Institute of Meteorology and Water Management
National Research Institute

Use of Meteosat stereographic view for more complete, 2-dimensional, parallax corrected images

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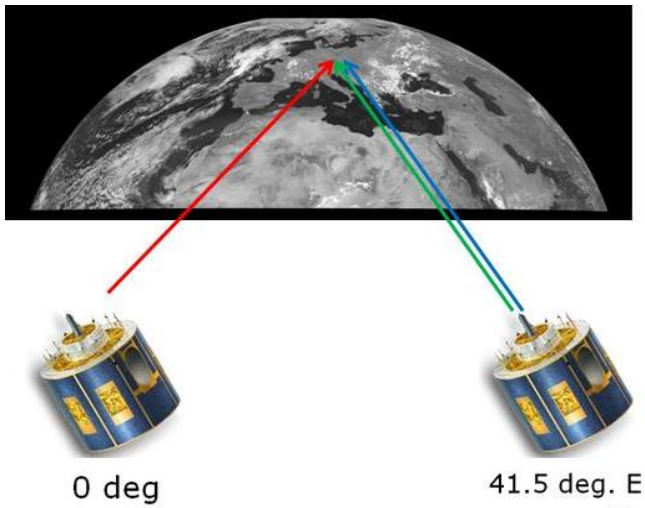
Presentation outline:

- Inspiration:
  - requirement for satellite imagery suitable for local monitoring and nowcasting,
  - expertise for insurance companies, courts etc.

- Parallax correction for 0 deg/IODC, results and problems.
- Use of dual view from 0 deg. and 41.5 deg. E, for creation of „better” 2D images.
- Selected examples.
- Conclusions



New requirement, starting from 2018,
local scale monitoring and nowcasting at IMWM in Poland

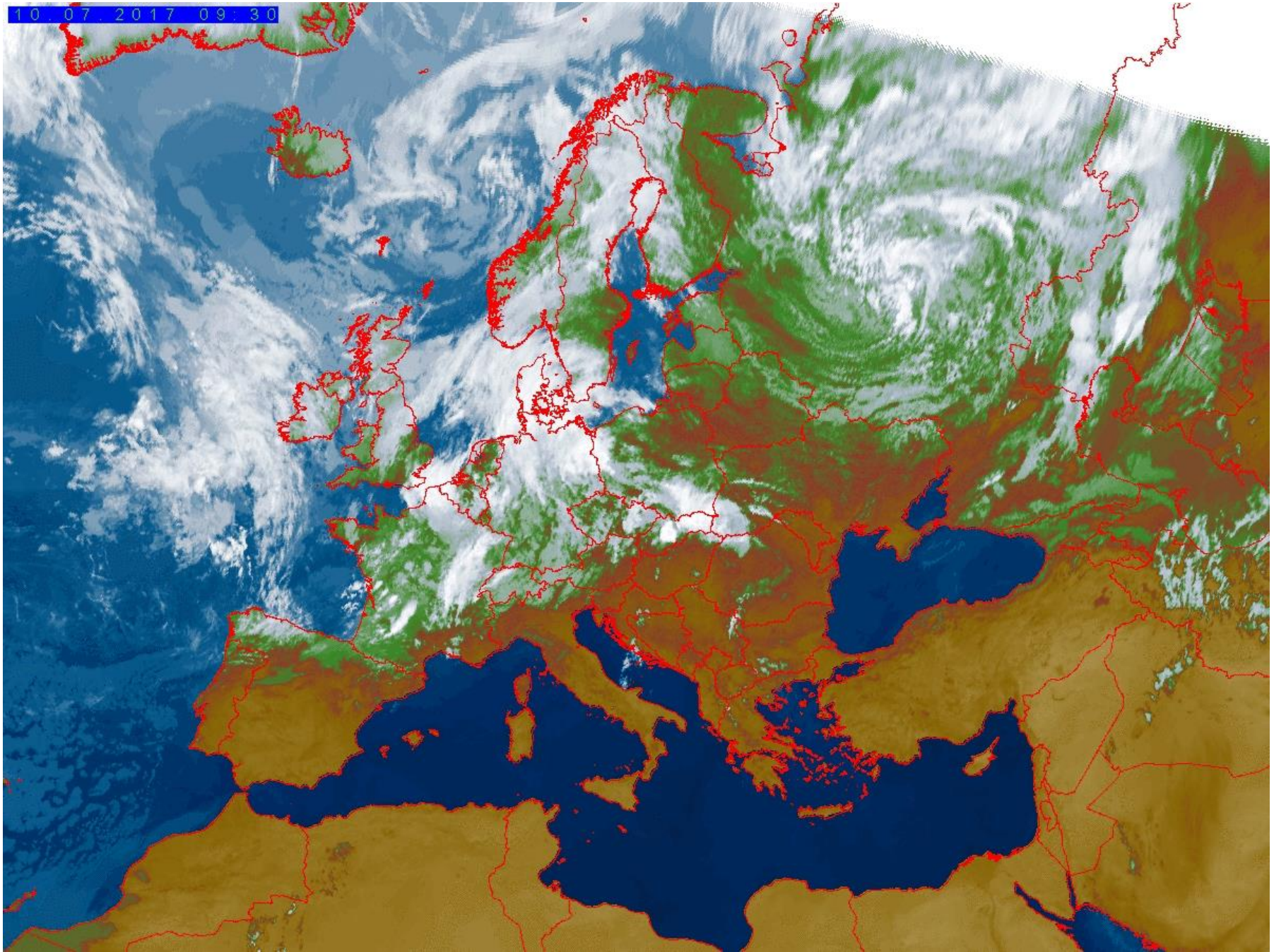
16 Provinces (Województwo)

600 km

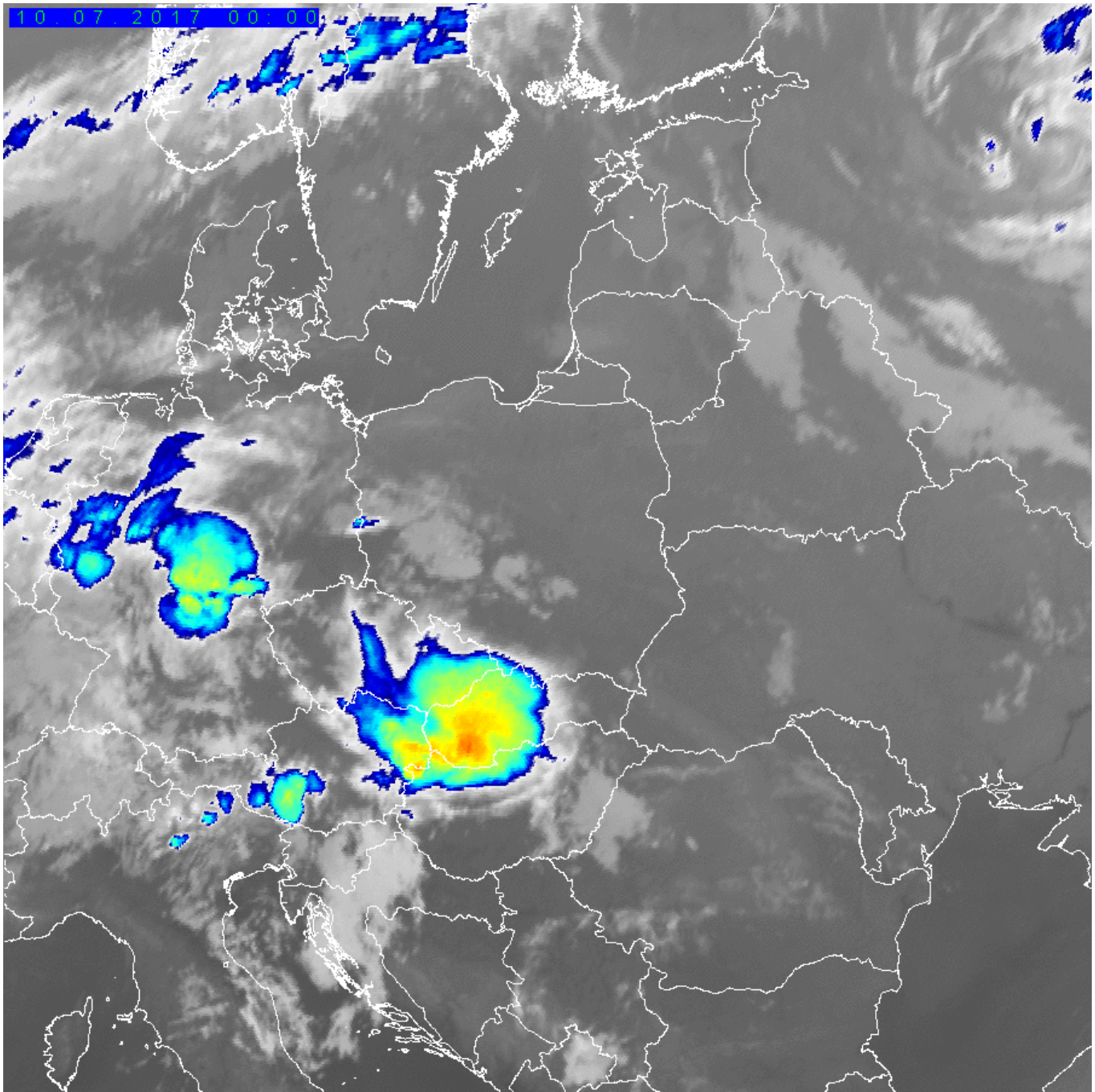
380 Districts (Powiat)
The lowest level Civil Protection Units

