Plans using IRS data at HungaroMet

Zsofia Kocsis

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HungaroMet

What did we do before?

Potential usefulness of IASI L2 (IR+MW) data for nowcasting purposes

- 6 month **statistics** – on consistency of IASI L2 (IR+MW) derived and SEVIRI GII environmental parameters
- 7 **case studies** on potential usefulness of IASI derived environmental parameters, profiles for nowcasting

Focused on the IASI L2 IR-only data – as proxy data for MTG/IRS

(including the usefulness of synergetic use of IASI data with ground measurements)

Statistics

- 6 month statistics – on consistency of IASI L2 (IR-only) derived and SEVIRI GII environmental parameters
- Comparison of the statistics between (IASI (IR+MW) and GII) and (IASI IR-only and GII)

Case studies - Gathered interesting cases (based on IASI (IR+MW) data)

Cases with considerable differences between IASI derived and ECMWF forecasted environmental parameters

- Performed some detailed case studies
- Analyzed IR-only derived parameters

Merged the IASI profiles with surface measurement

Experiences with IR-only data

We expected either no data for area covered with thick clouds, or profile data only above the cloud tops.
(Thick clouds are opaque in the IR spectral region – satellite do not „see" inside/below the thick cloud in IR region.)

The IR-only retrieval provide full profile output (down to the surface) for thick clouds as well.
(However, the vertically averaged error is usually high for these pixels.)

Comparing IASI (IR+MW) and IR-only data - summary

The vertically averaged errors are usually higher for IR-only data than for (IR+MW) data. It can reach even 5-6 C.
It is important to take into account the vertically averaged errors.

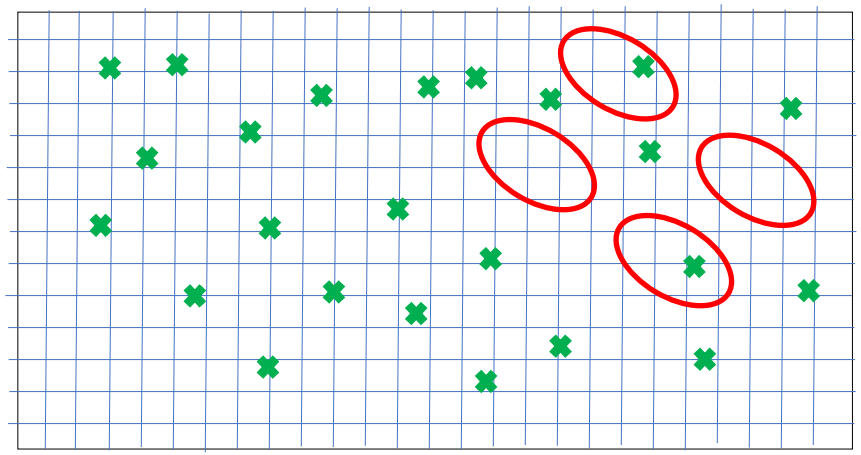
On cloud-free areas, and areas covered by thin cirrus or small cumulus the structure of the retrieved parameters and the profiles are usually similar, the differences in general not high.

For opaque mid/high clouds the profiles may be not reliable, even the T profiles can be considerably different.
For areas covered by opaque mid/high level clouds the uncertainty of T profile may became large.
It often strongly differ both from the forecasted and from the (IR+MW) T profile.

How to combine satellite derived profiles (representing **larger areas)** with **pointwise** surface measurements? The lowest level of the IASI profiles was modified.

Merging IASI profiles with surface measurements based on Bloch et al.

- In some dates and locations we performed it interactively using the in-built tools of the HAWK visualization system
- For the automatic merging, we did the following:



Ground-based measurements

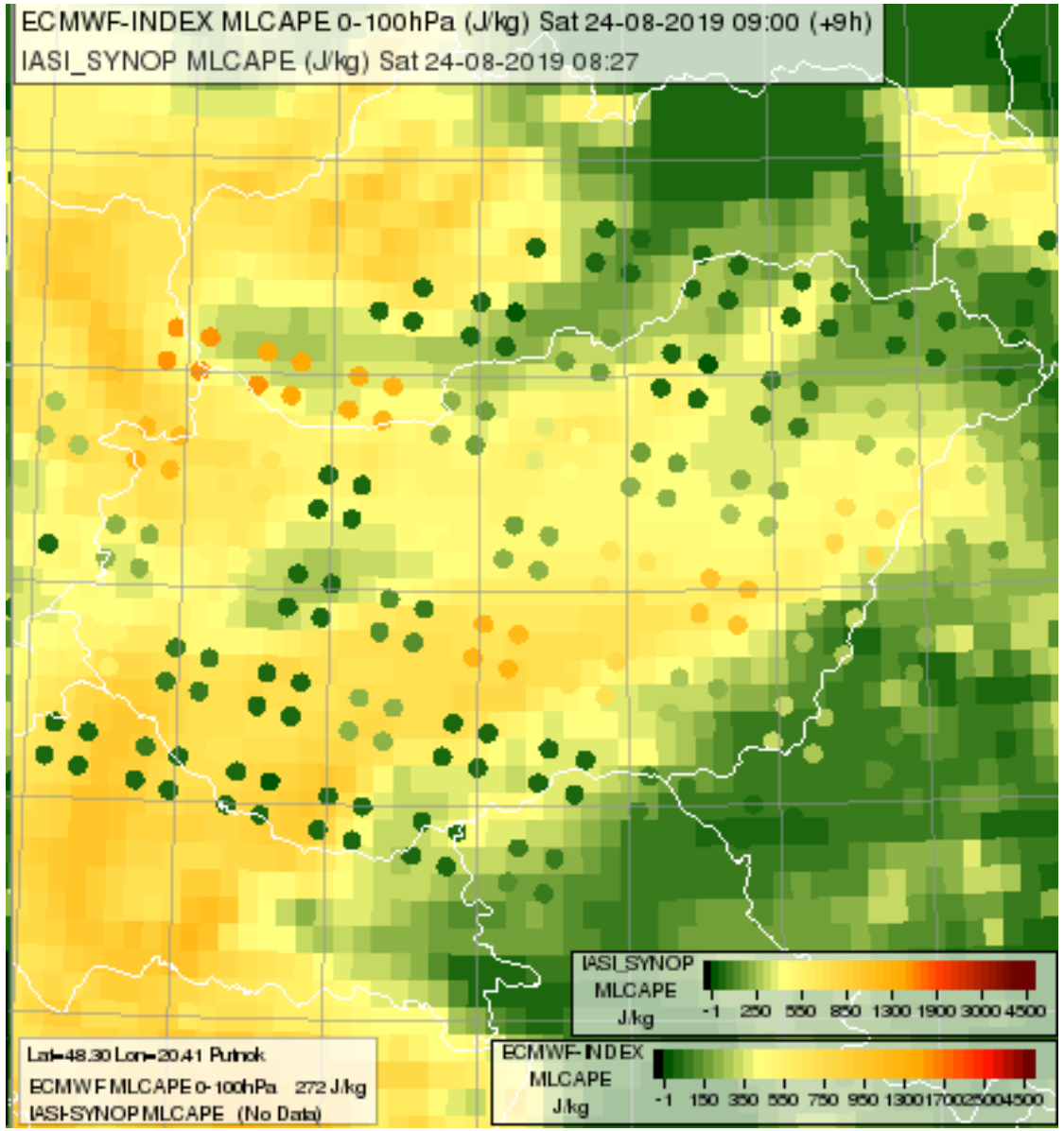
IASI pixel

1. Interpolate the ground-based measurement to a grid (0.02°) using inverse distance weighting (IDW) taking into account topography. – For each grid the stations within 50 km were used. (HAWK-3)
2. Within the IASI ellipses: calculate average T, Td of the grid points.
3. Use this new T, Td as the surface value in the IASI profile.

