

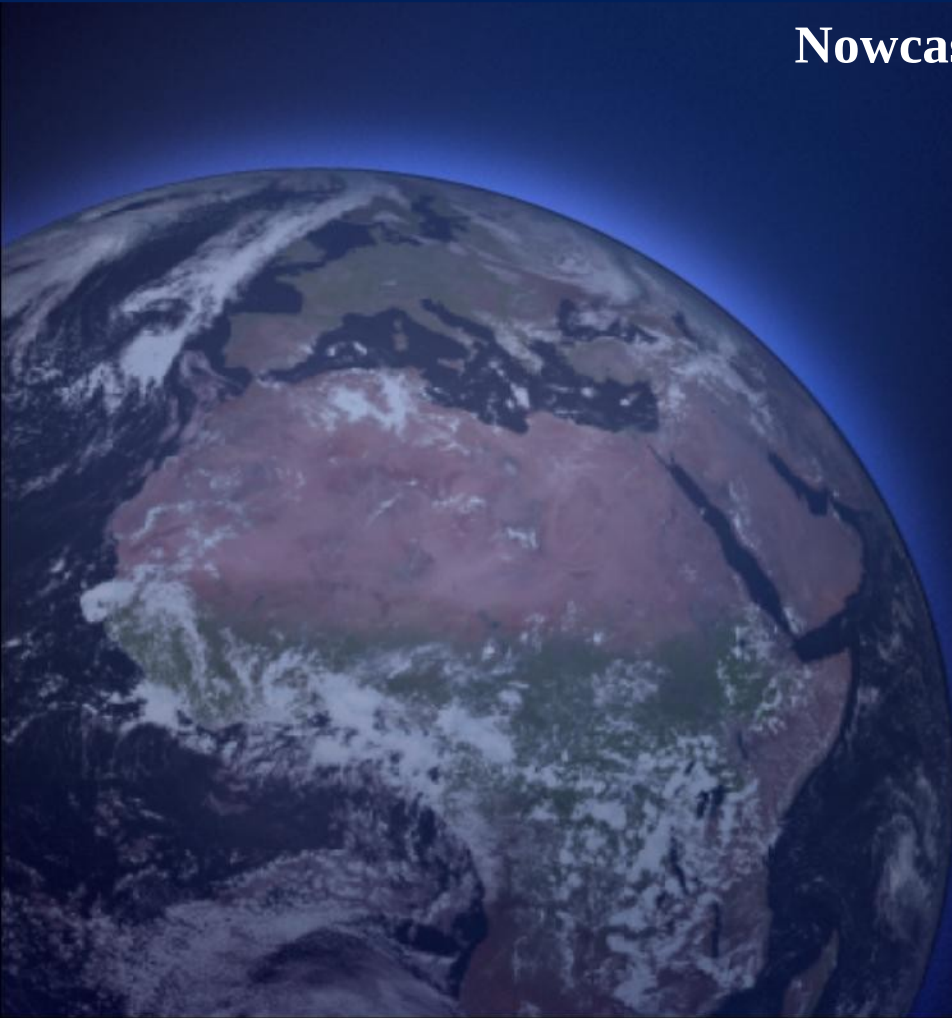
# Outlook into new MTG Nowcasting products and towards an integrated approach

20 April 2020

Xavier Calbet (AEMET)