100 km

Who cares on parallax correction when analysing images in Continental scale ?

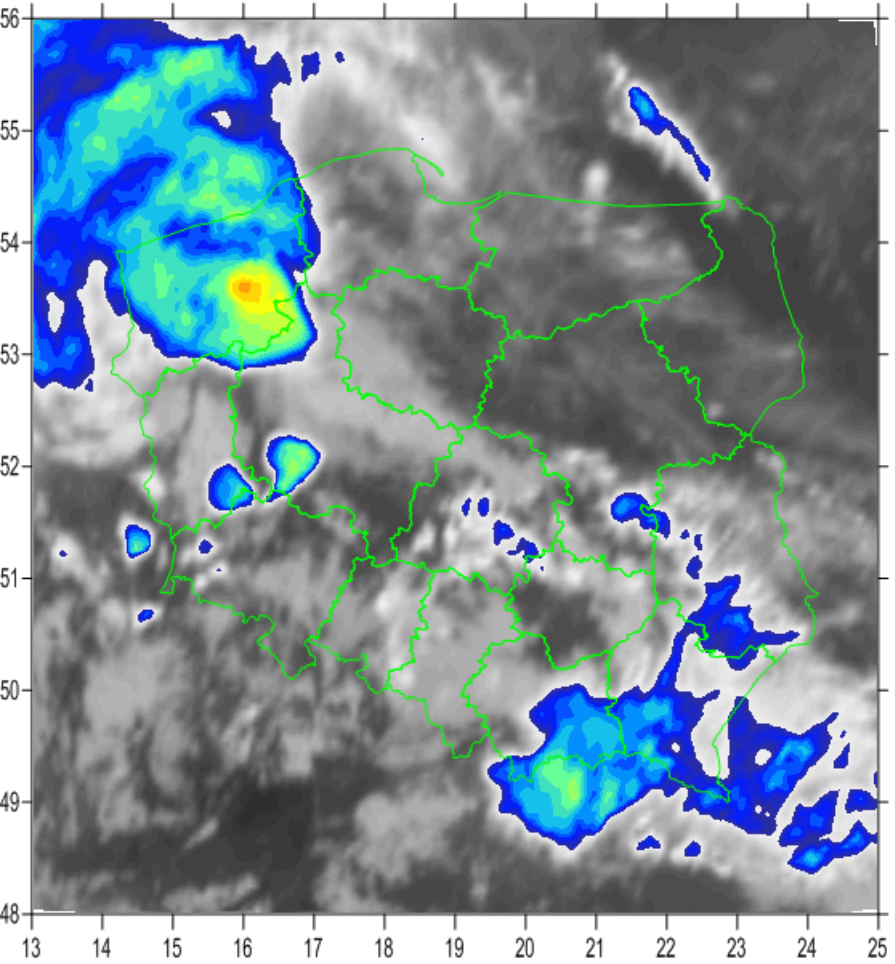


Who cares on parallax correction when analysing images in Regional scale ?

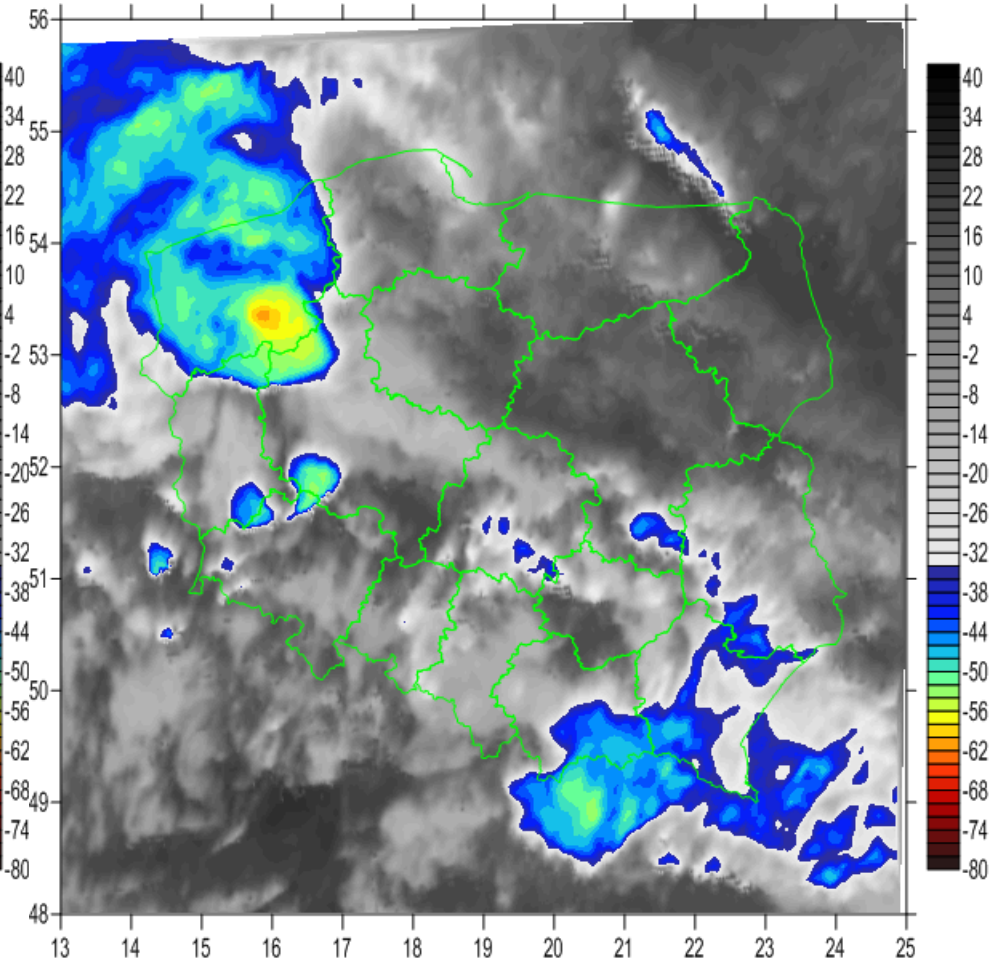


Use of Meteosat imagery in country (and lower) scale – proper navigation and parallax correction required.

Original image



Parallax corrected image



Idea

Meteosat image from 0 deg,
Cloud Top height for 0 deg

Meteosat image from 41.5 deg. E
Cloud Top height for 41.5 deg. E

Parallax corrected Image
0 deg.