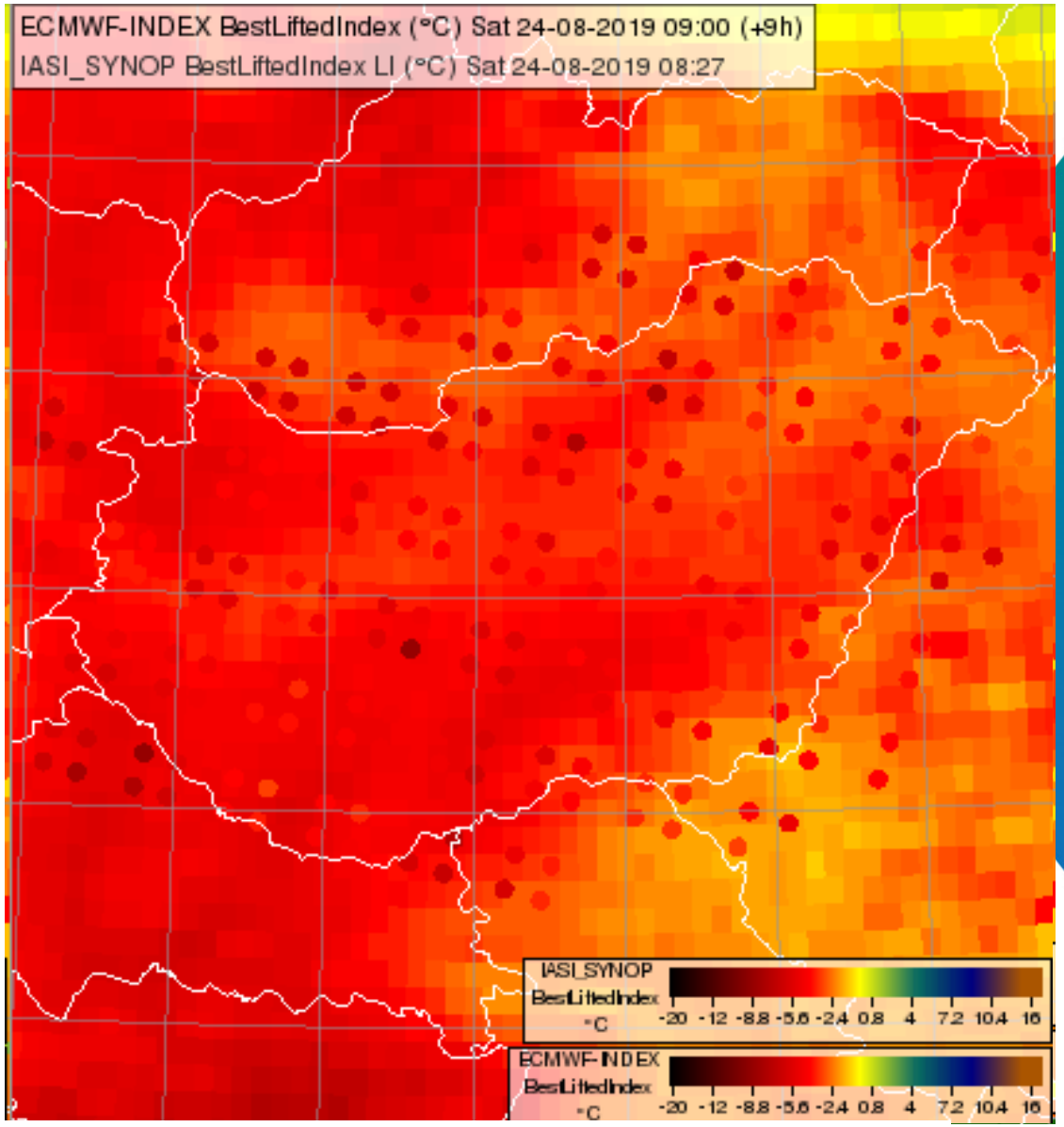
Bloch, C., R. O. Knuteson, A. Gambacorta, N. R. Nalli, J. Gartzke, and L. Zhou, 2019: Near-Real-Time Surface-Based CAPE from Merged Hyperspectral IR Satellite Sounder and Surface Meteorological Station Data. *J. Appl. Meteor. Climatol.*, **58**, 1613–1632, https://doi.org/10.1175/JAMC-D-18-0155.1.

Merge with surface measurements

24 August 2019 (IASI data from 08:27UTC, forecast valid for 09UTC



ECMWF + (IASI + synop) MLCAPE



ECMWF + (IASI + synop) Best Lifted index

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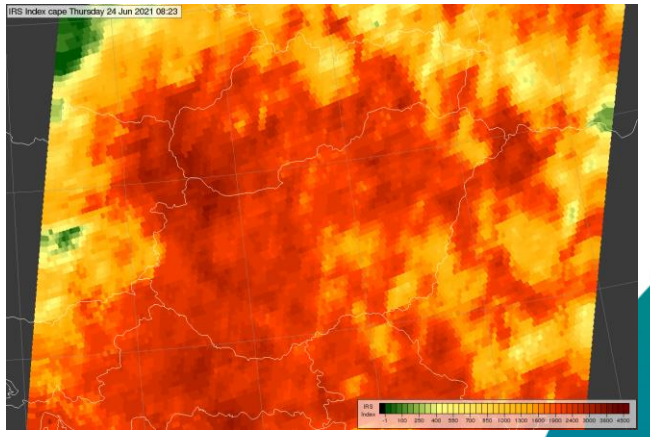
Plans at HungaroMet for IRS L2 data



- Visualization of IRS data in HAWK-3
  - Adding the IRS test data to HAWK – format conversion program is in progress
    - We need the surface pressure to be the lowest level in the profile (the number of vertical levels can change)
    - Calculate the height of the levels
    - Convert specific humidity to relative humidity
  - Using estimated errors – for profiles and indices
  - Very important to find visualization where the forecasters can easily compare IRS indices and profiles with NWP data
  - Cooperation with the forecasters to find out what would be the best for them

Plans at HungaroMet for IRS L2 data

- Assessing IRS L2 from nowcasting point of view:
  - How do the profiles behave for different clouds? – Experience from IASI L2 IR-only still valid? Relations to error estimation values
  - Convection – case studies using indices and profiles:
    - Comparison with models and other type of data – what are the added value
  - Can we see inversion – is there any information which can be useful for nowcasting of fog?
- Comparing both type of L2 with and without NWP – which one is best for our purposes?

Plans at HungaroMet

- Merging with synop data:
- Extanding the merging up to the boundary layer height - involving other measurement data sources (f.e. ceilometer, GNSS…)
- When IRS L2 data becomes available, we will assess it together with the forecasters.

Thank you! Any questions?

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