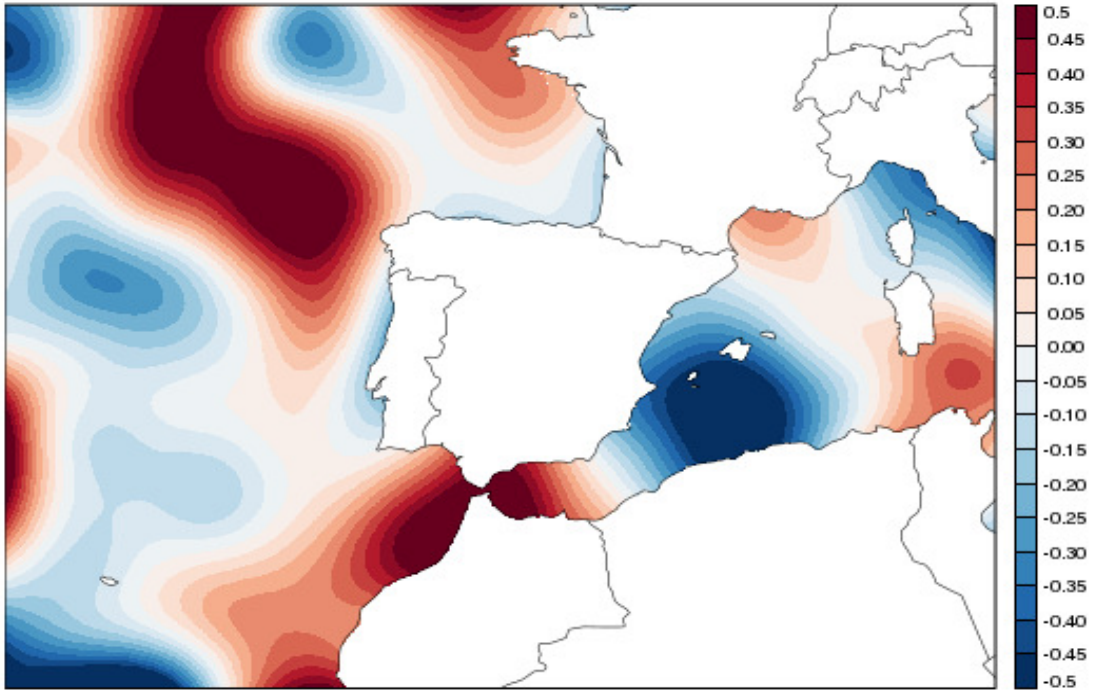


150 km

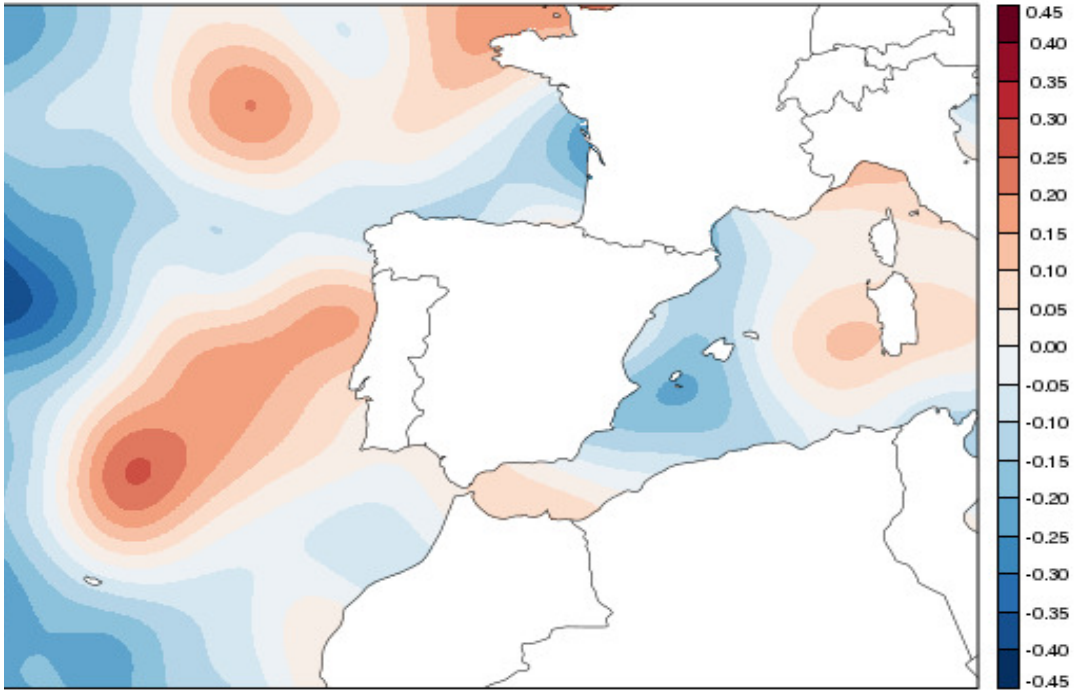


Sensitivity to re-scaled and clipping values

Clipping at ± 2



Clipping at ± 4
Standard deviation halved



UKMO (thanks to Anne Mccabe)