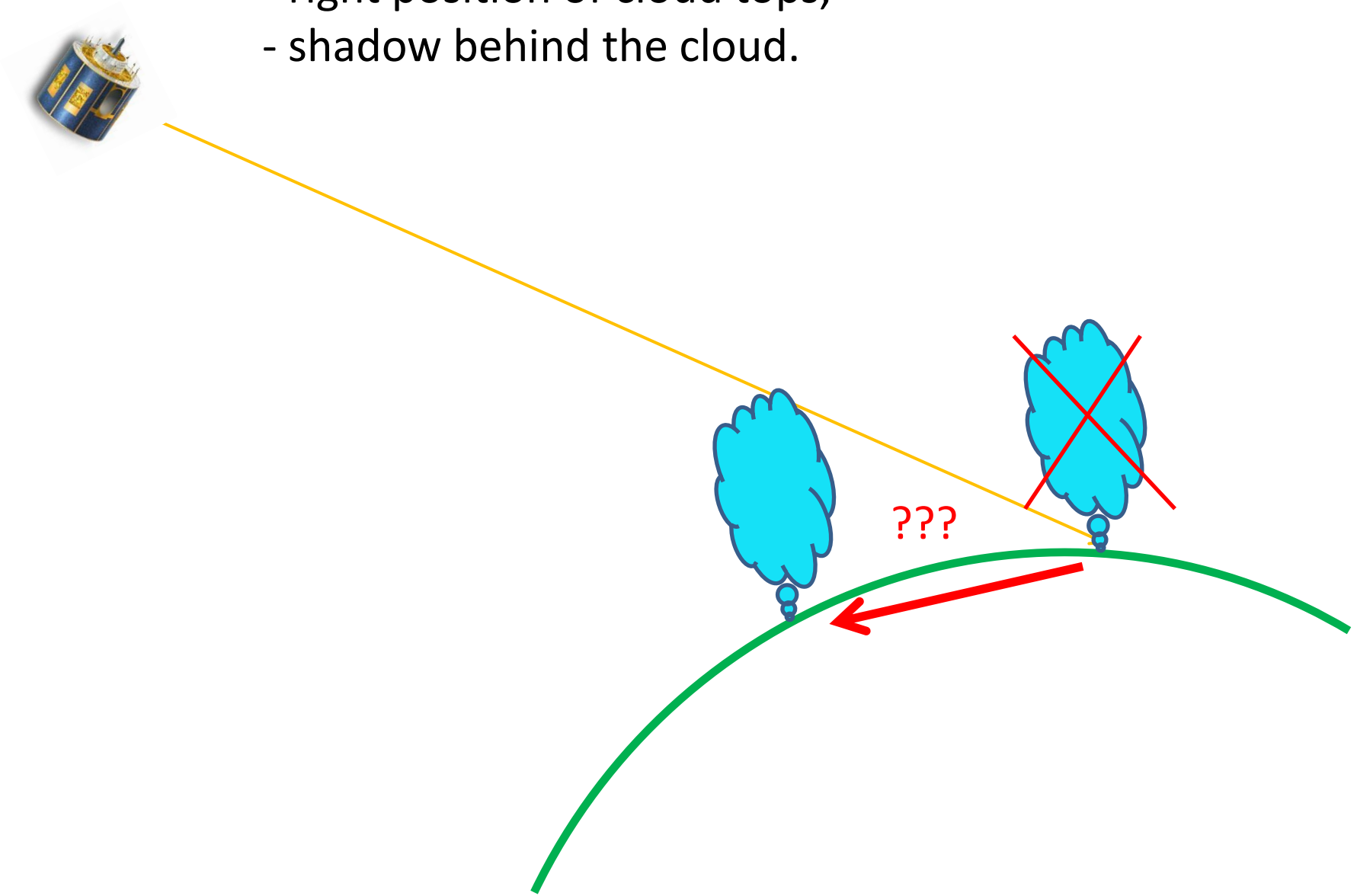
Parallax corrected Image
41.5 deg. E

All pixels merged
into one image

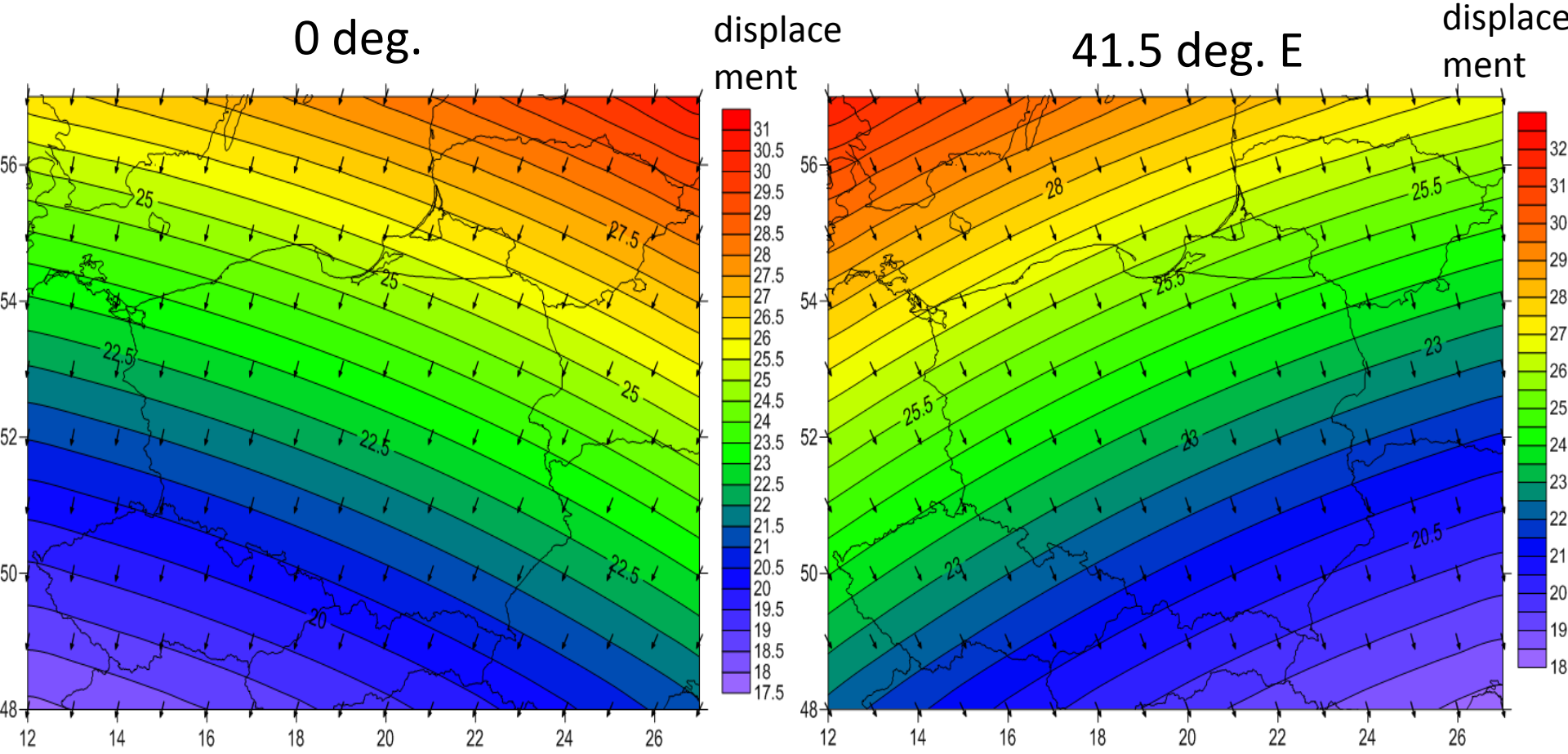
Better navigation,
better resolution
(more pixels)

Parallax correction – what we get, what we loose ?

- right position of cloud tops,
- shadow behind the cloud.



Parallax correction for 12 km height cloud – region of Poland



Candidates for Cloud Top Height:

Requirements:

-both 0deg. and IODC coverage,

- SEVIRI pixel resolution.

