Outlook into new MTG Nowcasting products and towards an integrated approach

20 April 2020

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and
Nowcasting SAF Team

Summary

1. New foreseen products
2. Product limitations and solutions
3. Integration/Visualization of products

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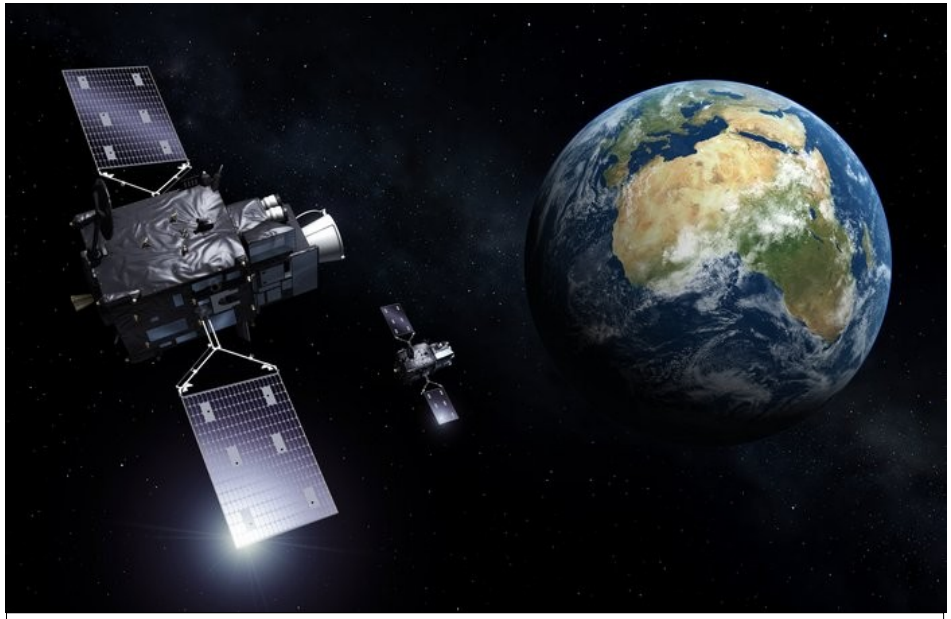
NWC SAF SW IN THE MTG ERA



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MTG: 3 main instruments in 2 satellites for nowcasting applications

MTG-I

- MTG-FCI
- MTG-LI

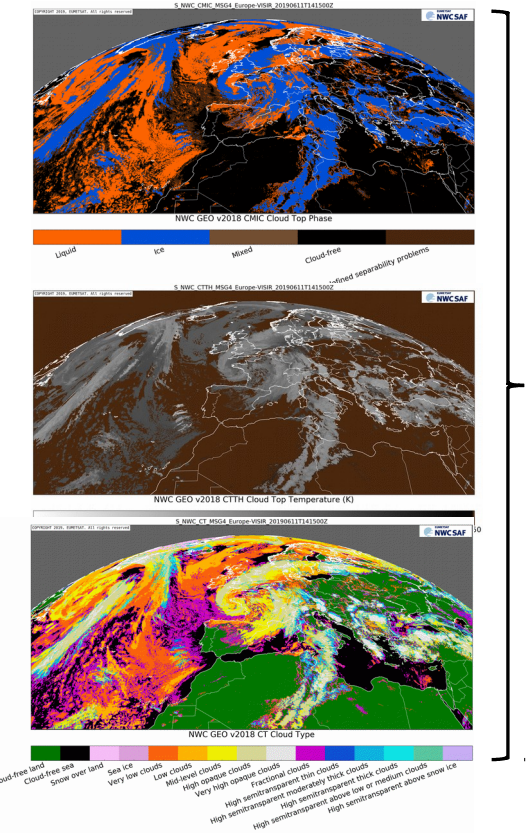
MTG-S

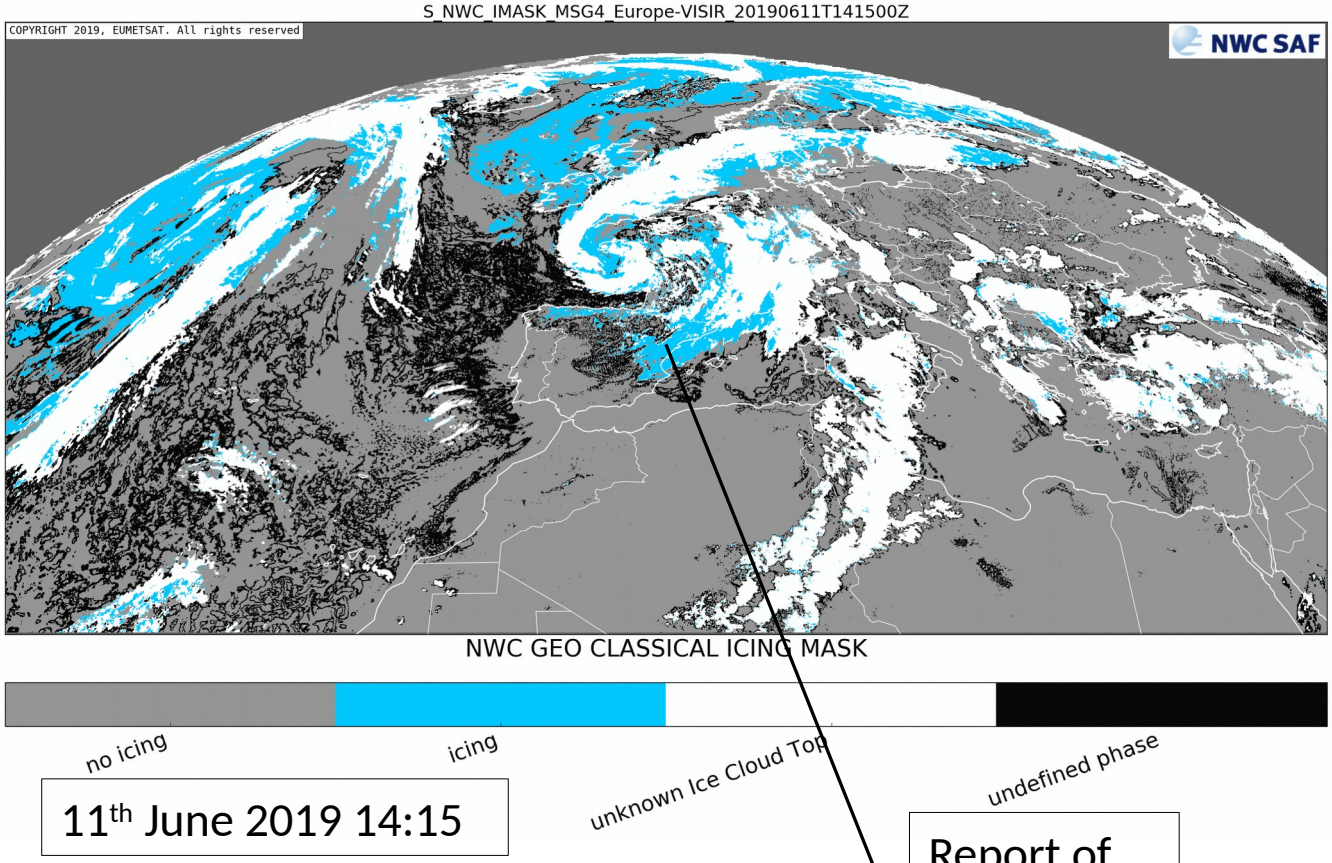
- MTG-IRS

The NWC SAF will provide to the users SW that provides services and generates products for the 3 MTG instruments and will allow to combine data of all of them with the aim of exploiting the synergies of all the MTG instruments