and

Nowcasting SAF Team



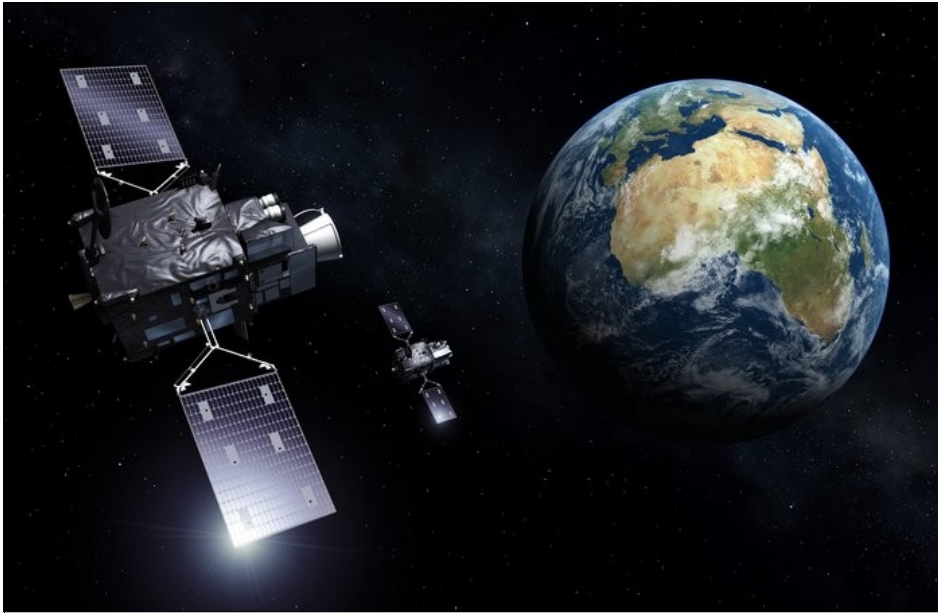
# Summary

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



METEOSAT THIRD GENERATION. Copyright ESA

MTG: 3 main instruments in 2 satellites for nowcasting applications

## MTG-I

- MTG-FCI
- MTG-LI

## MTG-S

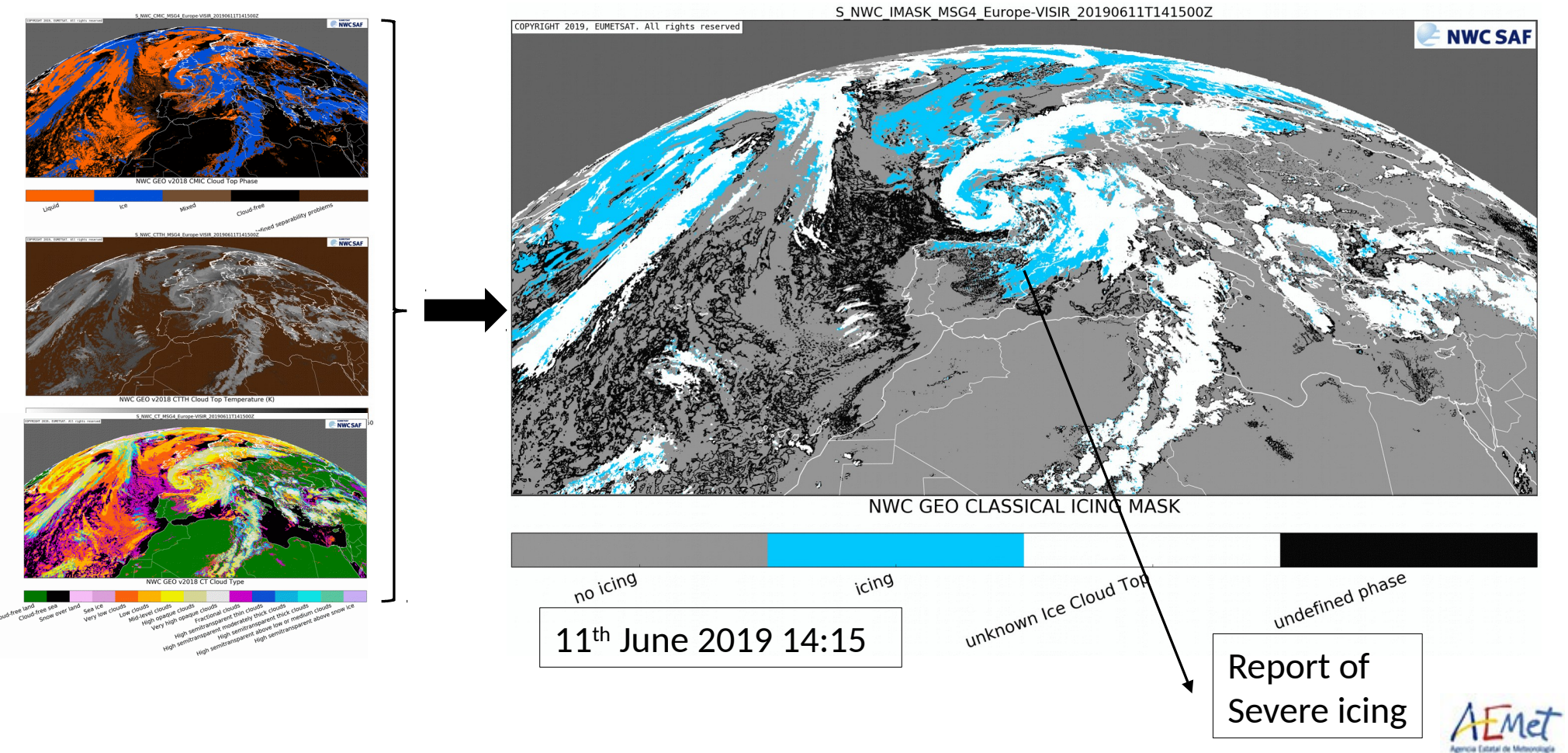
- MTG-IRS

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



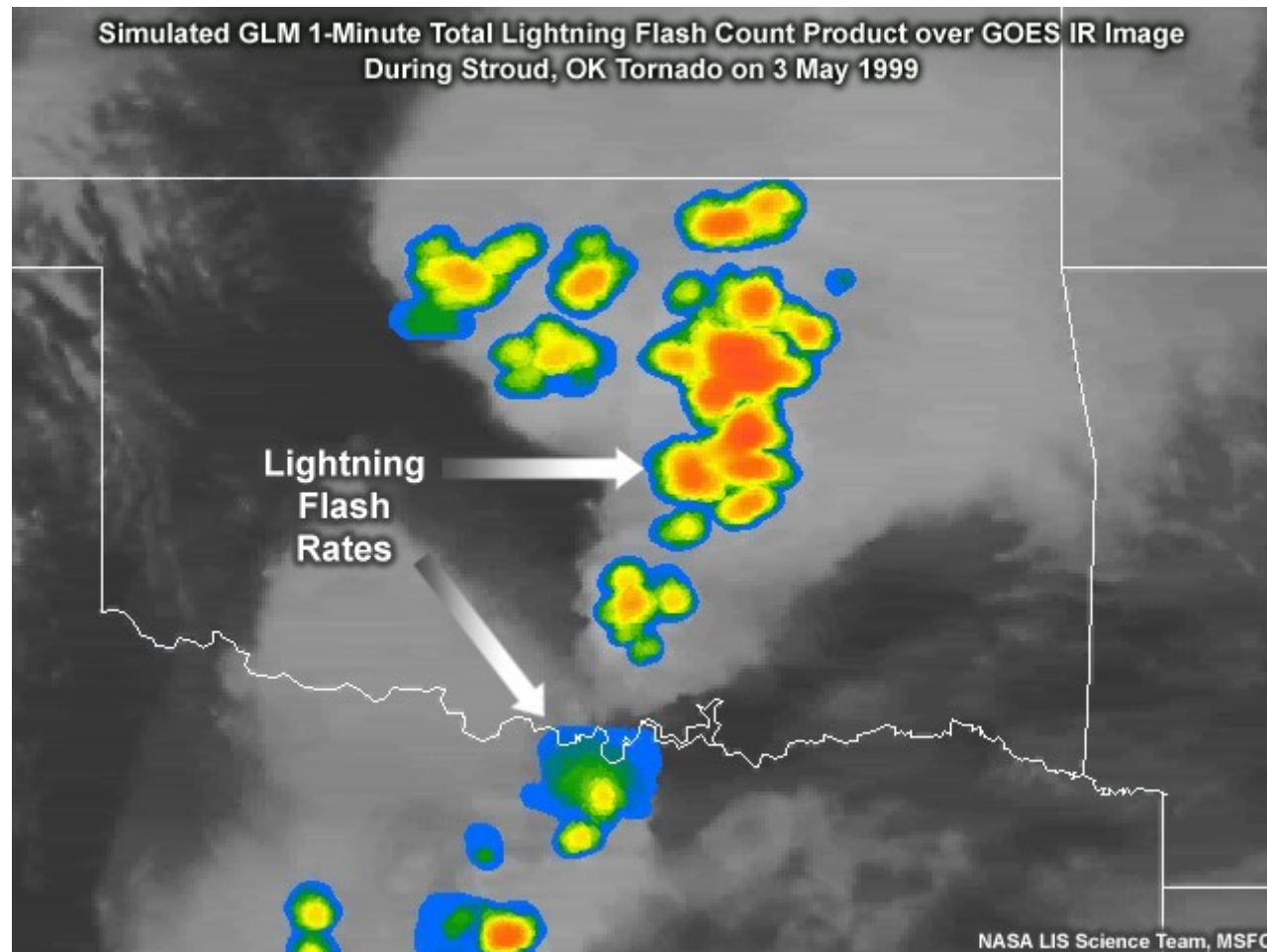
# In-Flight / Airframe Icing

- “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

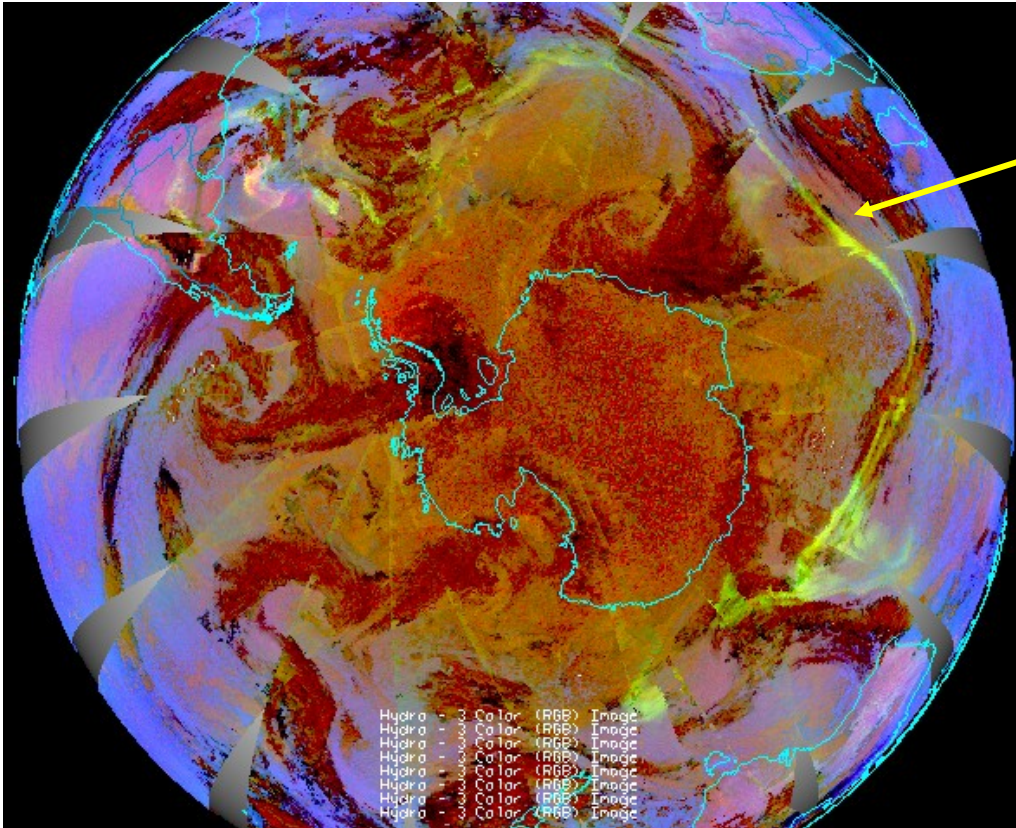
- There are many **different accumulated products** that can be derived from LI data depending how events, groups and flashes are combined