Possibible use:

EUMETSAT **CTH Product** – highest cloud in 3x3 pixels box,

EUMETSAT **Cloud Analysis** – highest cloud in 3x3 pixels box,

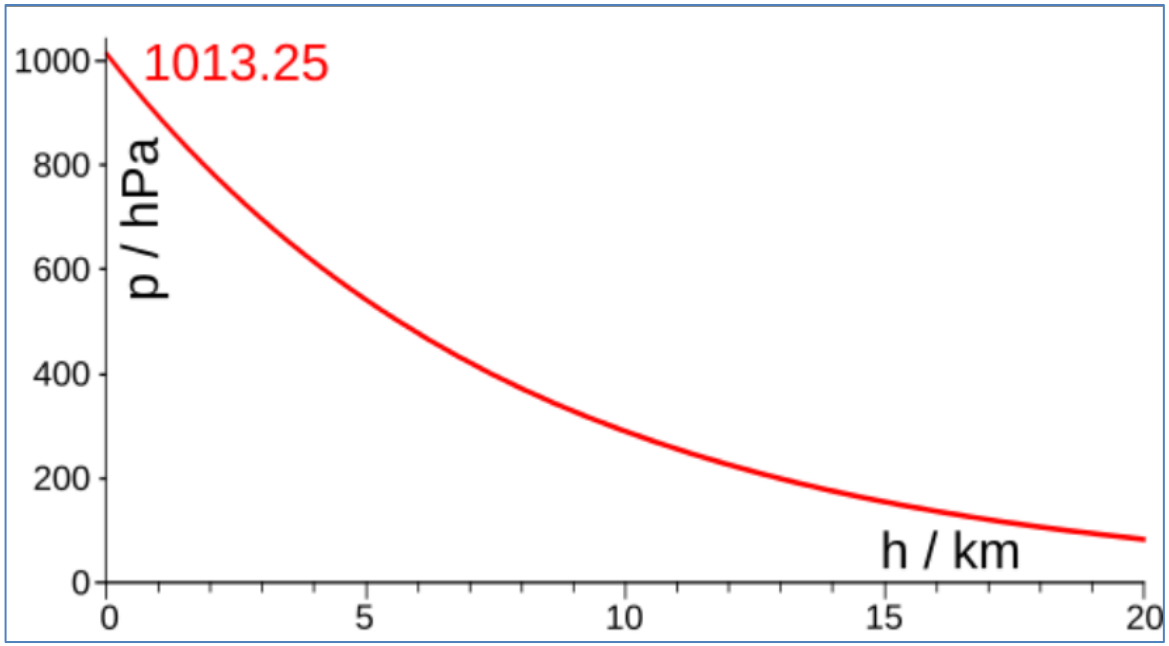
NWC SAF **CTTH** – perfect solution but require processing of 0 deg. and IODC data in parallel -> 2 instances,

EUMETSAT **OCA** – available operationally in full SEVIRI resolution, both for 0 deg. and IODC but contains Cloud Top Pressure.

Use of simple Barometric Formula for derivation of height from Cloud Top Pressure of OCA product

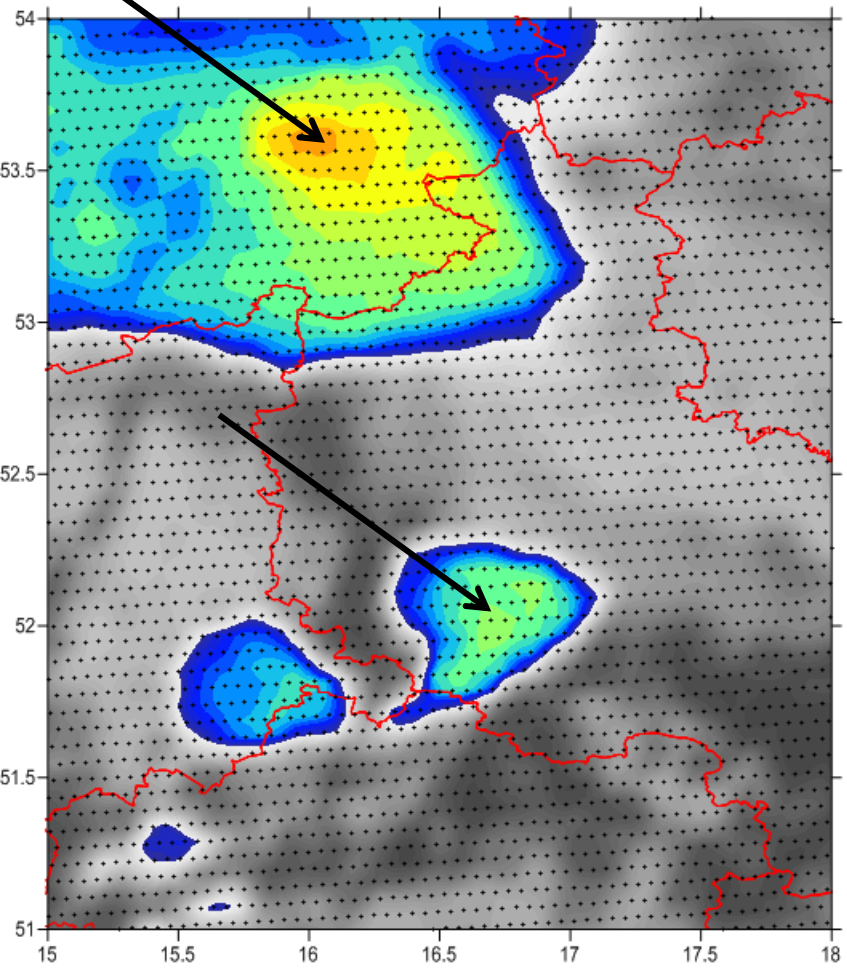
$$P = P_0 * \exp\left(-\frac{Mg}{R_g T} h\right) \qquad h = -\frac{R_g T}{Mg} * \log\left(\frac{P}{P_0}\right)$$

Simplified approach: Po, T - constant

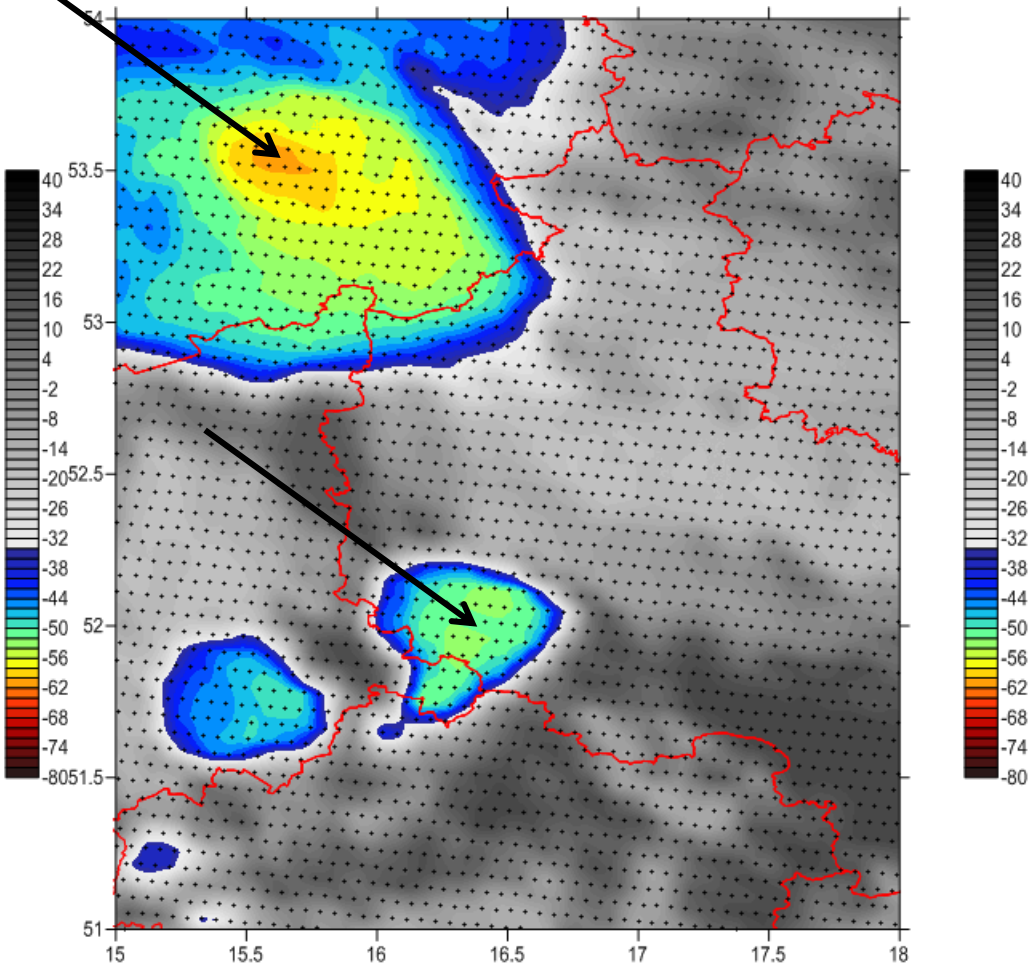


Example: 10.07.2017 12:15 UTC, original images

Meteosat-10 - 0 deg.

