Monitoring rada precipitati
data, satellite d

Outline

- Current practices
- Assessing radar data quality
- Radar alone
- Radar vs. radar
- Radar vs. NWP
- Radar rainfall vs. raingauges
- Radar wind
- Some user feedback

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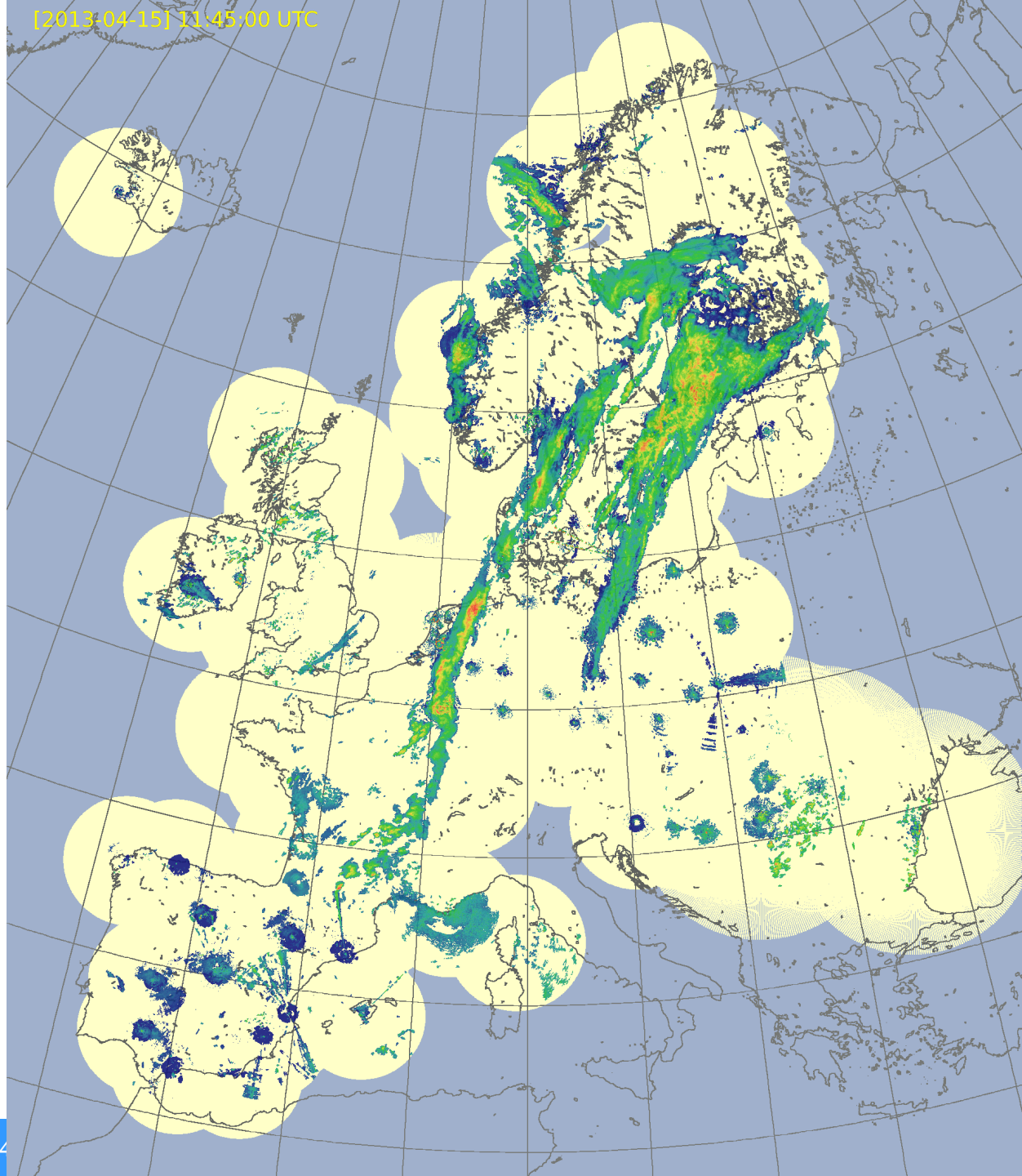
15 Apr 10UTC