In-Flight / Airframe Icing

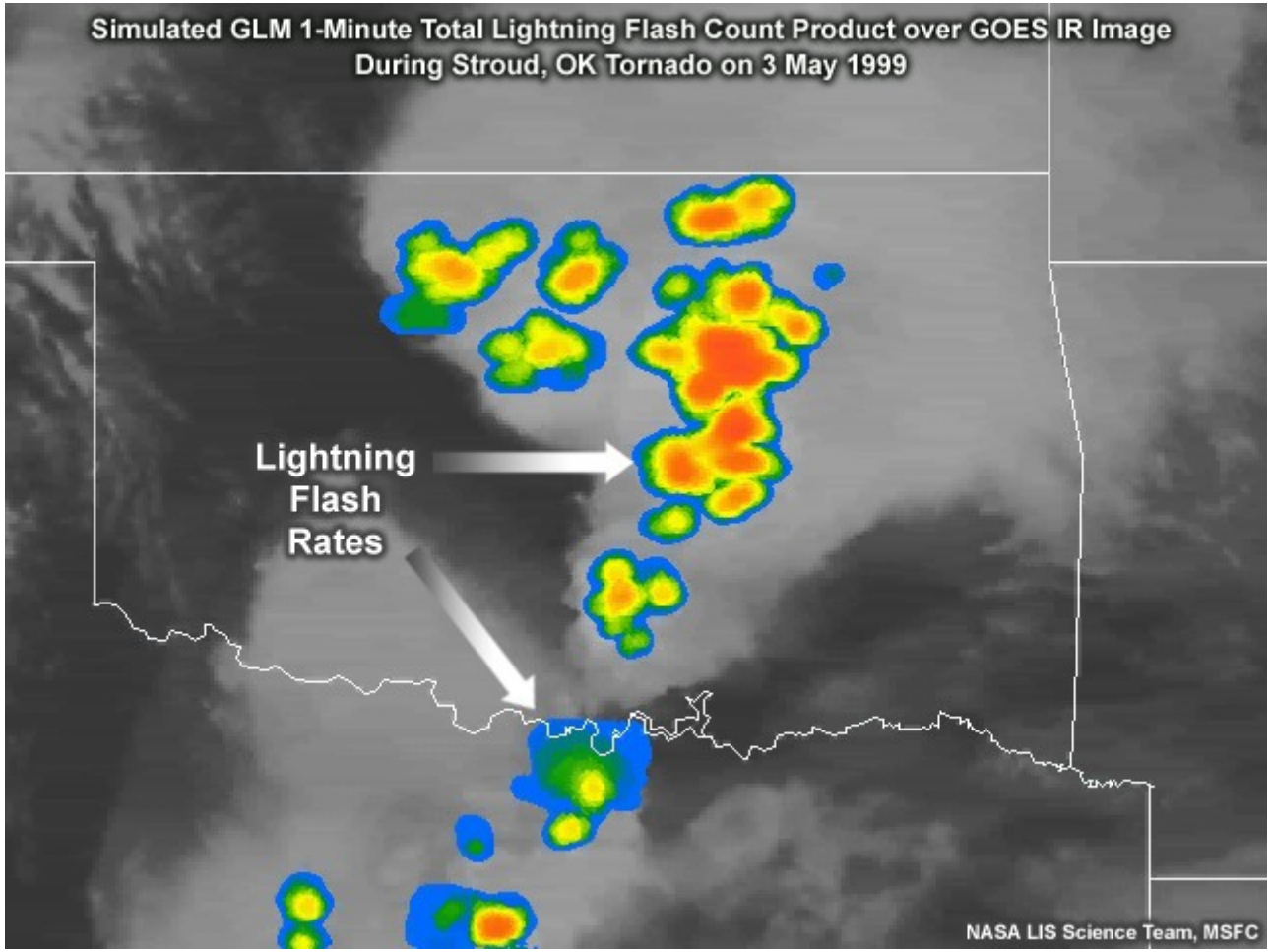
- "Normal" icing from ice accretion process on the aircraft airframe by supercooled water
- A prototype product for classical icing, derived from the cloud products (cmic_phase, ctth_tempe, ct) will be tested
- More info: Alexander Jann and Pilar Ripodas