- There are two products which have been found useful in the US: **average flash area** and **average group area**
- These products are **NOT** going to be generated at EUMETSAT **HQ**
- Both of these products need the **event data** which will NOT 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

*9<sup>th</sup> June 2011 22:24Z to 10<sup>th</sup> June 2011 10:35Z*



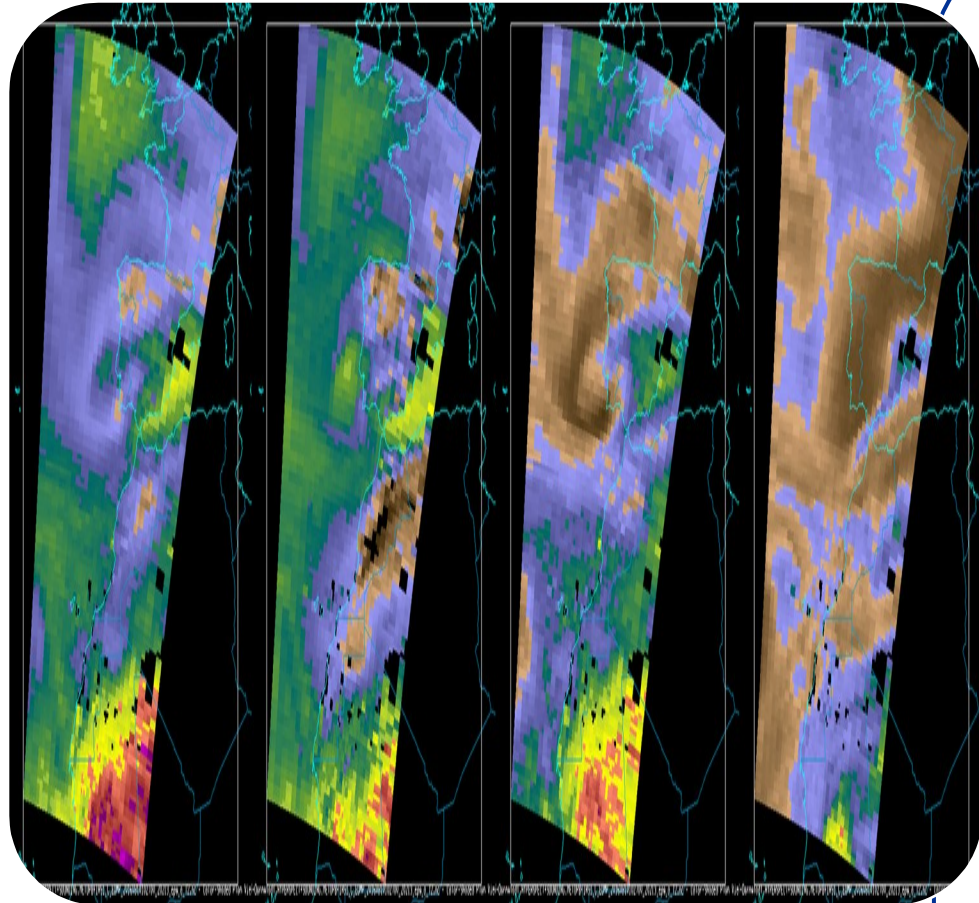
Volcanic ash and SO<sub>2</sub>

### 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.



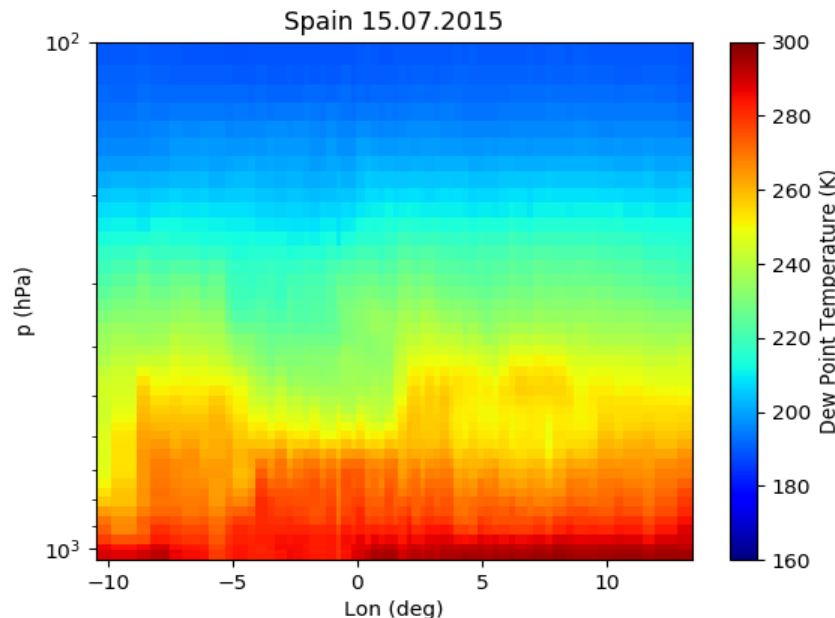
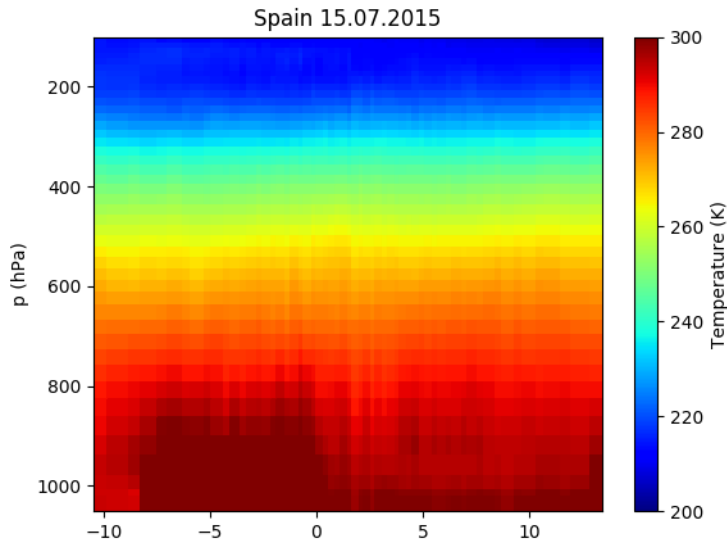
# MTG-IRS Infrared Sounder Products: sSHAI\_ES



