



# Joint EUMETSAT-JMA-NOAA initiative on using cloud infrastructure for global GEO-ringing climatology



Jörg Schulz (EUMETSAT), Ken Knapp (NOAA), Roope Tervo (EUMETSAT), Manan Dalal (NOAA), Arata Okuyama (JMA), Andrew Heidinger (NOAA)

Presented to CGMS-50 Plenary, Agenda Item 5.1  
EUMETSAT-WP-16

## Summary

- The presentation addresses a joint initiative of EUMETSAT, JMA and NOAA that addresses CGMS plenary action A48.05 to make better use of geostationary ring observations for climate
- Progress has jointly been made on a number of items:
  - Better QC for geo data detecting radiometric anomalies and incorporating the information into the images with an ongoing study for GOES and Himawary-8/9 data at EUMETSAT
  - Improved cross-calibration of historic geostationary sensors using an improved HIRS data record
  - ISCCP-NG has developed a prototype for a mapped radiance product (L1g) that will be reused
- Two planned projects will address:
  - Data rescue and reprocessing of early GOES data: SMS and GOES 1-7 at the University of Wisconsin (UW) Cooperative Institute for Meteorological Satellite Studies (CIMSS) and the Space Science and Engineering Center (SSEC)
  - Joint activities between EUMETSAT, JMA and NOAA to utilise cloud infrastructure to produce a consistent georing radiance data record and serve it to users via the clouds

# CGMS-48 Plenary Action

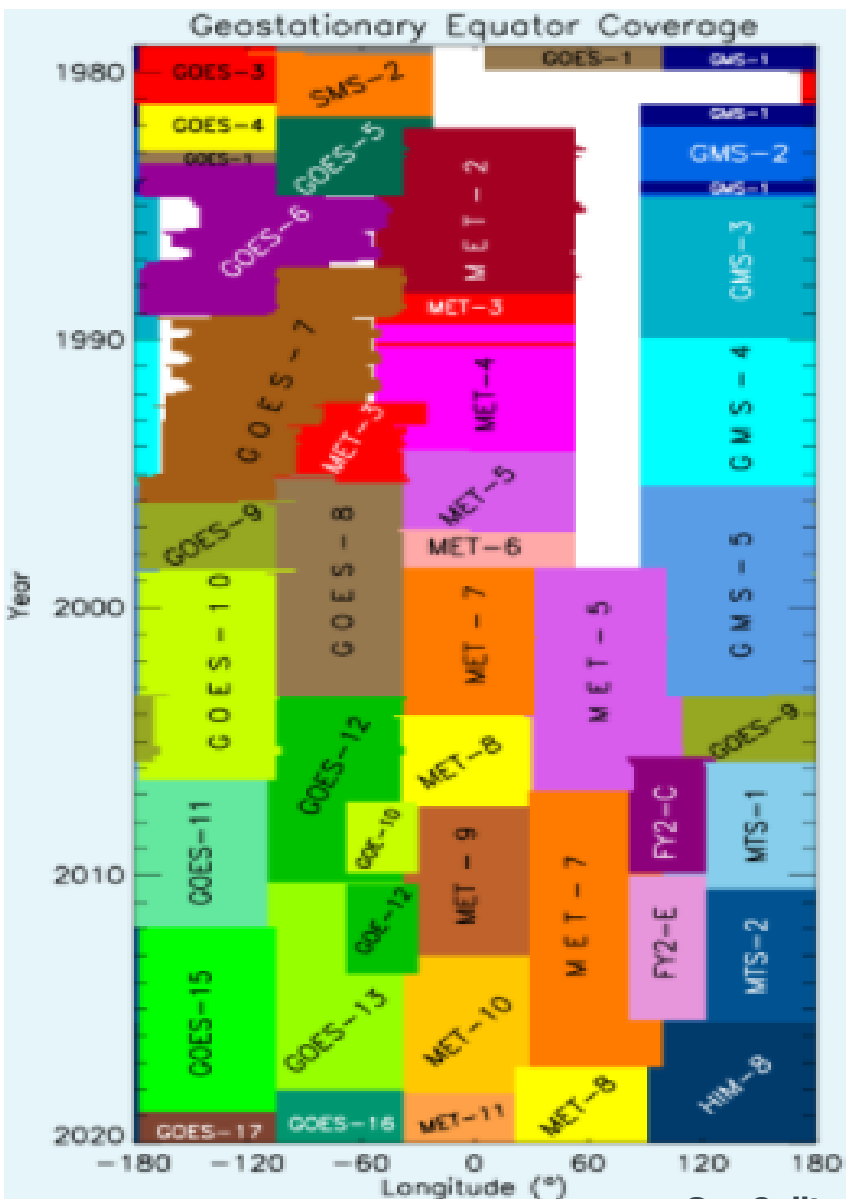
CGMS-48 | Virtual Meetings | 25-29 May 2020 and 25-26 August 2020