New «Accumulated» LI Products

- Lightning Flash Rate
- More info: Andrei Diamandi



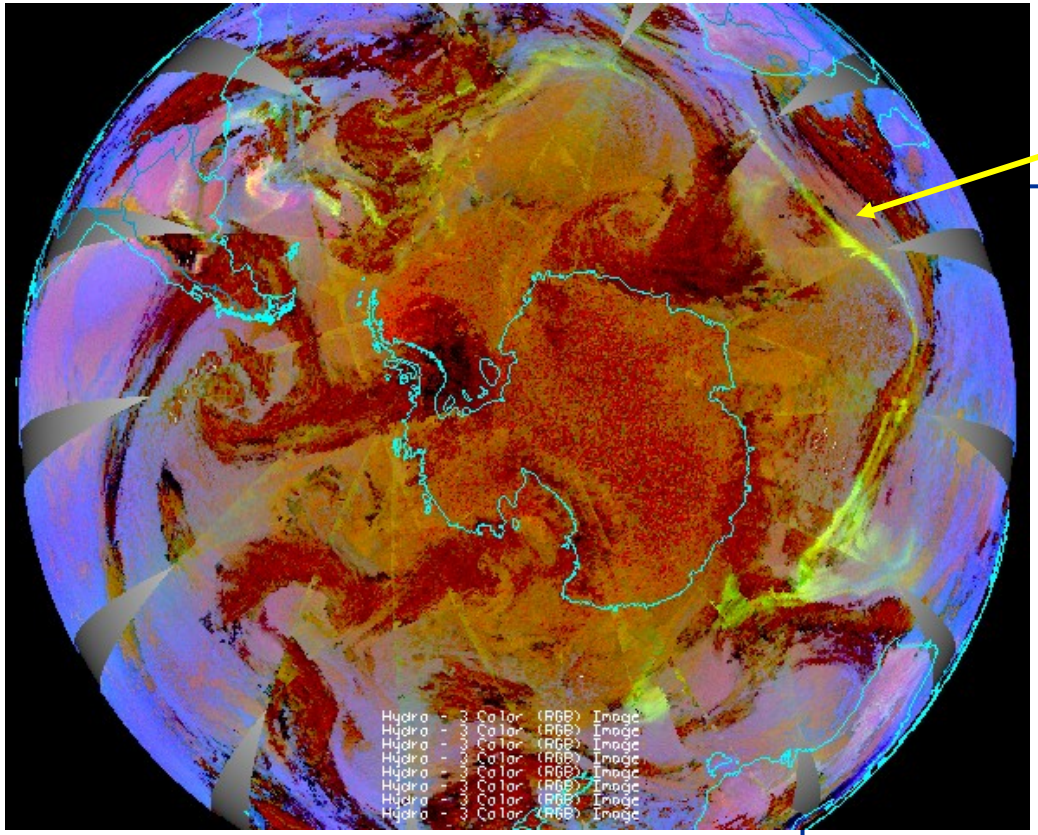
LI Products Issues

- There are many different accumulated products that can be derived from LI data depending how events, groups and flashes are combined
- There are two products which have been found useful in the US: average flash area and average group area
- These products are NOT going to be generated at EUMETSAT HQ
- Both of these products need the event data which will NOTt be disseminated via EumetCast → cannot be generated with the NWC SAF software
- What to do?

MTG-IRS Infrared Sounder Products: qIRS

IASI dust RGB on Eruption from the Cordon-Caulle volcano

9th June 2011 22:24Z to 10th June 2011 10:35Z

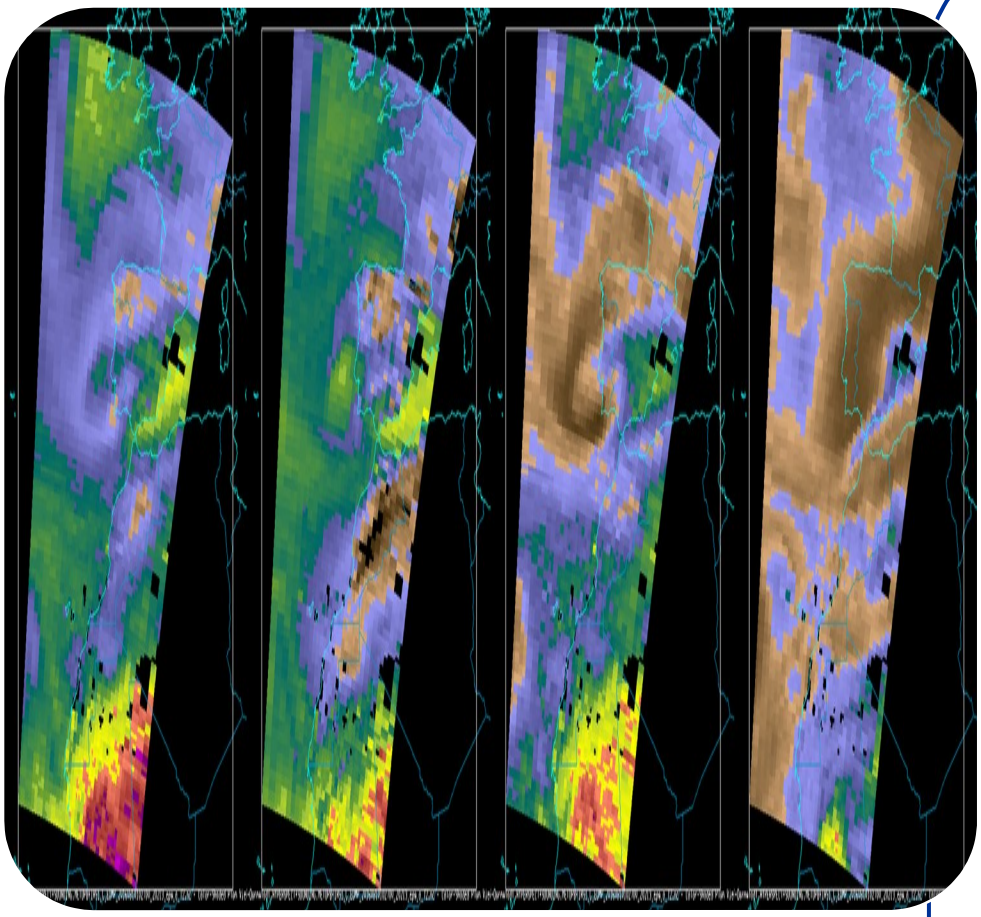


Volcanic ash and SO_2

qIRS: Quick IRS product

- **Principal Components to BTs conversion and IRS L1 images generation on NWC SAF region:** PC to BTs at dwells, combination and reprojection of users selected MTG-S L1 BTs from dwells to user NWC SAF defined regions.
- Generation of IRS L1 imagery related products; as example RGB images.

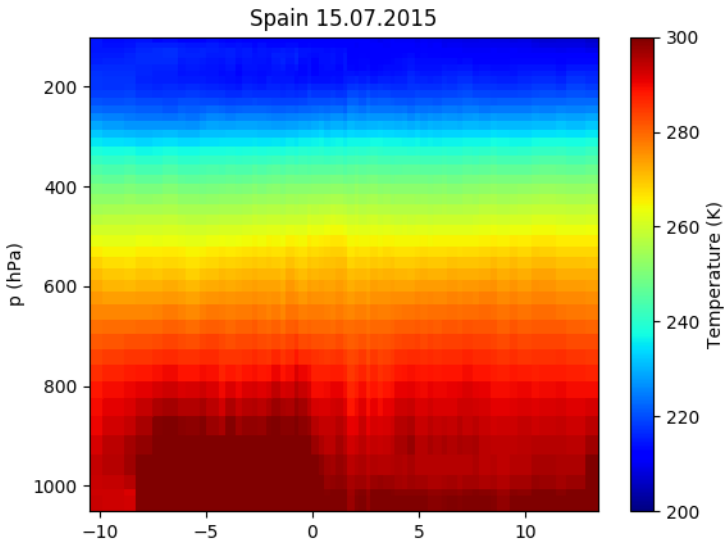
MTG-IRS Infrared Sounder Products: sSHAI_ES