## **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  
humidity 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 humidity and instability
- NWC SAF will reproject to FCI grid

More info: **M.A. Martínez,**  
**Niobe Peinado**

# Summary

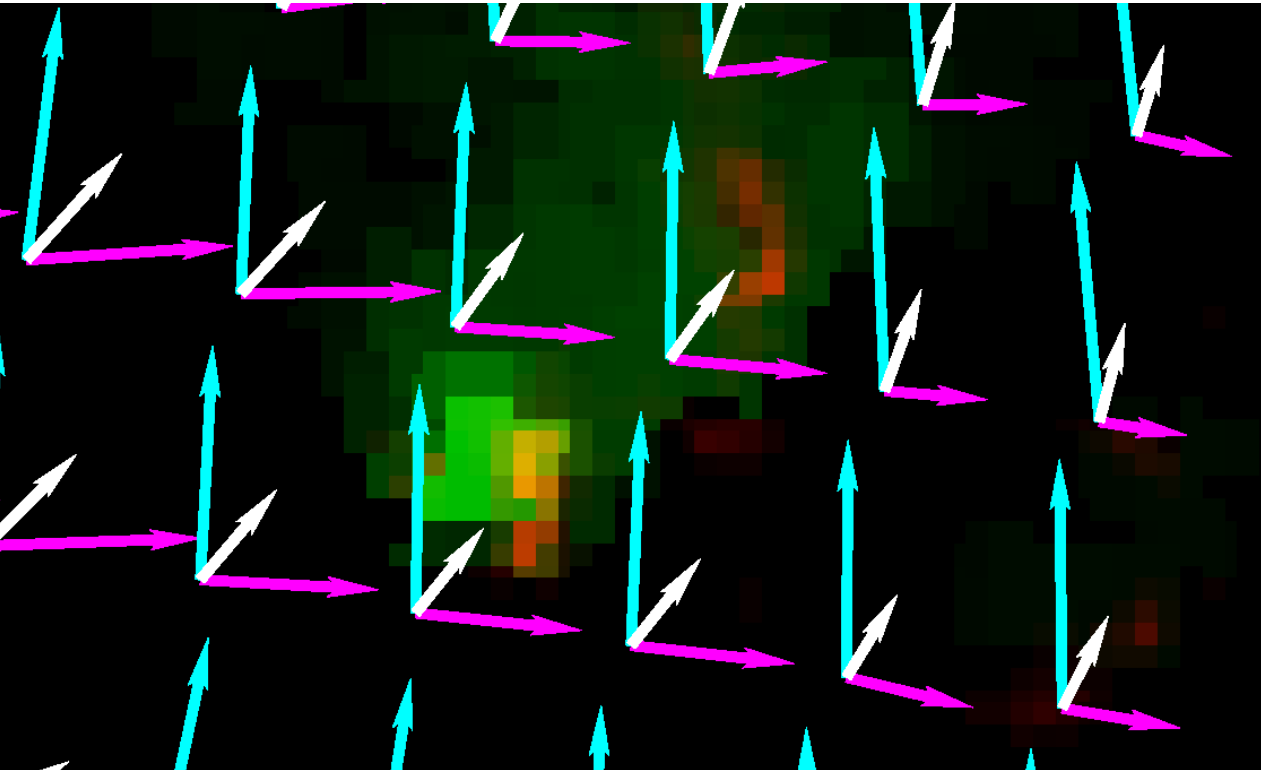
1. New foreseen products
2. **Product limitations and solutions**
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# Combining Radar and Satellite precipitation