CGMS-48 actions – Plenary Session					
Actionee	AGN item	Action #	Description	Deadline	Status
CGMS space agencies	6.2	A48.05	CGMS agencies, in particular those operating geostationary satellites, are encouraged to make commitments within GSICS and SCOPE-CM that enable the creation and maintenance of the cross-calibrated 'geo-ring' radiance climate data record and in second step to a project for the cloud property data records.	CGMS-49	OPEN

- EUMETSAT, NOAA and JMA have embarked on coordinated activities making progress on this action
- EUMETSAT provided a presentation on this to the CGMS WGIV Cloud Services Expert Group Workshop on Cloud Technologies dedicated to the link between the science and the use of cloud infrastructure

## Global observations from missions in geostationary orbit

- Long history of measurements from geostationary orbit provide a treasure and are essential for climate science and services with thousands of users
- Measurements will continue with satellites that have improved capabilities, with data volumes increasing sharply making access more difficult for users
- Recent years saw great scientific and technical progress in data QC and cross-calibration
- **For climate a consistently quality controlled, recalibrated, and remapped radiance data set from all geostationary satellites is required**
- Cloud infrastructure is beneficial to consolidate the quality of the entire historical dataset and to continue with data from current and new missions, as well as to organise access to the products.



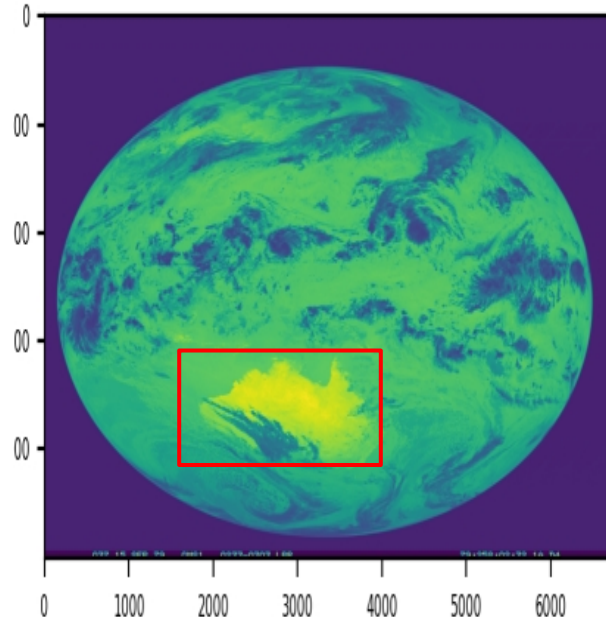
Geo Quilt (from <https://www.ncdc.noaa.gov/gridsat/isccp-b1-info.php>)