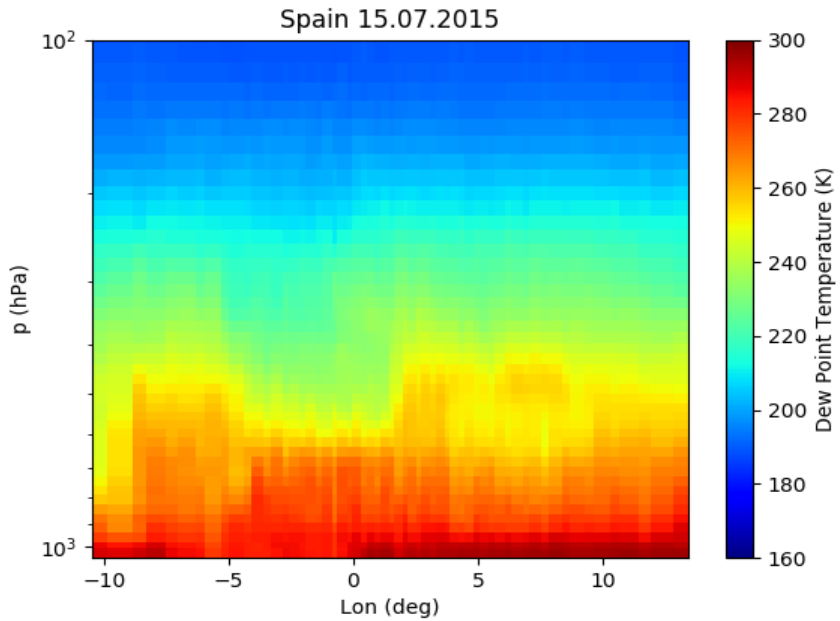


sSHAI_ES: sounder Satellite Humidity And Instability from Eumetsat Secretariat

- EUMETSAT Secretariat(ES) MTG-IRS L2 service
- All cloud piecewise linear regression retrievals
- Constant coefficients applied
- NPW forecast free
- Useful for Nowcasting, Climate and NWP assimilation
- NWC SAF will evaluate humidty and instability
- NWC SAF will reproject to FCI grid

MTG-IRS Infrared Sounder Products: sSHAI





sSHAI: sounder Satellite Humidity

- NWC SAF locally generated retrievals
- All cloud non-linear Kernel Ridge Regression retrievals
- Coefficients calculated daily
- With and without NPW forecast as input
- Targetted toward Nowcasting
- NWC SAF will evaluate humidty and instability
- NWC SAF will reproject to FCI grid

More info: M.A. Martínez, Niobe Peinado

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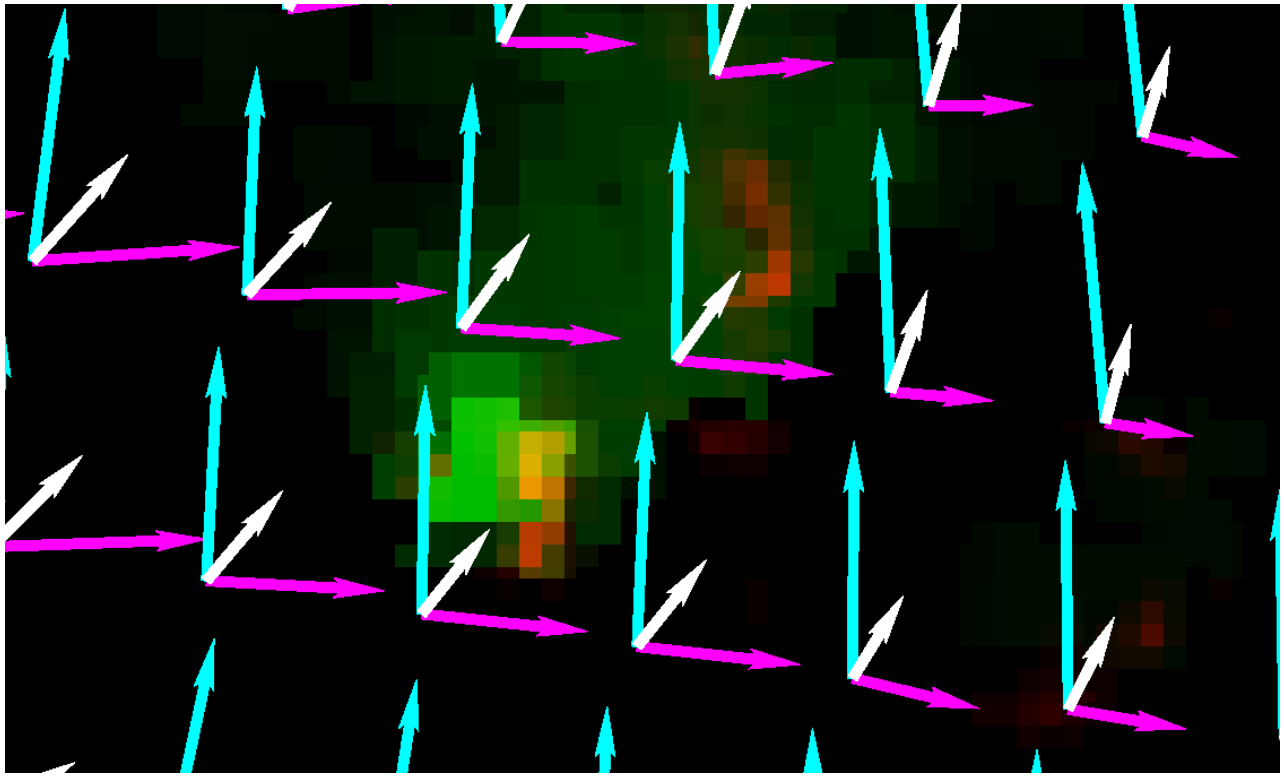
Combining Radar and Satellite precipitation

- Combining Radar and Satellite precipitation is not easy because they are often inconsistent

- Long term project to try to find the physical reasons behind this inconsistency

- Which links with a more long term goal of finding the dynamics of convection via satellite data