- Max. reflectivity
- Produced by the radar compositing center of OPERA: Odyssey



Current monitoring of radar and satellite data

- EUCOS monitors availability and timeliness of radar reflectivity sent to and composites produced by Odyssey
- No systematic radar data accuracy monitoring so far, but: ECMWF (Philippe Lopez) has compared Odyssey rainfall composites to gauges
- Radar wind profiles are monitored as part of E-PROFILE
- NWP does not use satellite precipitation products, only radiances
- Satellite monitoring done by satellite people, process not directly available to most NMS

A word about quality flags

- You can't assess the quality of a radar product by a single value, you use a mixture of global, per scan and per pixel flags
- Historically 2 schools inside OPERA:
  - flags associated with the electronics health and the processing limits (Nyquist velocity, minimum detectable signal...)
  - flags giving level of confidence in final product (rainfall accumulation)

Monitoring radar data accuracy alone

- Inside the radar computer, internal processing can reveal:
  - clutter, attenuation
  - electronic's drift (solar calibration...)
  - adding quality flag can give NWP a clue about error of the observation
- Other error sources due to processing for rainfall:
  - Z-R law
  - advection correction with previous scans
  - sometimes external data needed (0°C altitude...)
  - we are not there at all in Odyssey!
  - more quality flags can be added at that step

Monitoring radar data with other radars

- Radars must be close enough (< 100km)
- Relative information only
- Homogeneous operating mode of the radars involved is needed
- Planned at Odyssey, also for data correction

Monitoring radar data against NWP

- Reflectivity or radial wind are not model parameters, so forward operator needed
- Easier case for rainfall accumulation (see Lopez's ECMWF comparison)
- In addition to radar errors we can accidentally get
  - model errors
  - errors of the forward operator
  - temporal and spatial displacement

Monitoring radar rainfall against gauges

- Sample volumes are very different
- Raingauges are not perfect
- Experience of Meteo France:
  - monitoring is the basis for radar rainfall calibration
  - monthly and hourly monitoring/calibration steps
  - monthly: 20 to 30 ”good” gauges per radar, used to compute a monthly global correcting factor per radar
  - hourly: available realtime gauges for an additional global correcting factor per radar (Z-R correction)
  - quality indicator: average monthly ratio of corrected hourly radar rainfall over hourly gauges value must lie in interval [0.7 , 1.43] in 55% of all the cases

Monitoring radar rainfall against gauges (2)

- Practical problems extending Meteo France method to OPERA:
  - not enough raingauges data exchanged across Europe
  - often, radar people are not the same as the raingauge or IT people in charge of such data exchange, so not easy to improve that
- ECMWF monitoring experiment: smoothes out heavy rain events which are the ones where you want the radar to give reliable information

Approach of E-PROFILE

- Comparing differences:
  (model-radar wind profile) vs. (model-radiosonde)
- Avoid problems like e.g. model boundary layer too ”windy”

Open questions

- Currently Odyssey composites can be empty; minimum number of radars included?
- Doppler wind data: very different scan strategies and Nyquist velocities between countries (from 15 m/s to 60 m/s), difficult to monitor except through a data hub like Odyssey
- Alerting about bad radar data: crucial for automated use of products; can be done technically, done so far at Odyssey level only for badly formatted data.

Interview of Gergely Bölöni (SRNWP)

- Radar by radar or OPERA as a whole ?
  - Maybe national network by national network would be informative (if the national networks can be considered more or less homogeneous)
- If NWP were to blacklist some radars from assimilation, what would they base that on ?
  - I would guess: serious ground clutter, low signal-to-noise ratio, systematic errors, etc.

Comment from Klaus Stephan, COSMO, DWD

- The quantity to be assimilated has to be monitored, i.e. monitoring of 2D precipitation (composite) does not tell you anything about 3D reflectivity, and vice versa.
- Monitoring should provide the data assimilation the possibility to quantify the observation error as a function of volume.
- The mean bias between model and observation is a important quantity.
- Would like to correct the spatial error of the forecast but retaining the model climate.

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