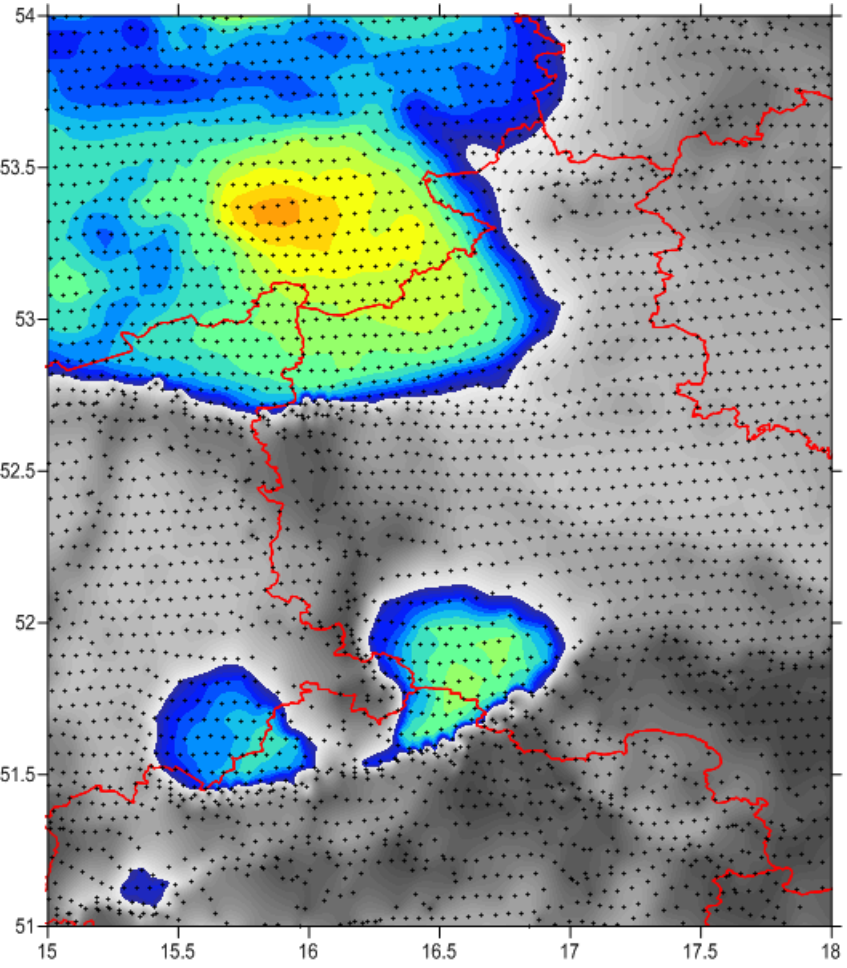


Meteosat -8 – 41.5 deg. E

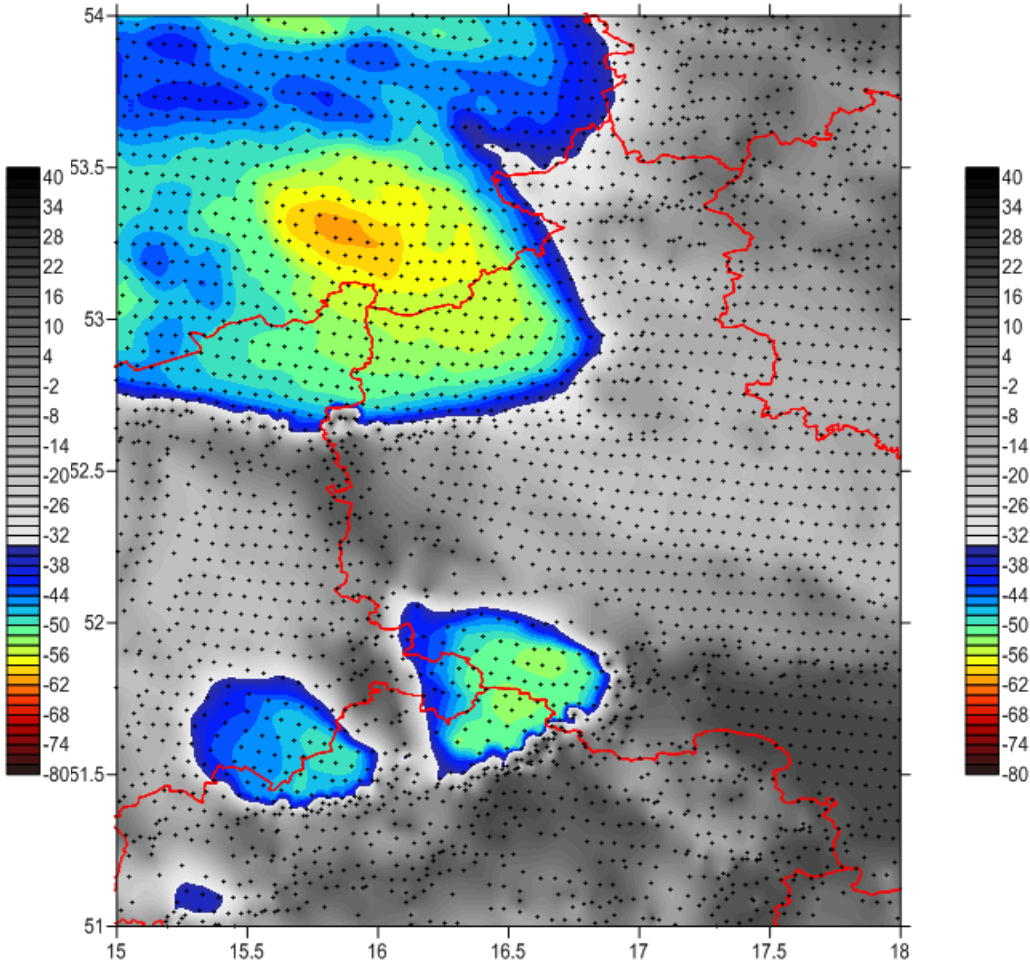


10.07.2017 12:15 UTC

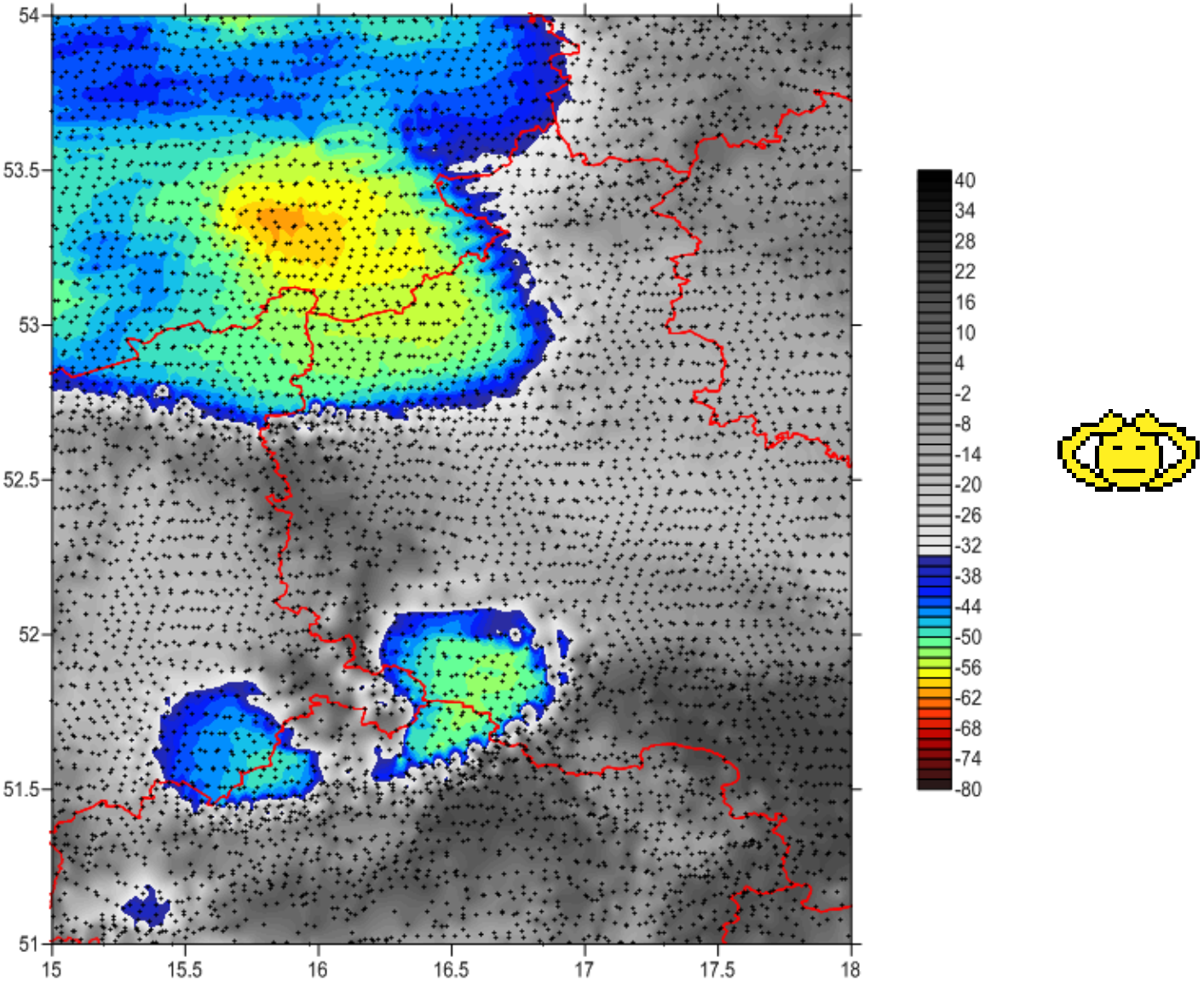