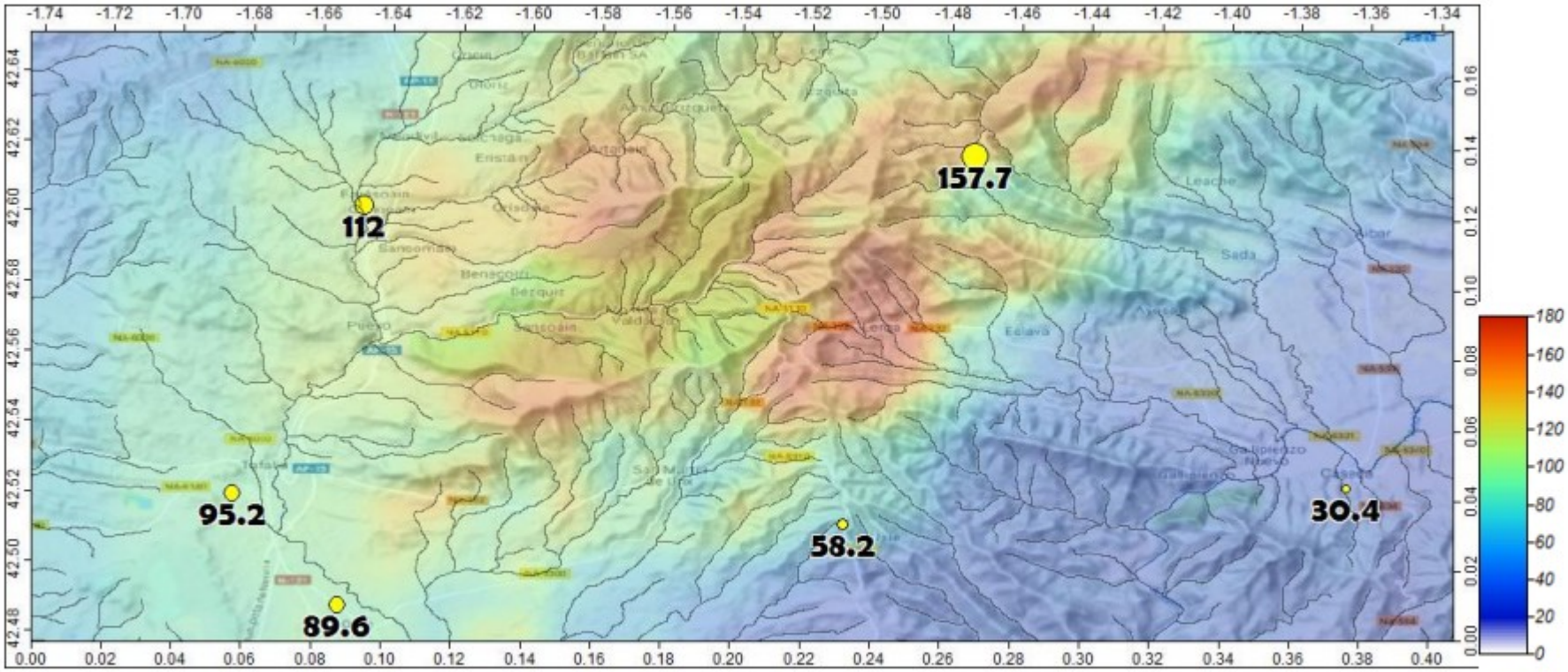
Combining Radar and Sat precipitation



- Satellite precipitation in green
- Radar precipitation in red
- Three velocities: wind mean, right and left Bunkers
- More info: Arantxa Revuelta

Easier mid-term solution: Integral QPE

- AEMET has prototype QPE using rain gauges, satellite and radar
- Needed for flash flood identification

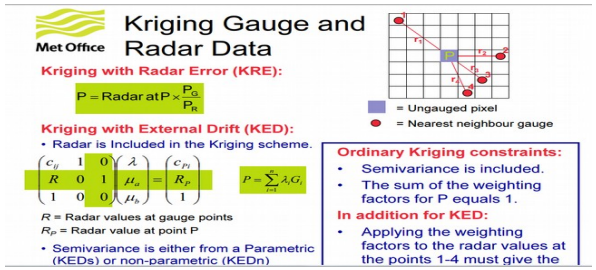


Prototype AEMET Integral QPE

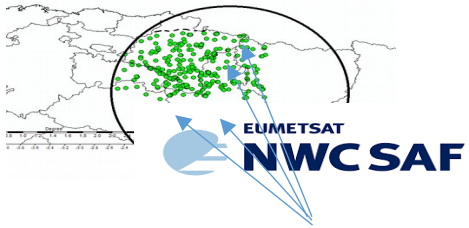
New method: QPE based on (geo-)statistical techniques and local approach

Temporal and spatial high resolution precipitation fields (1 hour – 1 sq. km) obtained by applying local geostatistical approaches :

1. KED scheme:



In addition to radar (*sri*), satellite-based estimation product (*crr* from NWC SAF) is also used as ancillary information for KED.



2. mMFB (“*modified*” *Mean field bias)*

Similar to MFB approach but bias is spatially interpolated .

Local approach: the estimation is improved through the use of as many as possible rain data (networks of AWS belonging to official institutions: hydrological, agriculture, regional networks, crowdsourcing (future)). The approach provides a precipitation field for hydrological purposes (flash-flood forecast, early-warnings, etc.)