- 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



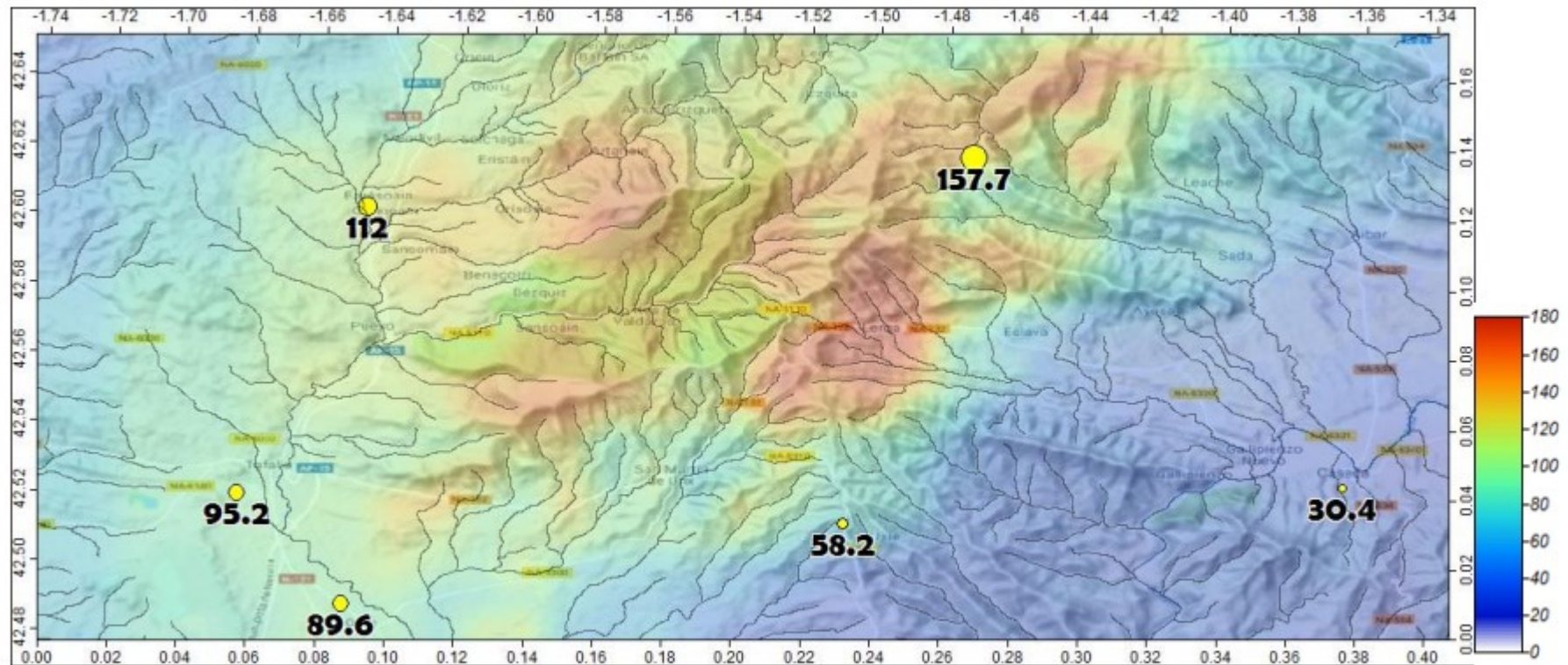
# Combining Radar and Sat precipitation



- 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

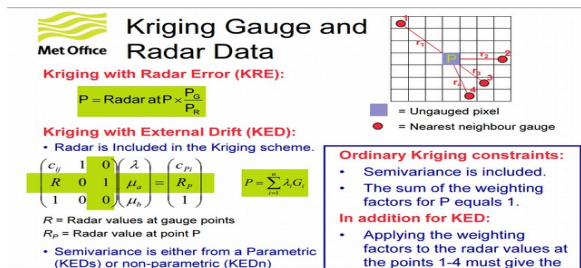


# Prototype AEMET Integral QPE

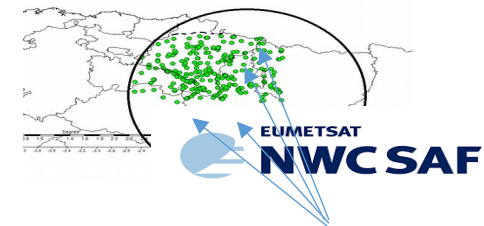
New method: QPE based on (geo-)statistical techniques and local approach

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.



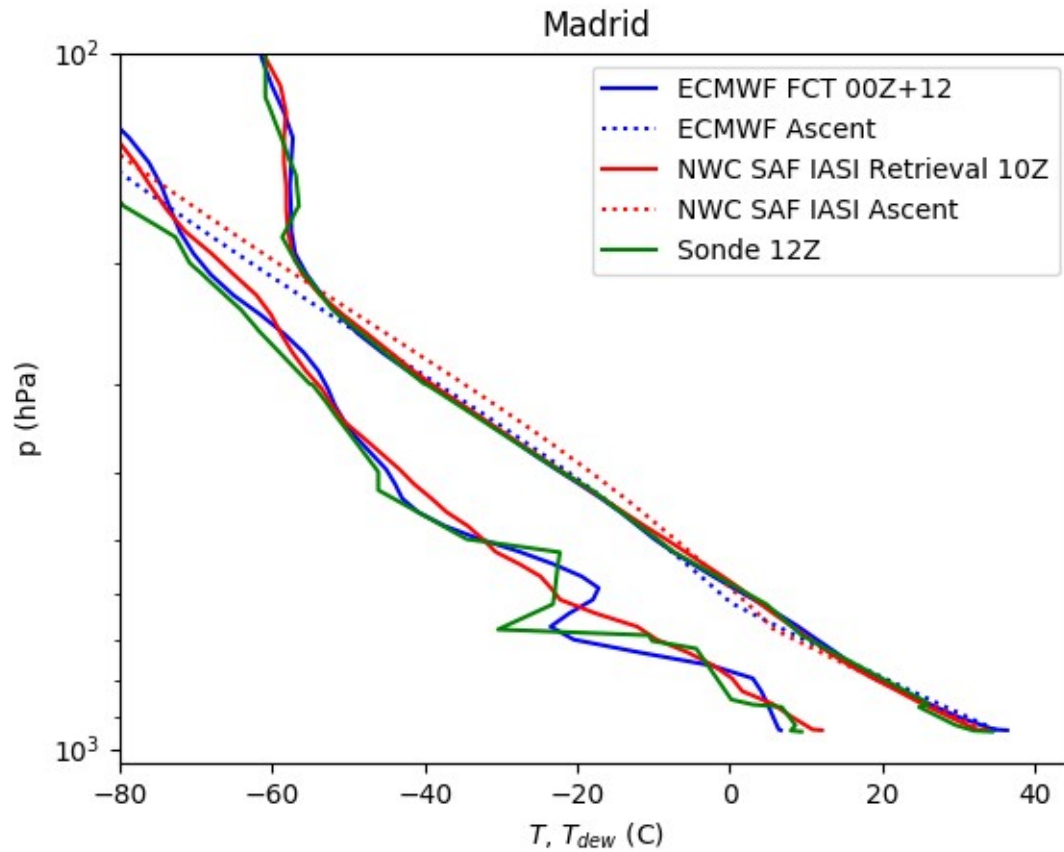
## 2. mMFB (“modified” Mean field bias)