Meteosat-10 after parallax correction



Meteosat-8 after parallax correction



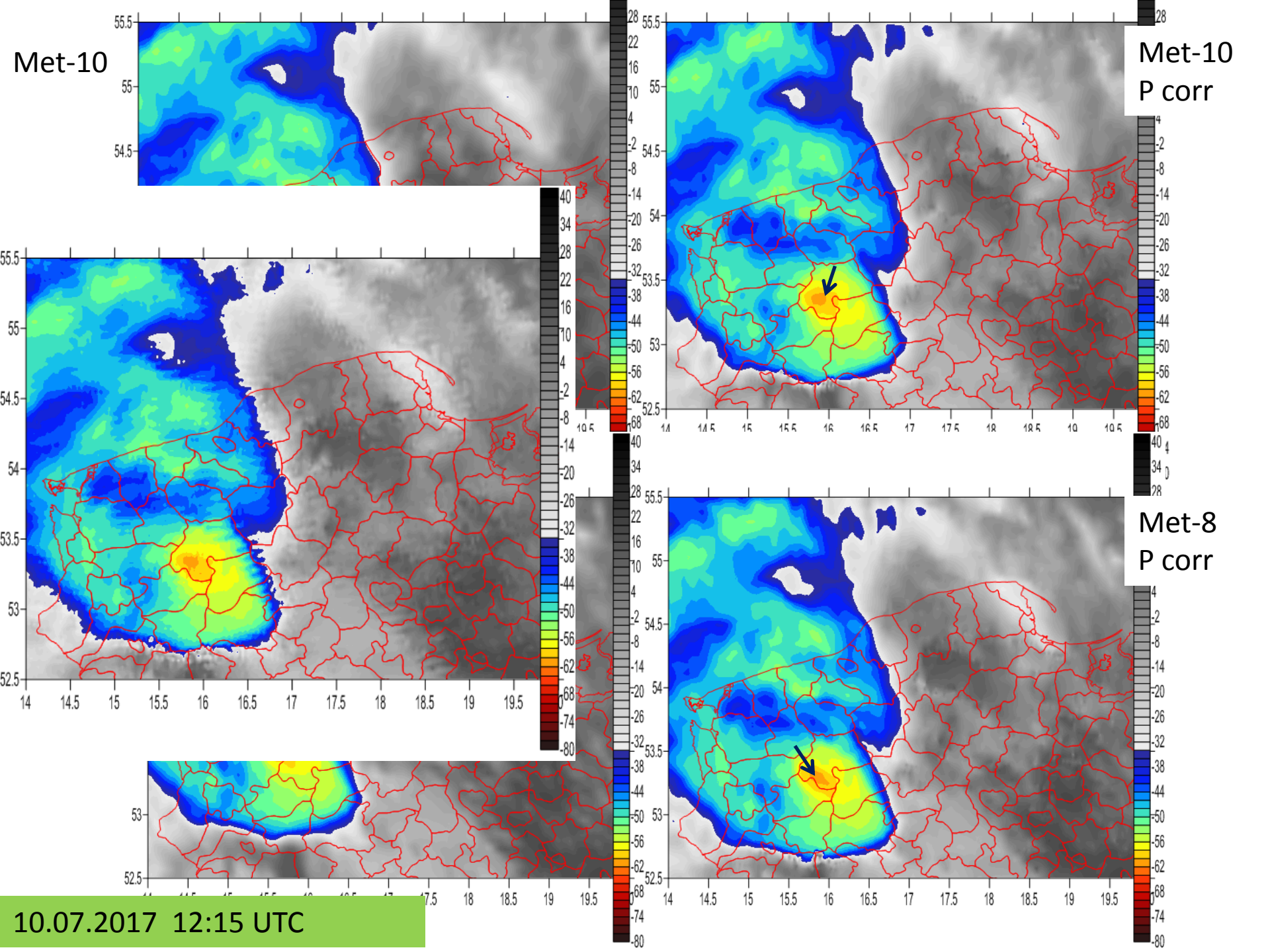
Meteosat-10 + Meteosat-8 10.07.2017 12:15 UTC With parallax correction