More info: Peio Oria

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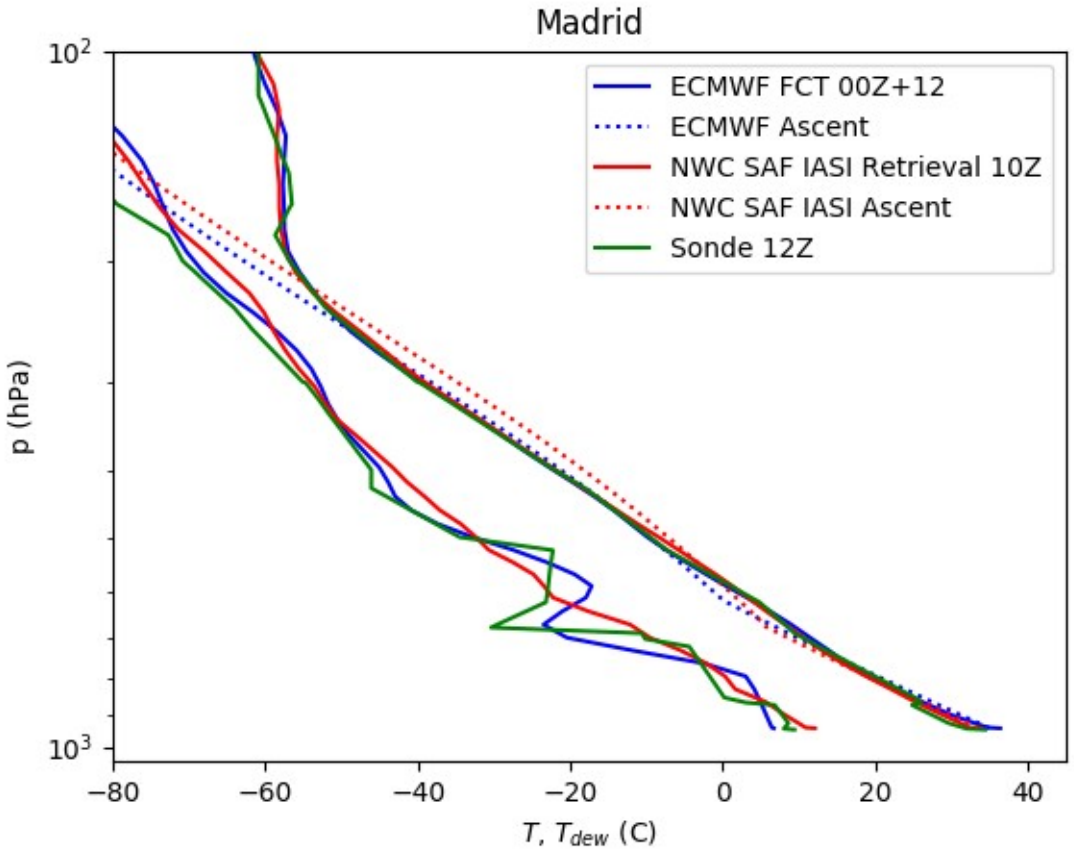
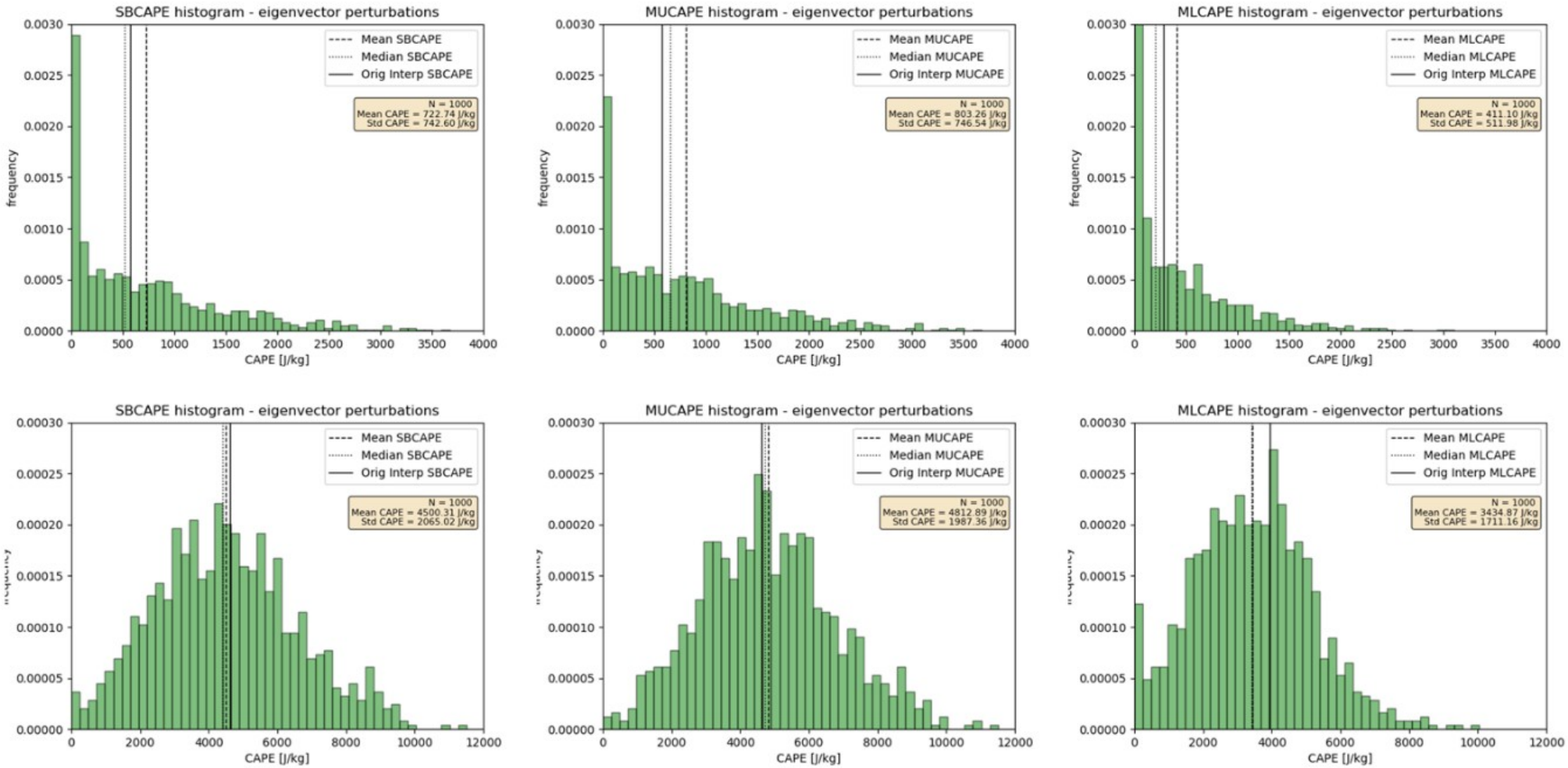
MTG-IRS Infrared Sounder Products: sSHAI



CAPE varies a lot from one profile to another!

MTG-IRS Infrared Sounder Products: sSHAI



CAPE distribution varies significantly!

More info: Jana Campa

MTG-IRS Infrared Sounder Products: sSHAI

- NWC SAF will try to complement Infrared Sounder profile data with surface based