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**

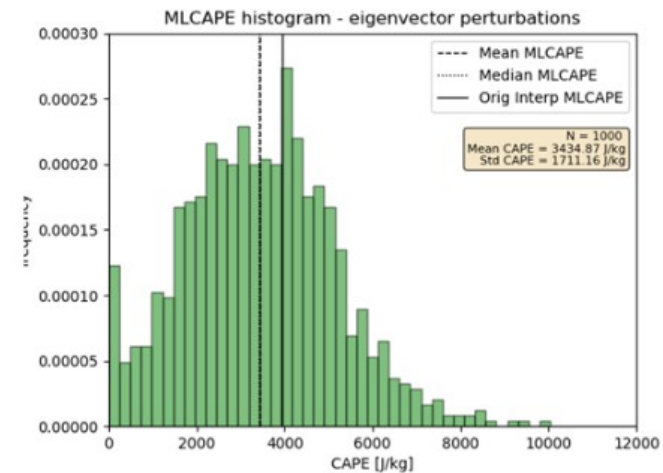
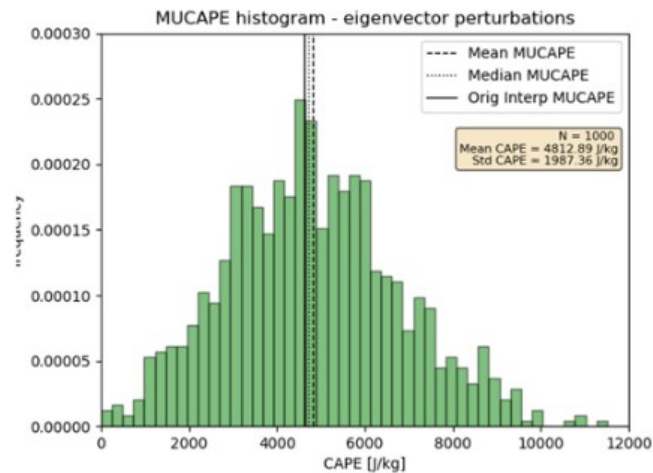
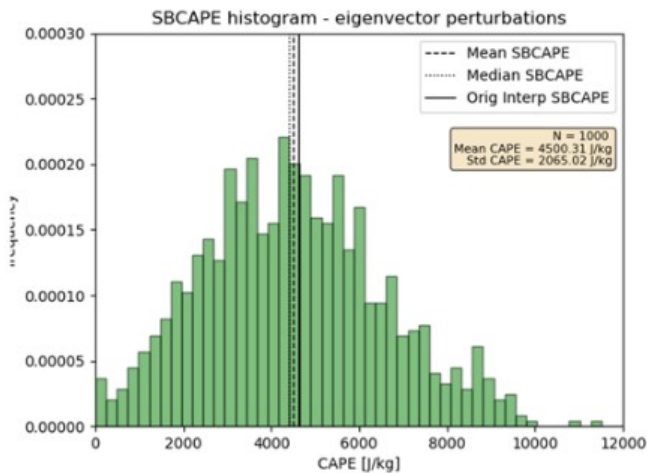
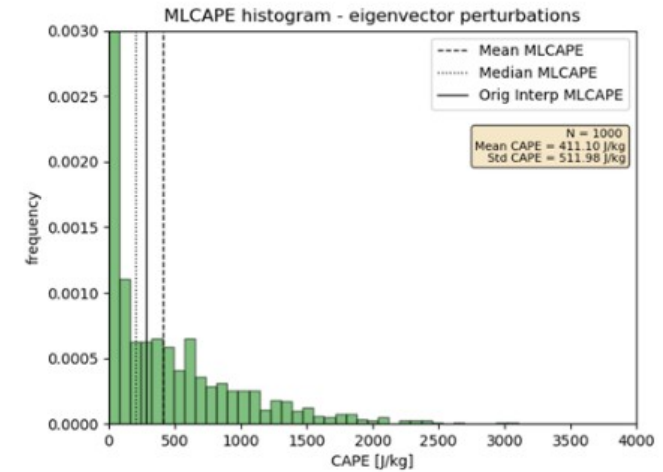
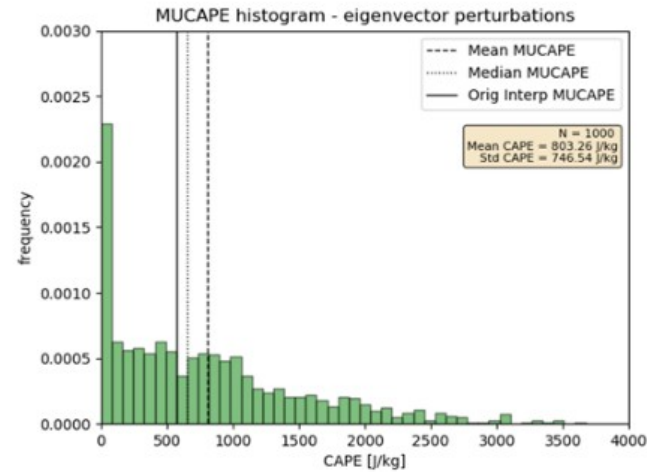
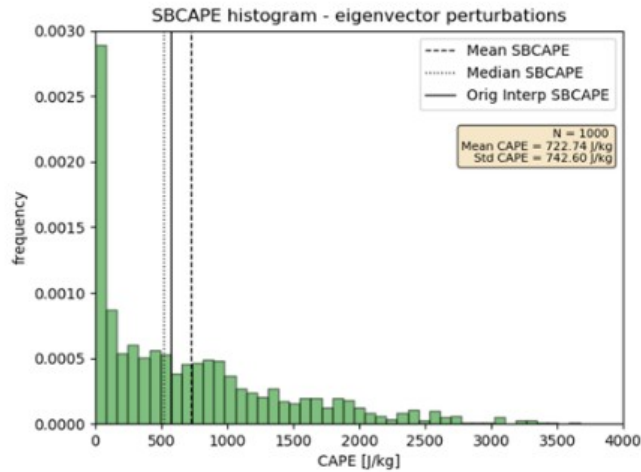
# MTG-IRS Infrared Sounder Products: sSHAI



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

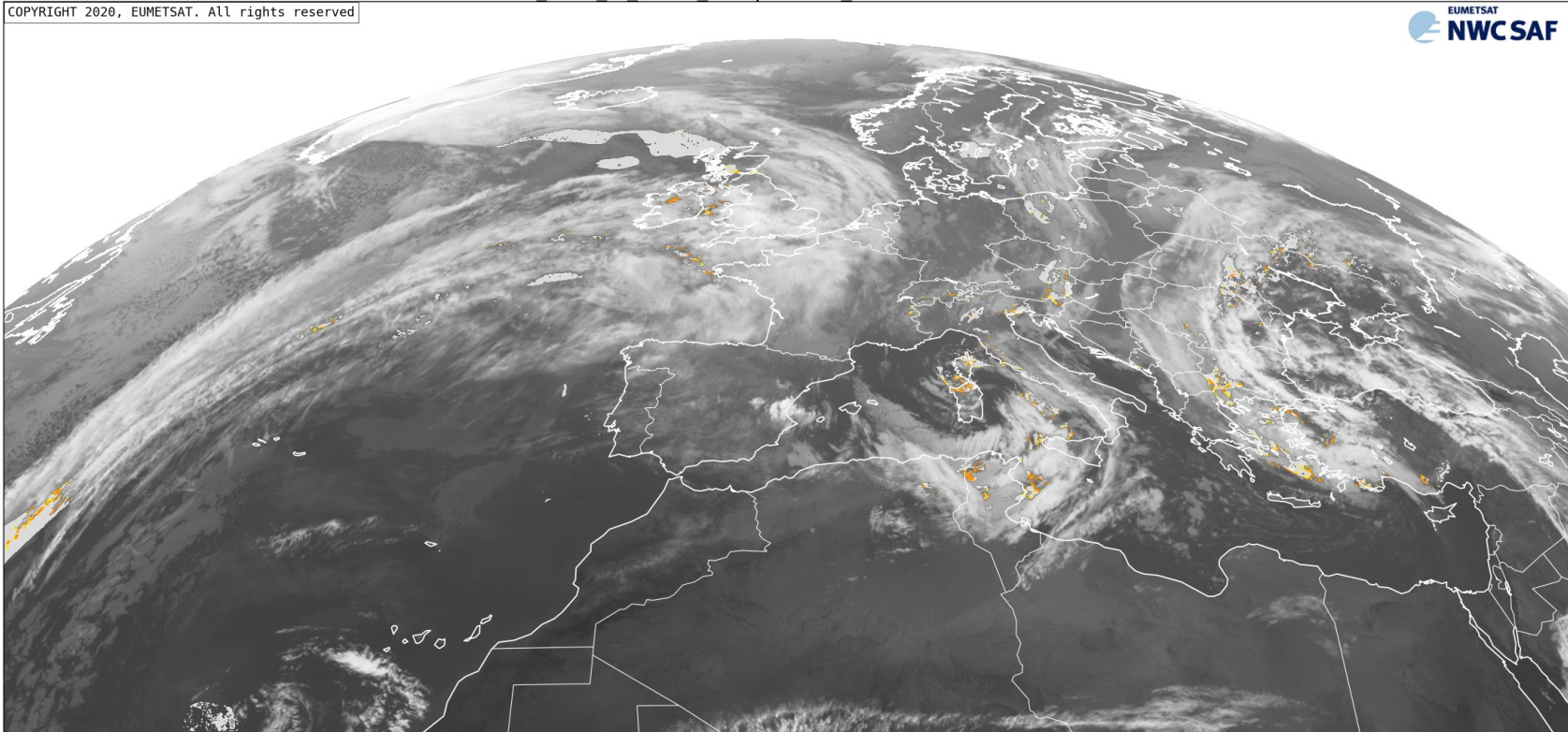
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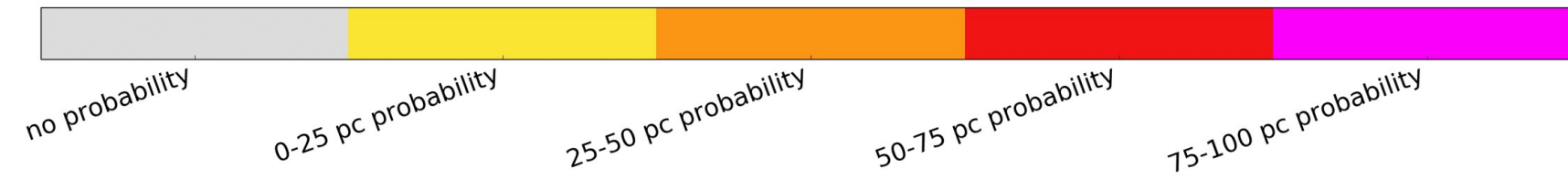
# Convective Initiation (CI)