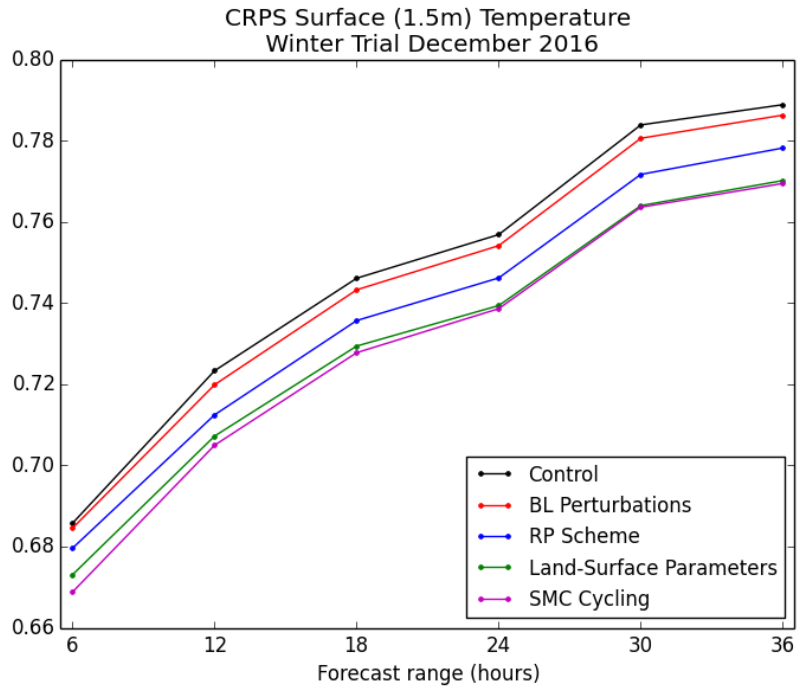
- 2 month-long trials have been run using MOGREPS-UK for summer and winter 2016
- For each trial, the following experiments have been run:
  - Control (No stochastic physics)
  - Boundary Layer Perturbations
  - Random Parameters (RP) Scheme (operational version)
  - RP scheme with new parameters from the land-surface parametrization
  - Initial soil moisture content perturbations (SMC) created by cycling (SMC) between forecasts

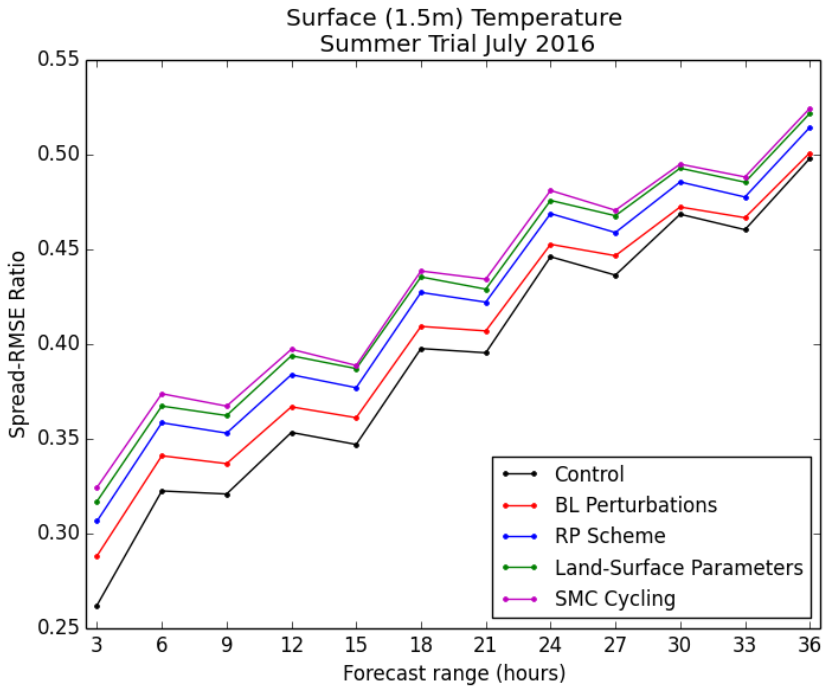
UKMO (thanks to Anne Mccabe)