- Tests will be carried out this year

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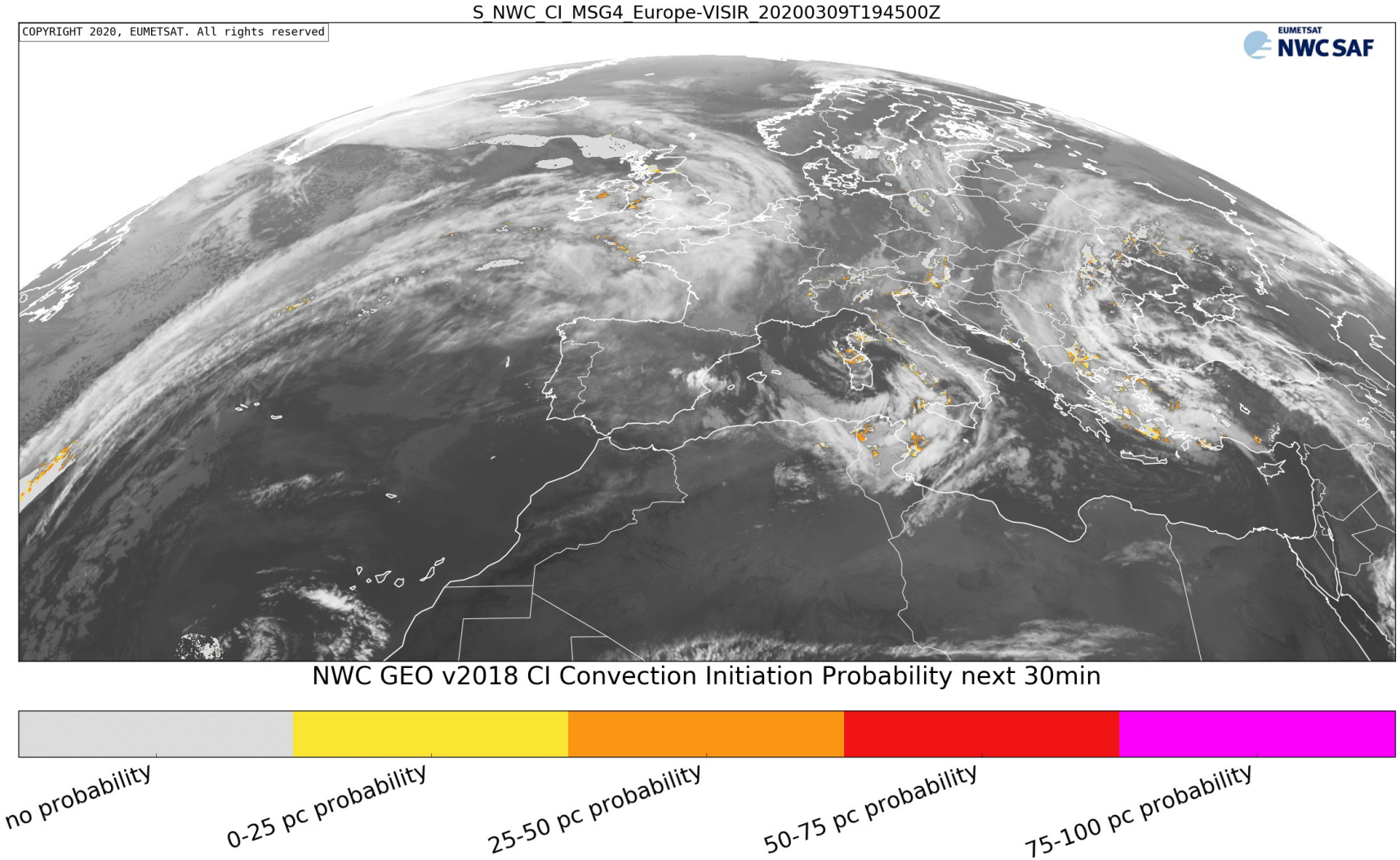
Convective Initiation (CI)

- CI has significantly improved in v2018. It can be further improved

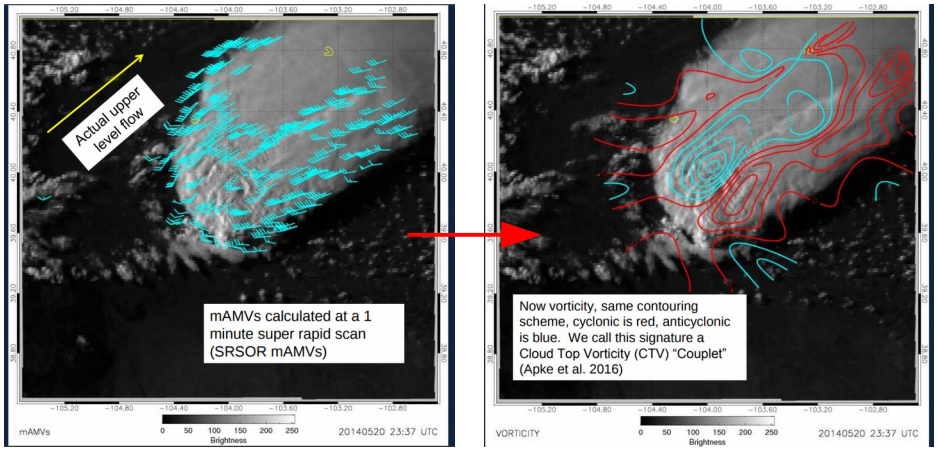


Dynamics from Satellite?

Could a more precise determination or modelling of cloud dynamics from satellite data help in these situations?

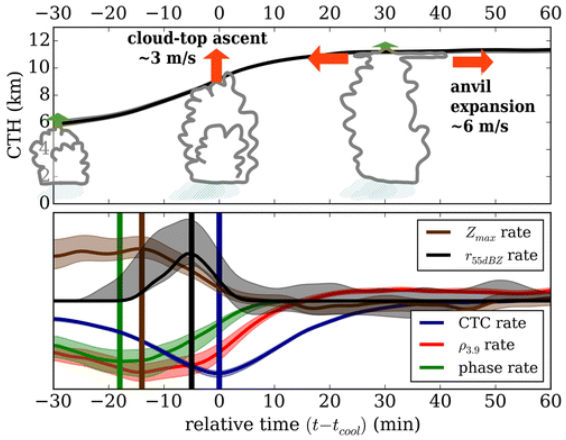
- Winds from RSS:

  → Potential to determine kinematics at cloud top (Apke et al., CWG 2016)



- Determination of updraft strengths:

  → From anvil or cloud top area determination (Senf and Deneke, CWG 2018)



NWC SAF via CI/RDT will most likely explore this

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Combination/Simplification of products

- Too many products for a forecaster!!!
- Need to simplify or combine products: complicated
- Mid-term solution: improve visualization