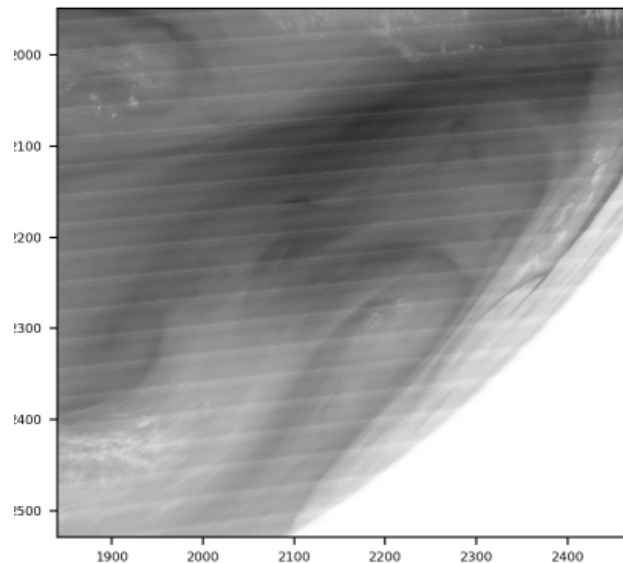
# Data rescue – EUMETSAT and JMA

Performed two studies on automated radiometric anomaly detection in imagery of all Meteosat 1-11 and GMS/MTSAT satellites and developed data base of anomalies

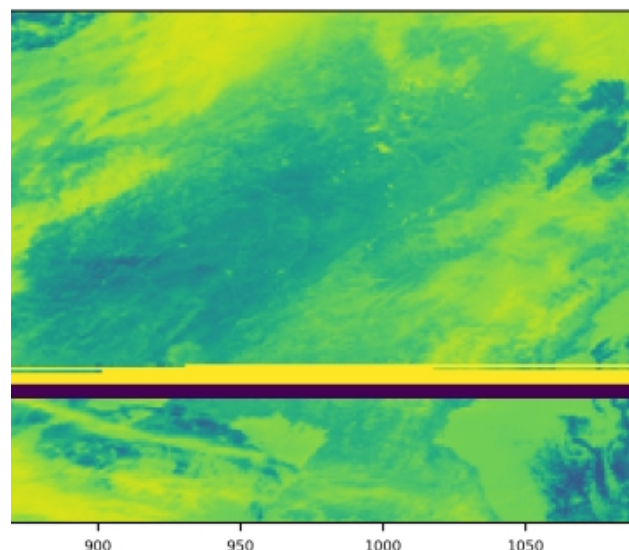
GMS-1 over illumination IR  
15 Sep 1979



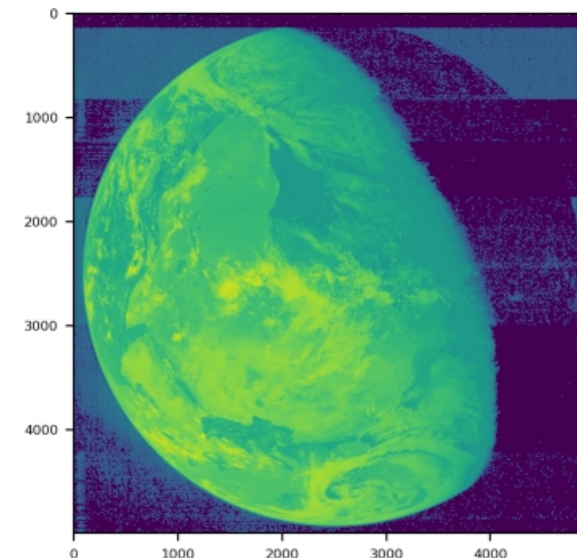
MTSAT-1R moonlight  
contamination WV,  
27 May 2007