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

S NWC CI MSG4 Europe-VISIR 20200309T194500Z



NWC GEO v2018 CI Convection Initiation Probability next 30min

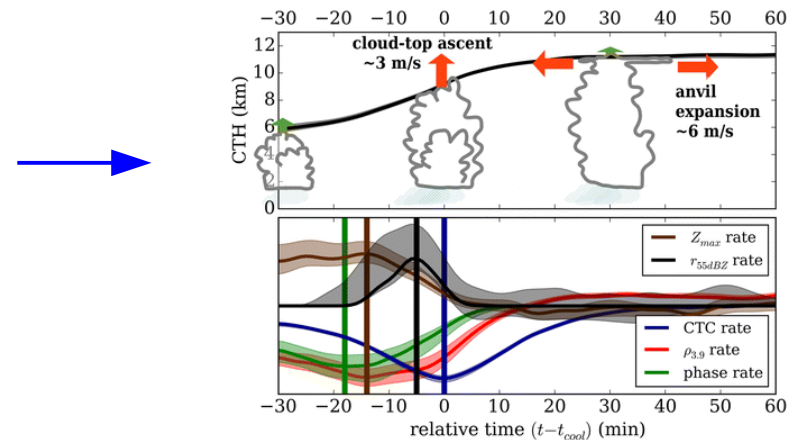
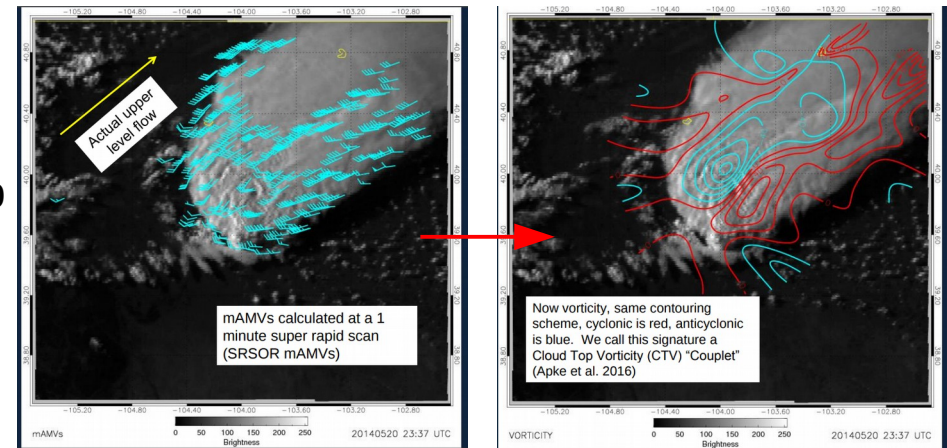




# Dynamics from Satellite?

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

# Summary

1. New foreseen products
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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

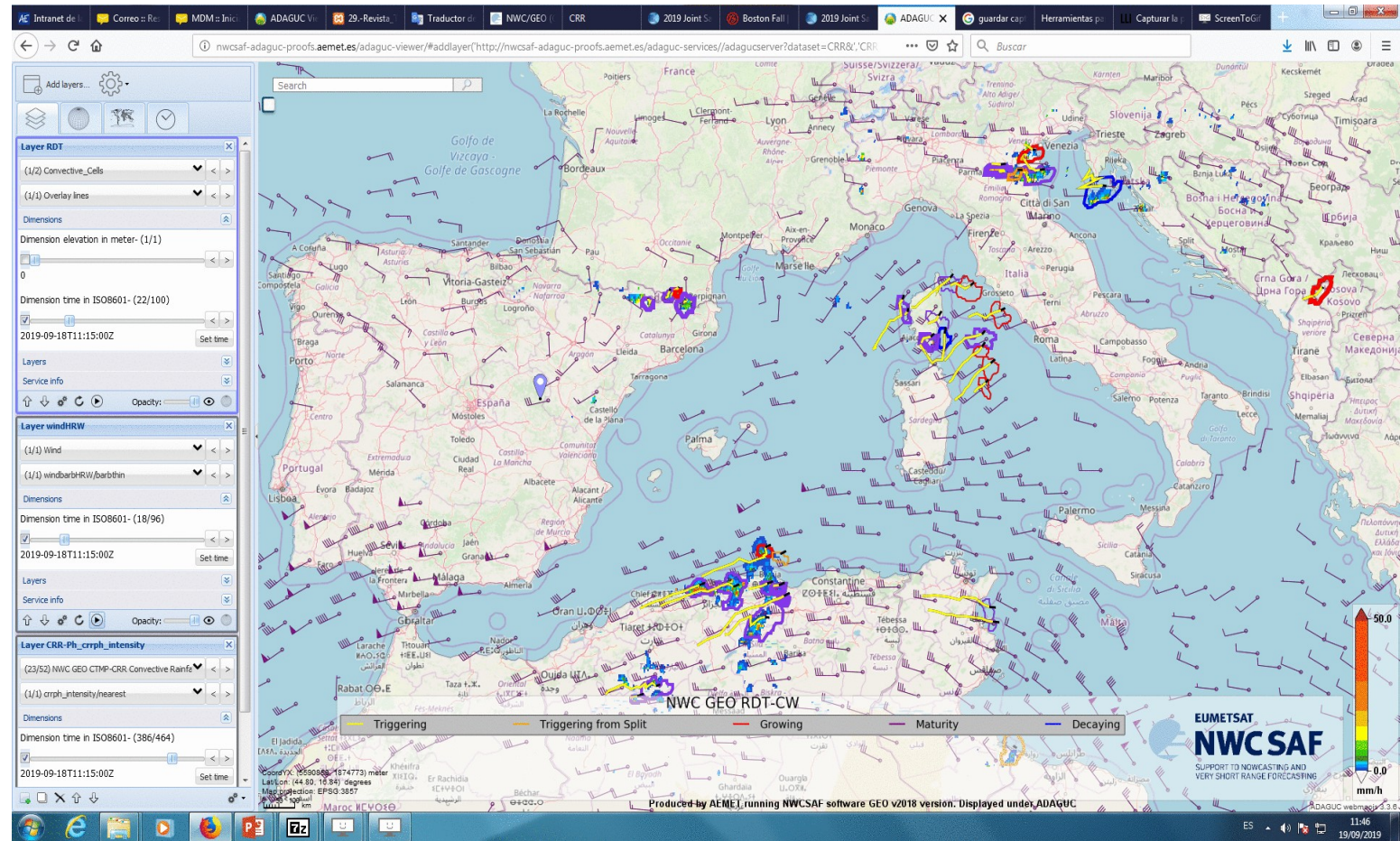
# Visualization/Distribution with ADAGUC