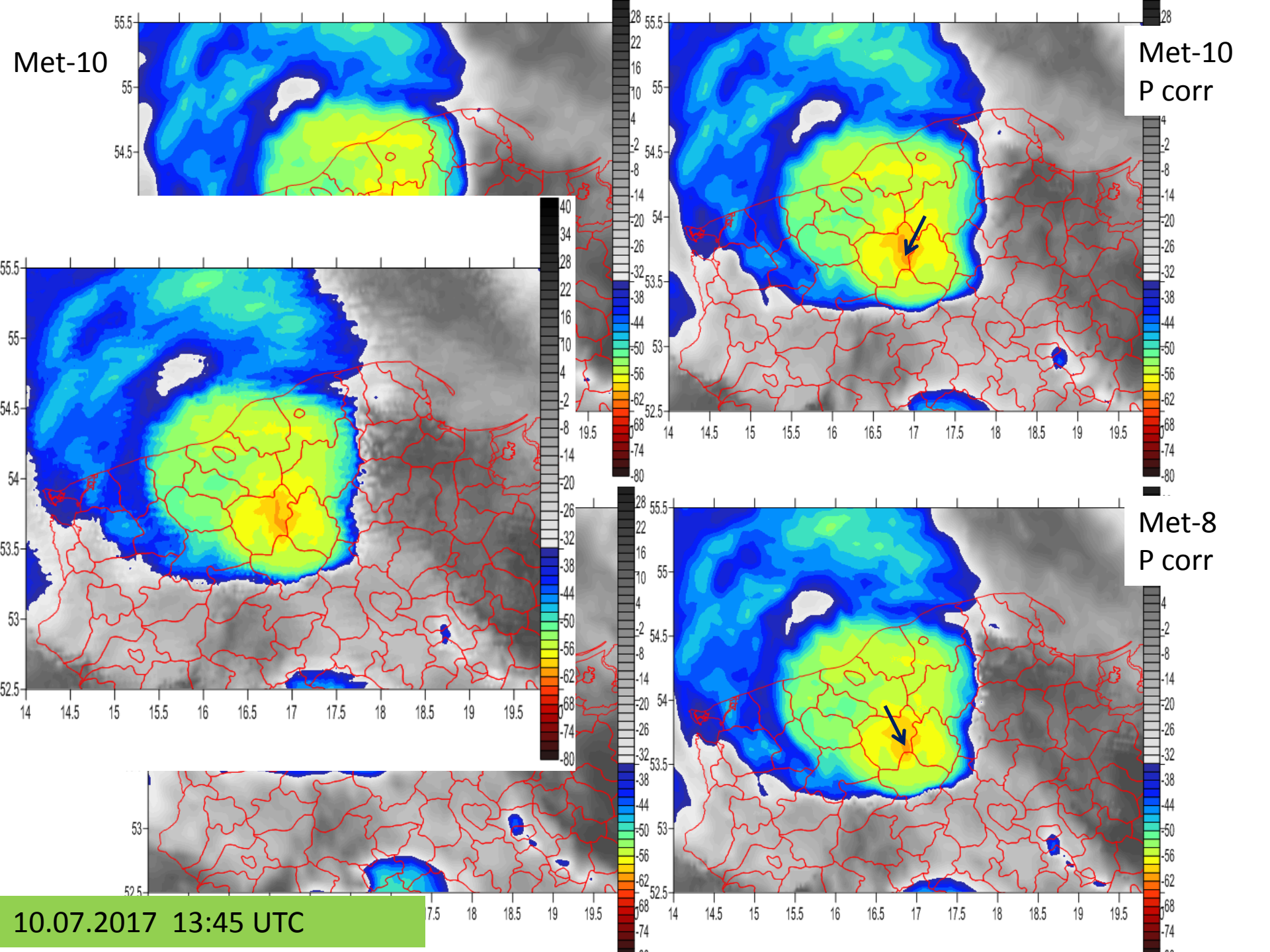


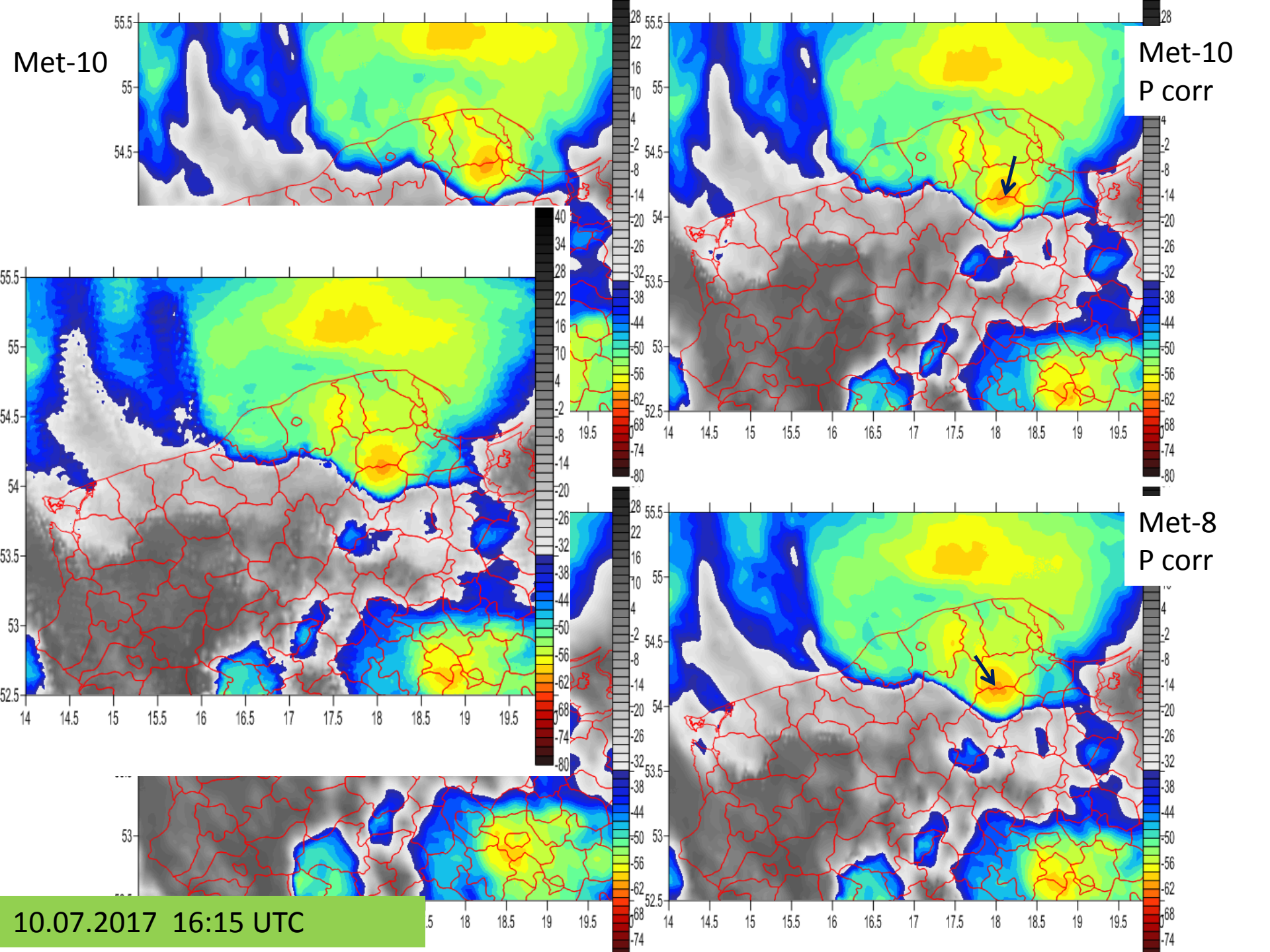
Identified issues:

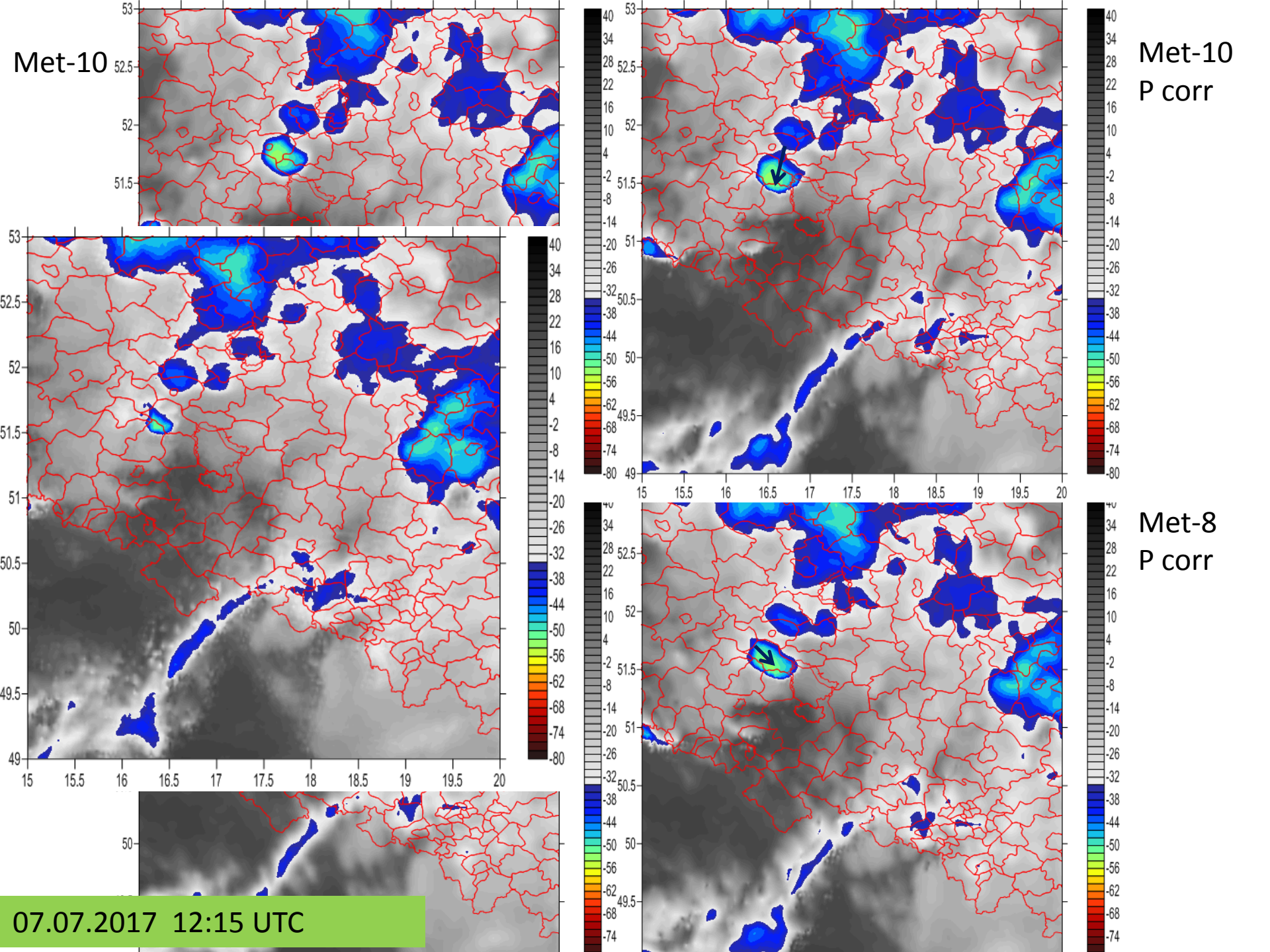
- Navigation of IODC images is not correct and not stable.
- Difference between navigation of IR 10.8 channel and OCA product (up to 3 pixels) for IODC, not a case for 0 deg.
- used colour palette is very helpful for cloud top analysis, shows better pixels above -33 deg. C. But we have in gray shades column of cloud up to almost 10 km -> displacement of pixels in gray shades.
- Without interpolation we have still black holes in image (from two missions, less than from one mission after parallax correction !).
- Applied interpolation, cause substantial differences in final image.

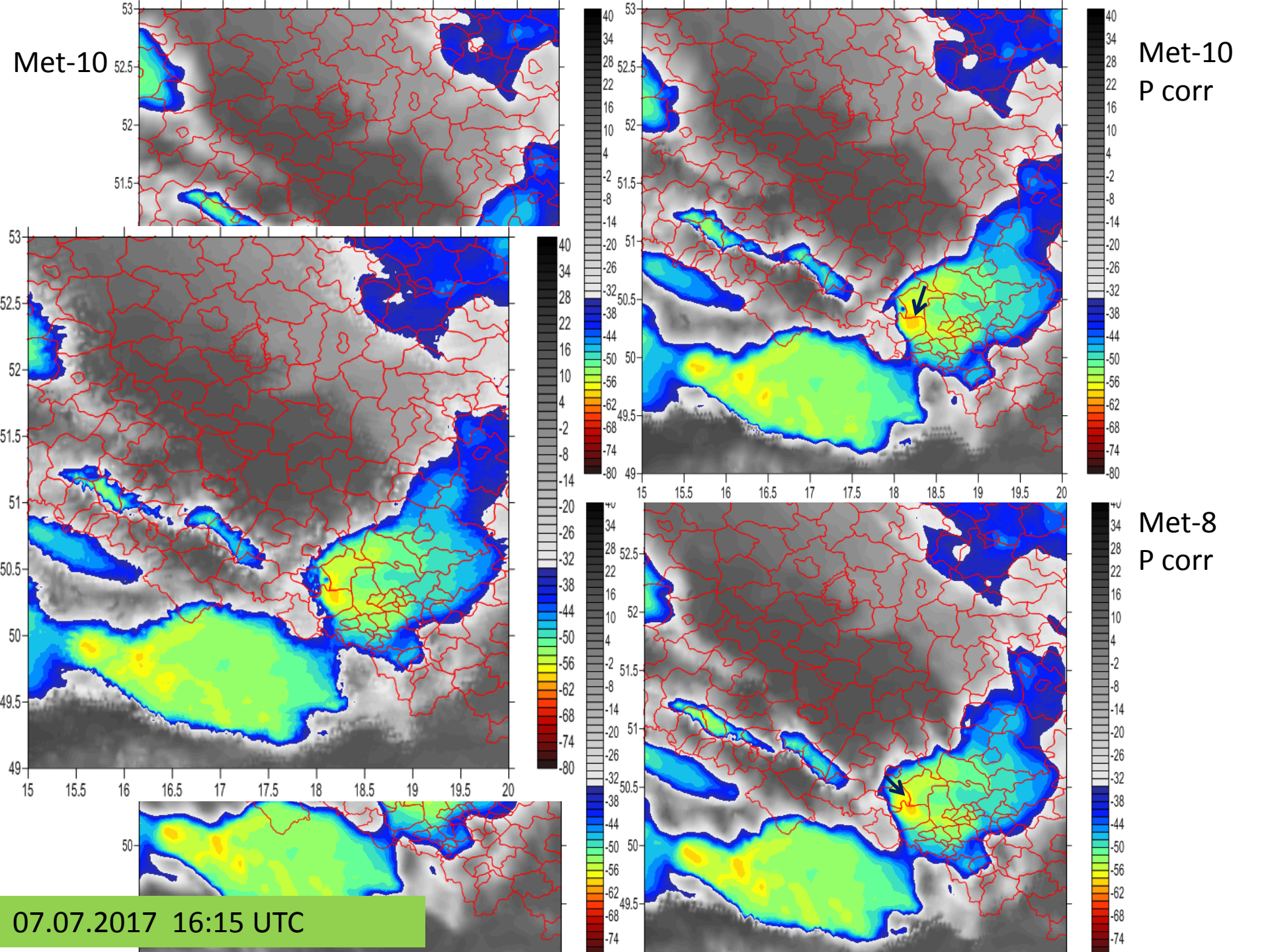
Some examples


Met-10
Met-10
P corr
Met-8
P corr
10.07.2017 12:15 UTC


Met-10
Met-10
P corr
Met-8
P corr
10.07.2017 13:45 UTC


Met-10
Met-10
P corr
Met-8
P corr
10.07.2017 16:15 UTC


Met-10
Met-10
P corr
Met-8
P corr
07.07.2017 12:15 UTC


Met-10
Met-10
P corr
Met-8
P corr
07.07.2017 16:15 UTC

Conclusions:

1. Meteorological monitoring and nowcasting at District („Powiat”) scale is demanding, shift of 25 km, frequently means different Civil Protection authority.
2. Use of satellite data close to/below its resolution is not a trivial task, require close cooperation between satellite data provider and user.
3. Idea with combination of 0 deg./IODC was good, but my realisation was not perfect (due to poor IODC navigation !).
4. **Could you imagine results, in case of detailed navigation !!!**

Recommedation to EUMETSAT:

Problem: Why, **part of work** related to creation of MSG Level 1b data were **shifted to the users** ? Data for proper navigation were stored to Prolog files (Chebyshev polinominals) but not applied by EUMETSAT processing system !

Request for full navigation of Level 1b IODC data, done by EUMETSAT !

Thank you
for your attention

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