MTSAT-2 IR data loss  
16 Nov 2006



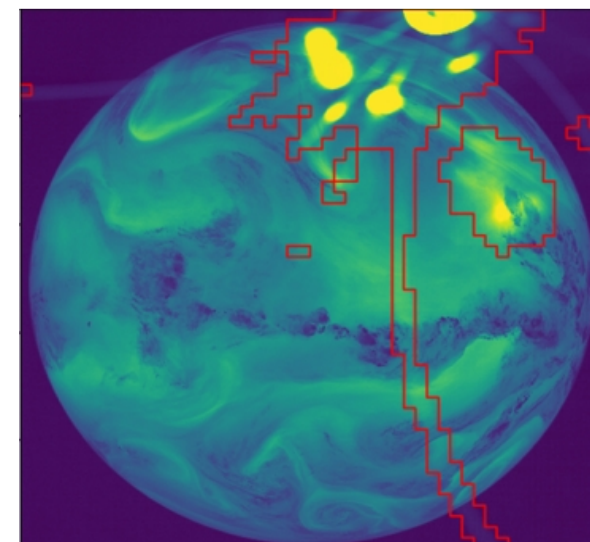
Meteosat-1 VIS  
non-uniform background noise  
16 Dec 1978



Collaboration on data rescue is ongoing with NOAA and JMA analysing US GOES and Himawari 8/9 data at EUMETSAT

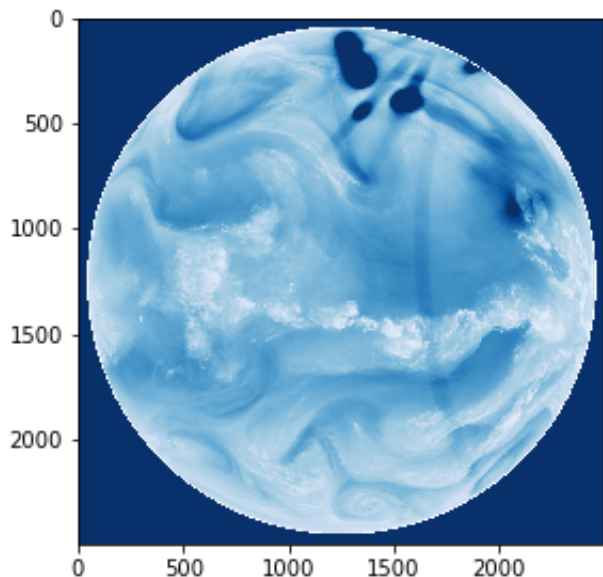
# Raw data with flagged radiometric image anomaly

- Anomalies have been detected in Level 1.0 (unrectified images)
- Anomaly images have been constructed at L1.0 satellite grid
- Anomaly images are then rectified in the same way as normal images
- Anomaly images are included as new variables in the FCDR
- Anomaly images are available per channel – VIS, IR, and WV