18th September  
2019

Three products

- RDT-CW
- CRR-Ph
- HRW

On OpenStreetMap



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

[nwc-saf.eumetsat.int](http://nwc-saf.eumetsat.int)



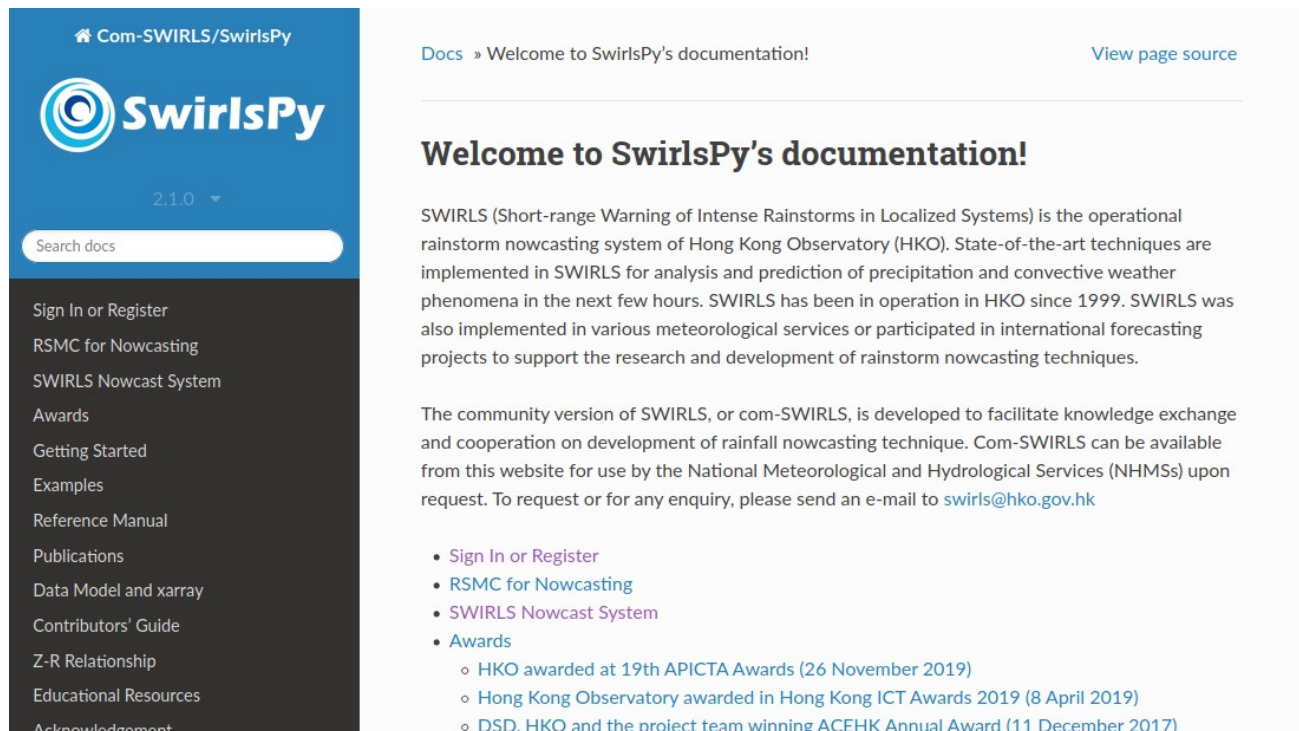
# Visualization/Distribution with ADAGUC

- 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



The screenshot shows the documentation page for SwirlsPy. The left sidebar is dark blue with white text for navigation links. The main content area is white with a blue header. The header includes the 'Com-SWIRLS/SwirlsPy' logo and version '2.1.0'. The main text area has a heading 'Welcome to SwirlsPy's documentation!' followed by a paragraph about SWIRLS and a section for the community version. A list of links is provided at the bottom of the main content area.

Com-SWIRLS/SwirlsPy

SwirlsPy

2.1.0

Search docs

Sign In or Register  
RSMC for Nowcasting  
SWIRLS Nowcast System  
Awards  
Getting Started  
Examples  
Reference Manual  
Publications  
Data Model and xarray  
Contributors' Guide  
Z-R Relationship  
Educational Resources  
Acknowledgement

Docs » Welcome to SwirlsPy's documentation! [View page source](#)

## Welcome to SwirlsPy's documentation!

SWIRLS (Short-range Warning of Intense Rainstorms in Localized Systems) is the operational rainstorm nowcasting system of Hong Kong Observatory (HKO). State-of-the-art techniques are implemented in SWIRLS for analysis and prediction of precipitation and convective weather phenomena in the next few hours. SWIRLS has been in operation in HKO since 1999. SWIRLS was also implemented in various meteorological services or participated in international forecasting projects to support the research and development of rainstorm nowcasting techniques.

The community version of SWIRLS, or com-SWIRLS, is developed to facilitate knowledge exchange and cooperation on development of rainfall nowcasting technique. Com-SWIRLS can be available from this website for use by the National Meteorological and Hydrological Services (NHMSs) upon request. To request or for any enquiry, please send an e-mail to [swirls@hko.gov.hk](mailto:swirls@hko.gov.hk)

- [Sign In or Register](#)
- [RSMC for Nowcasting](#)
- [SWIRLS Nowcast System](#)
- [Awards](#)
  - HKO awarded at 19th APICTA Awards (26 November 2019)
  - Hong Kong Observatory awarded in Hong Kong ICT Awards 2019 (8 April 2019)
  - DSD, HKO and the project team winning ACEHK Annual Award (11 December 2017)

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

[nwc-saf.eumetsat.int](https://nwc-saf.eumetsat.int)

# Conclusions

- NWC SAF Products are useful for **Nowcasting** and other applications
- More information at [nwc-saf.eumetsat.int](http://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**