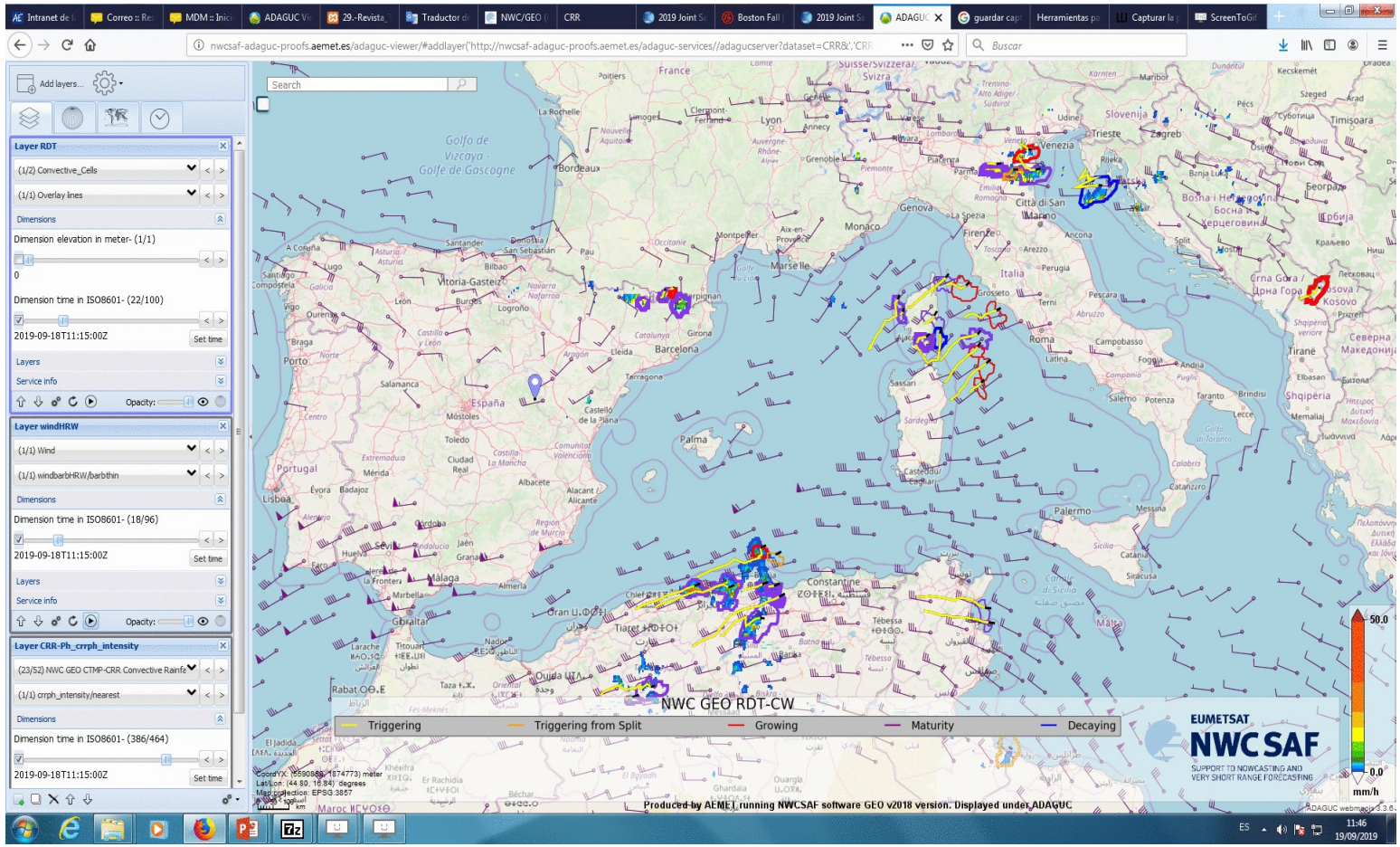
Visualization/Distribution with ADAGUC

18th September 2019

Three products

- RDT-CW
- CRR-Ph
- HRW

On OpenStreetMap



http://nwcsaf-adaguc-proofs.aemet.es/adaguc-viewer/

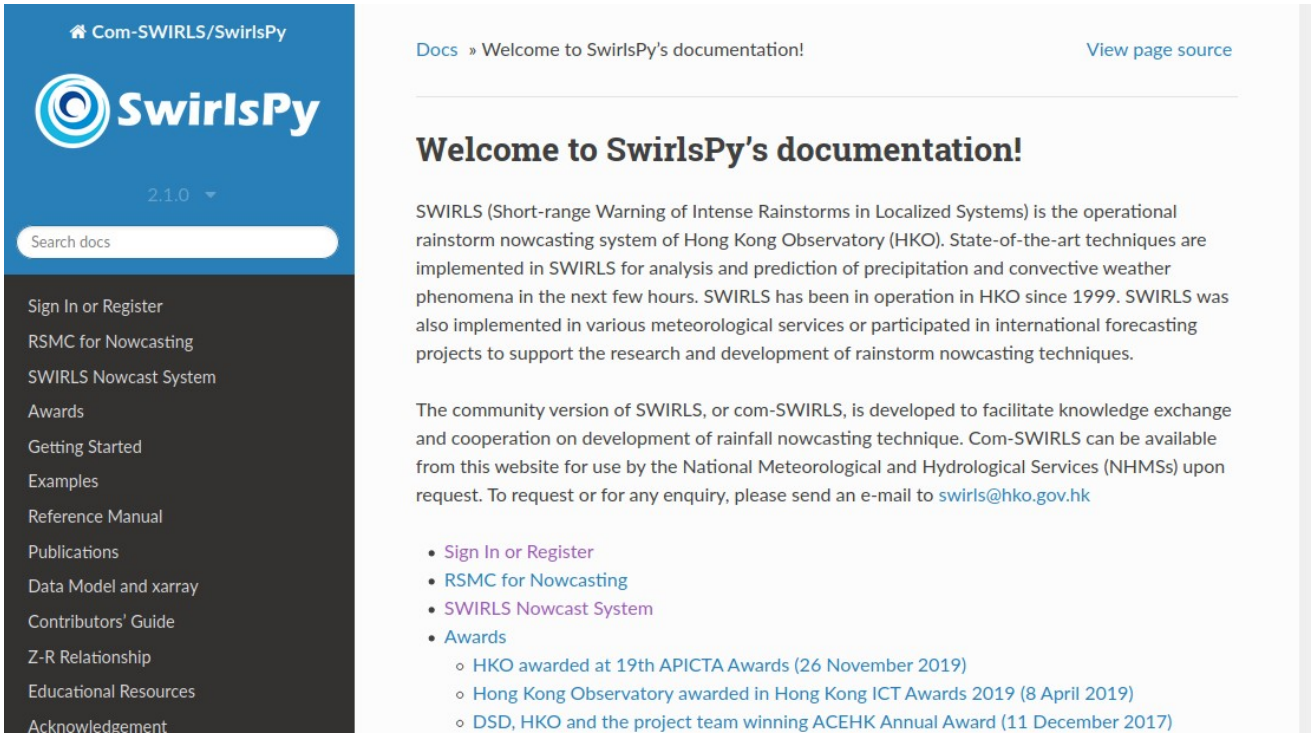
Visualization/Distribution with ADAGUC

- Developed by KNMI (Netherlands)
- Completely Open Source
- Has two server components: ADAGUC services and ADAGUC server
- Has two clients which are web visualizers: ADAGUC viewer and GeoWeb
- Will be operational for NWC SAF in a few weeks
- Inputs are HDF5, NetCDF4, GeoJSon and CSV
- Outputs are Web Mapping Services (WMS) for online visualization, Web Feature Services (WFS) for downloading vector data, Web Coverage Services (WCS) for downloading raster data and OpenDAP

KNMI ADAGUC - http://adaguc.knmi.nl/

Integration with Nowcasting com-SWIRLS suite

- Developed by Hong Kong Observatory
- Nowcasting suite integrating radar and surface station data
- Integrating it to NWC SAF



HKO com-SWIRLS - https://docs.com-swirls.org/

Conclusions

- NWC SAF Products are useful for Nowcasting and other applications
- More information at nwc-saf.eumetsat.int
- More detailed practical guide at http://www.nwcsaf.org/web/guest/practical-guide
- Products in near real time at http://nwcsaf-adaguc-proofs.aemet.es/adaguc-viewer/
- Some of the MTG products will be a challenge to make. In particular from new instruments MTG-IRS instabilities and useful LI products