- Note that in each case, the experiments build upon the one before, so, for example, the SMC cycling experiment also has the BL perturbations and uses the RP scheme (operational and with the new land-surface parameters).
- Objective verification statistics are currently being analyzed for standard variables and metrics
- Still to do: more specific analysis: i.e. the effect of the different schemes on visibility and lightning

UKMO (thanks to Anne Mccabe)

- A couple of plots showing the effect of the different schemes on the surface temperature: (1) the spread/skill ratio for the summer month and (2) the CRPS for the winter month.

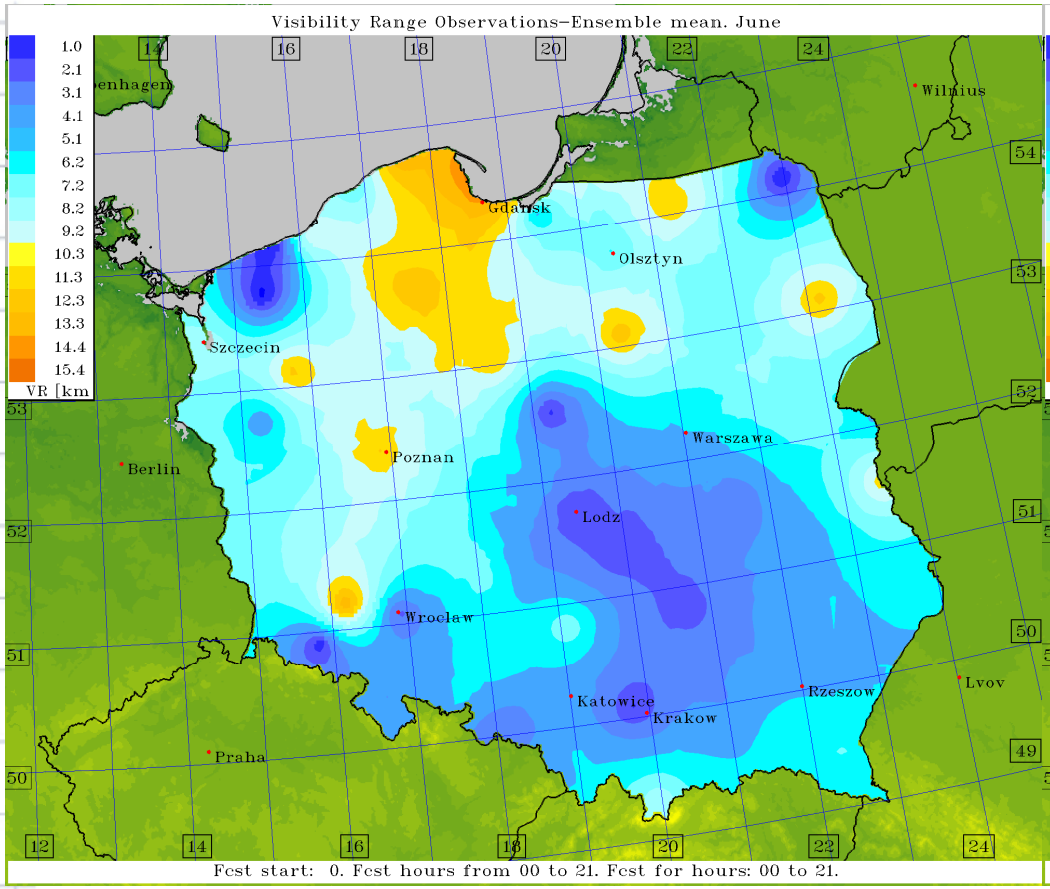




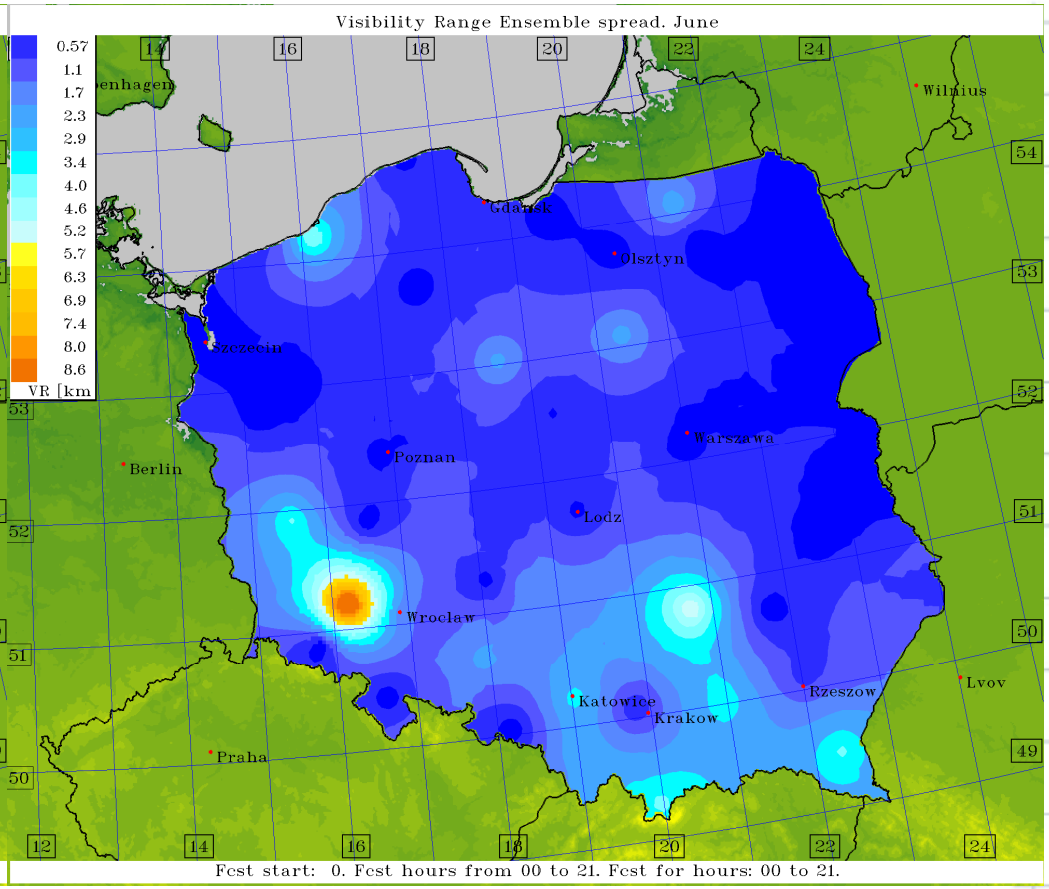
IMWM - Poland (thanks to Andrzej Mazur)

Visibility range – ensemble mean/spread vs. observations

(a) Ensemble mean – observations (SYNOP)