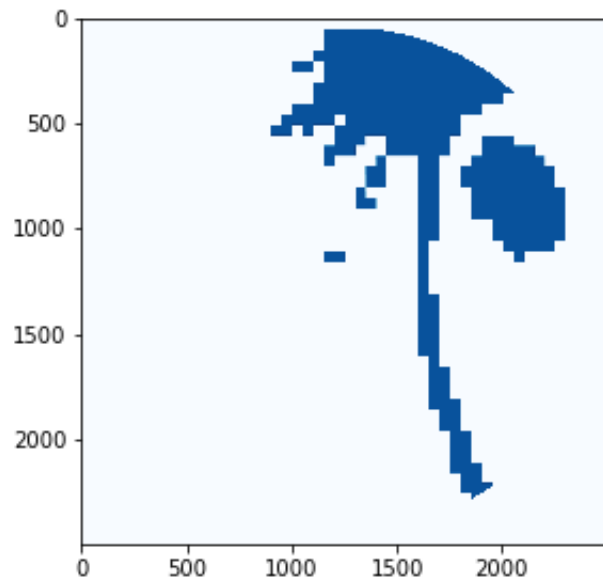


**MET5 – 1996-10-16 00:00 – WV Channel**

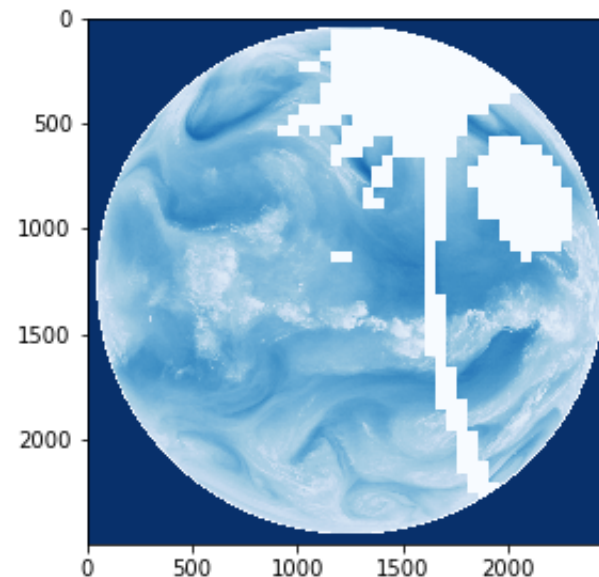
**L1.5 Image**



**Anomaly Image**

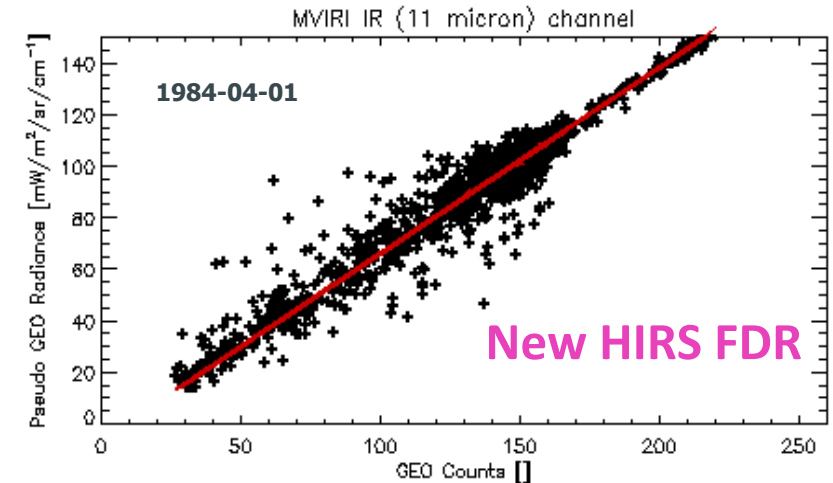
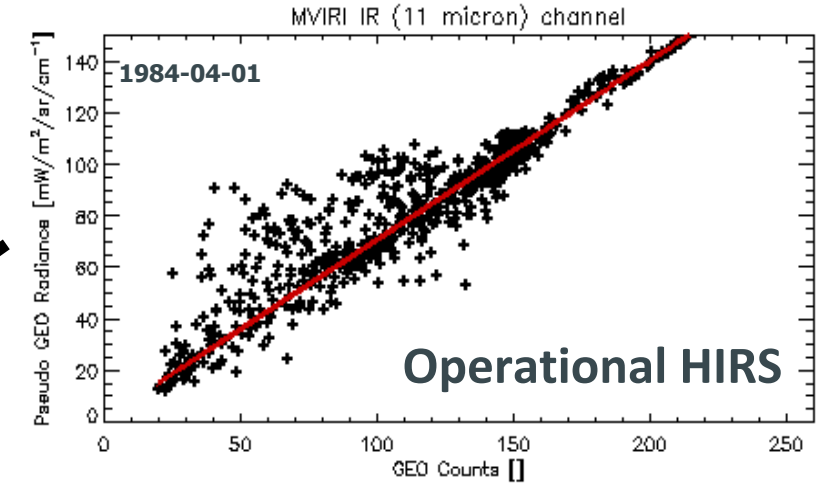
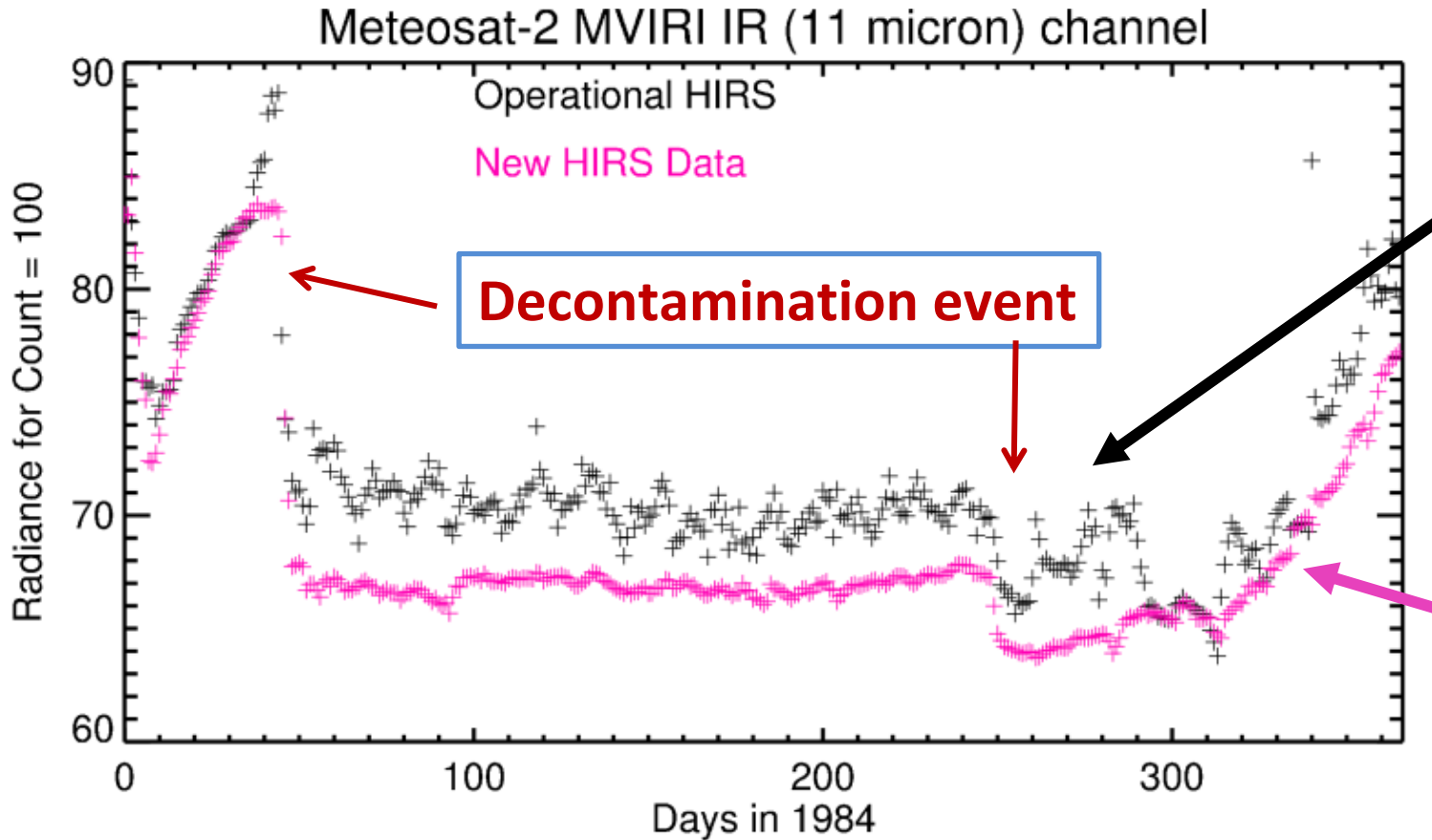


**L1.5 Image – Anomaly Flagged**



**Anomaly detection related software can be containerised and applied to all other instruments**

# Improvements of instrument calibration



Methods and software developed in one place could be applied in several places to harmonise calibration across the georing



# Potential benefits of using cloud infrastructure in a collaboration

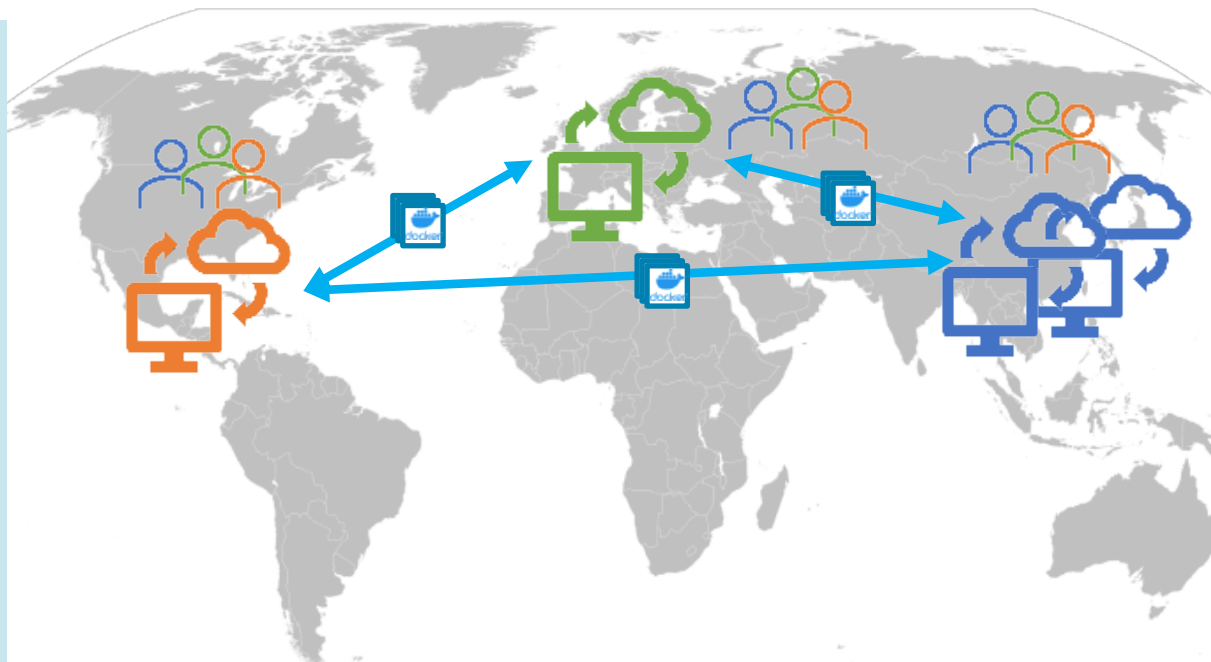
## Processing to the data

Share “best-of-breed” code

- QC including image anomaly detection
- Instrument cross-calibration
- Data processing
- Product validation
- ...

Use of containers

- Interoperability in different cloud environments
- Allows local customisation



## Possibility of mutual access to remote processing infrastructure

- to provide support in running processing code
- to facilitate remote validation work

## Output data

Global gridded product

- Consistent and available from several agencies
- User service regionalised per continent (TBC)

Opens opportunity for later analysis-ready data and/or data cube approaches

- Simplifies usage
- Supports using subsets of the data, e.g., for local area analyses

Data used by other agencies and academia for downstream applications



## To be considered by CGMS:

- The collaboration with other agencies on the generation of a geostationary 'ring' FCDR for the whole time series of past, current, and future sensors in **addressing CGMS Plenary Action A48.05** has been increased and will lead to concrete joint action to produce a data record maintainable with future observations
- The use of the cloud infrastructure will enable efficient data processing, distribution and online use of the data. The activity provides a primary WG-II use case for the WG-IV cloud infrastructure aspirations
- The data record can support the needs of many 'georing' FCDR users for quasi-global ECV and other data records including the cloud properties planned in the ISCCP-NG project
- It is recommended that CGMS scientific working groups, particularly ICWG, IWWG and IPWG engage with the producers to maximize benefits for CGMS
- Other operators of geostationary satellites are invited to join the activities
- Watch the [wonderful video on Meteosat-1](#) maintained by ESA