(b) Ensemble spread

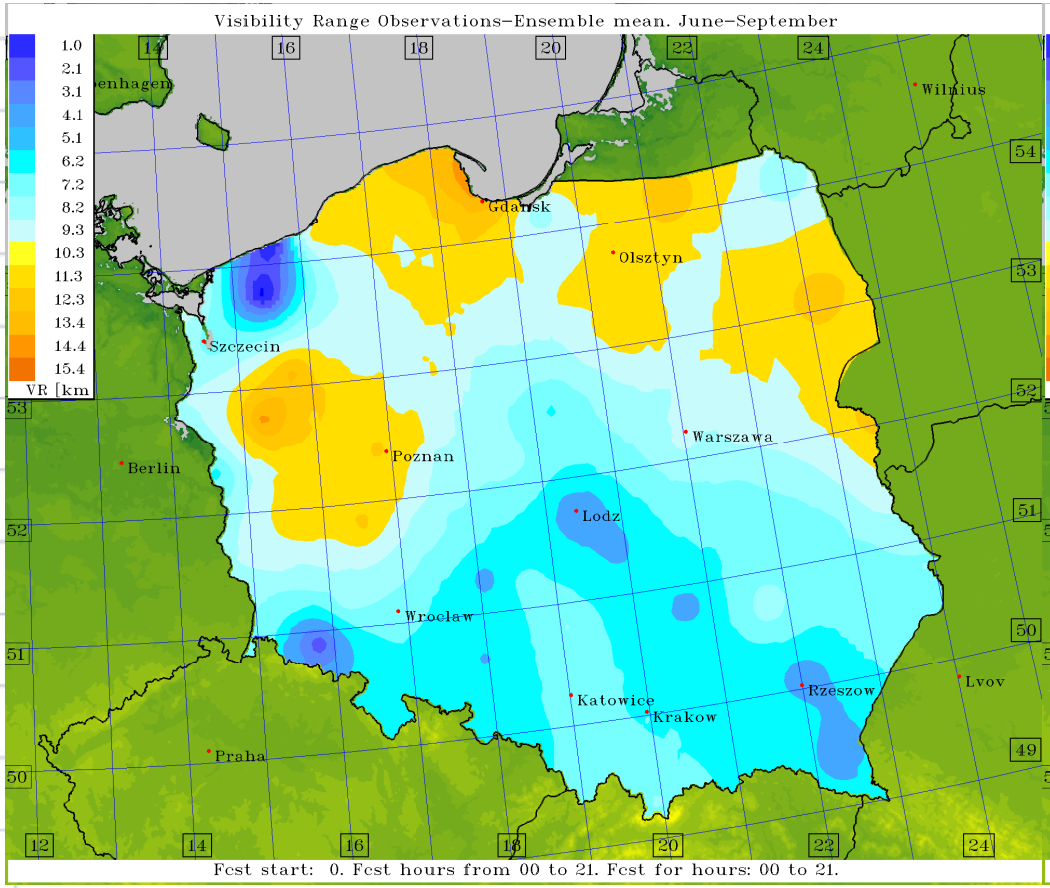


Average values – June 2013

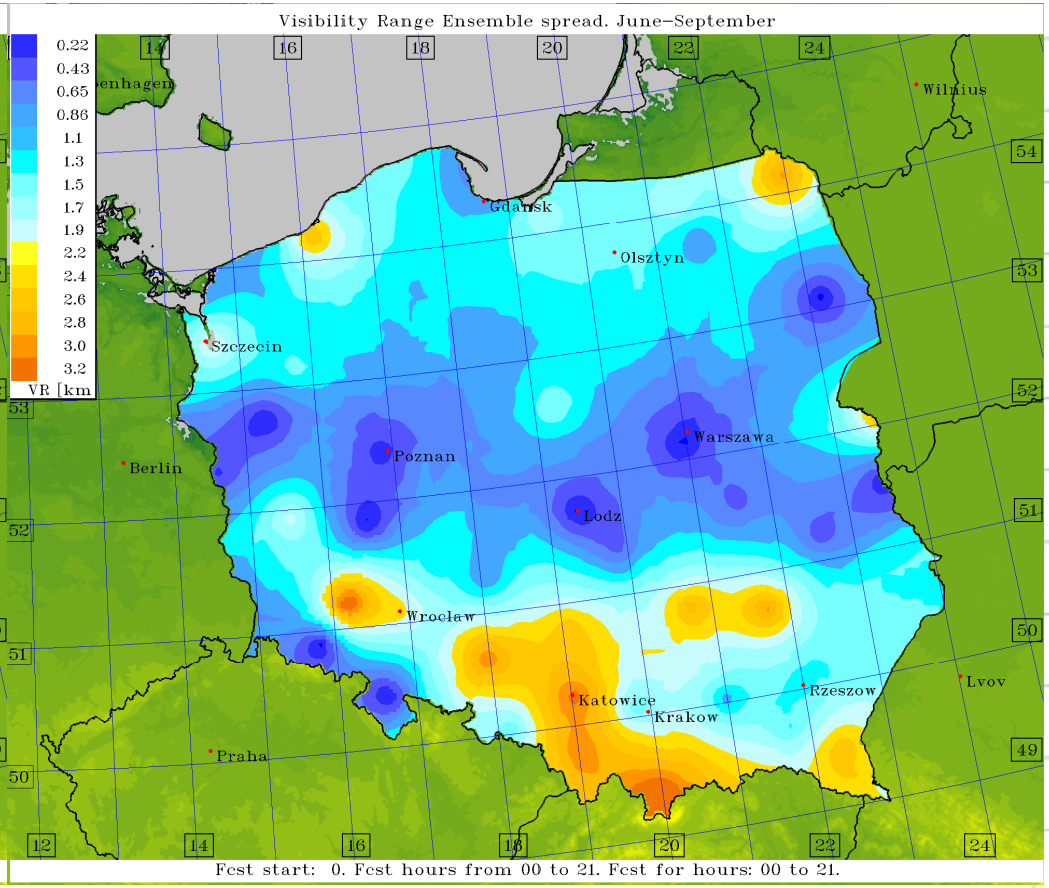
IMWM - Poland (thanks to Andrzej Mazur)

Visibility range – ensemble mean/spread vs. observations

(a) Ensemble mean – observations (SYNOP)



(b) Ensemble spread



Average values – June-September 2013