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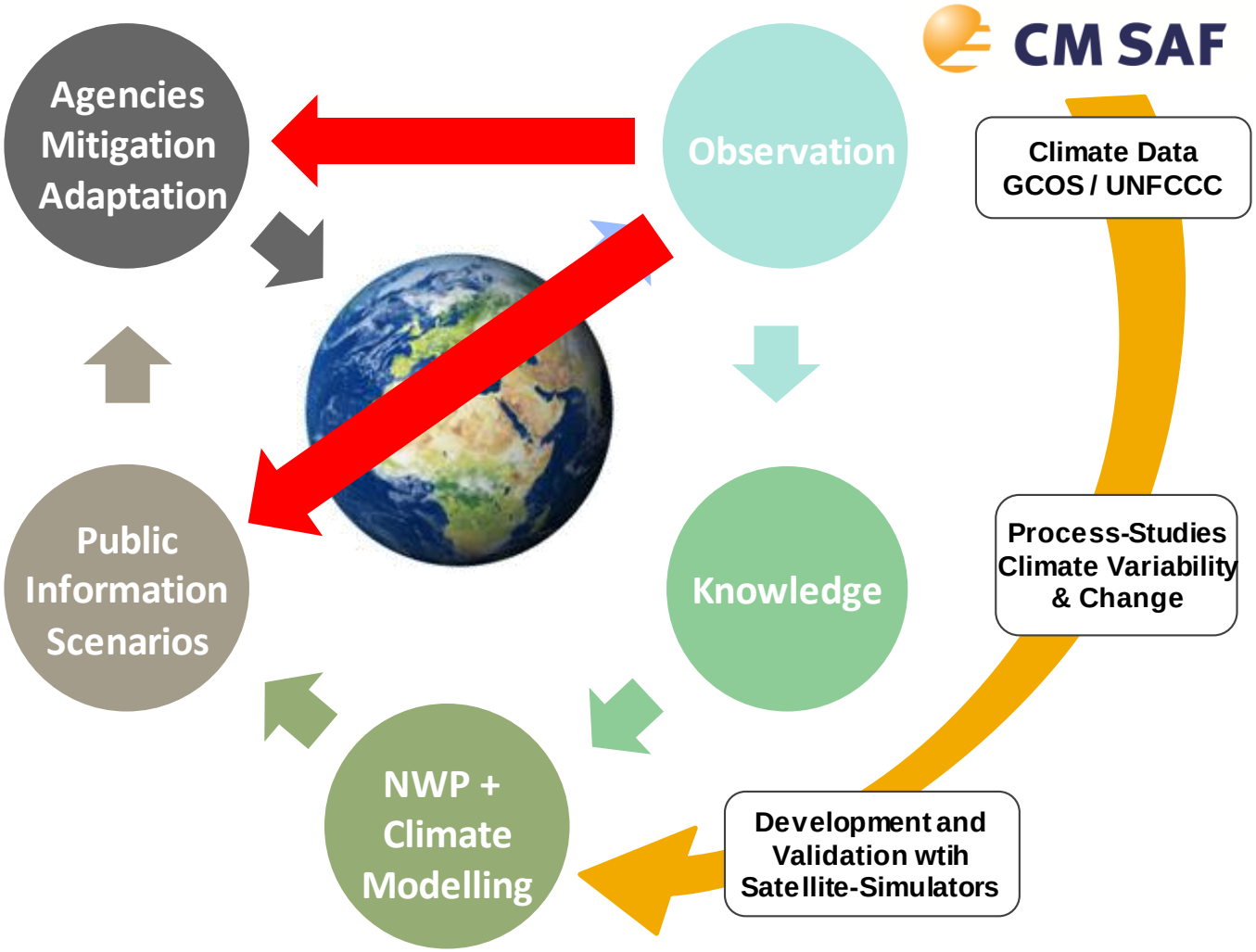
EUMETSAT
CM SAF
CLIMATE MONITORING

# How to foster the application of Satellite Climatology within the national Climate Service?

**Reto Stöckli & Friends of**
**CM SAF and MeteoSwiss**

# The CM SAF «food chain»: is there a more direct path for «impact»?



**Do not ask,**
**“which parameter do you need?”,**
**but instead ask:**
**“what are you doing?”**

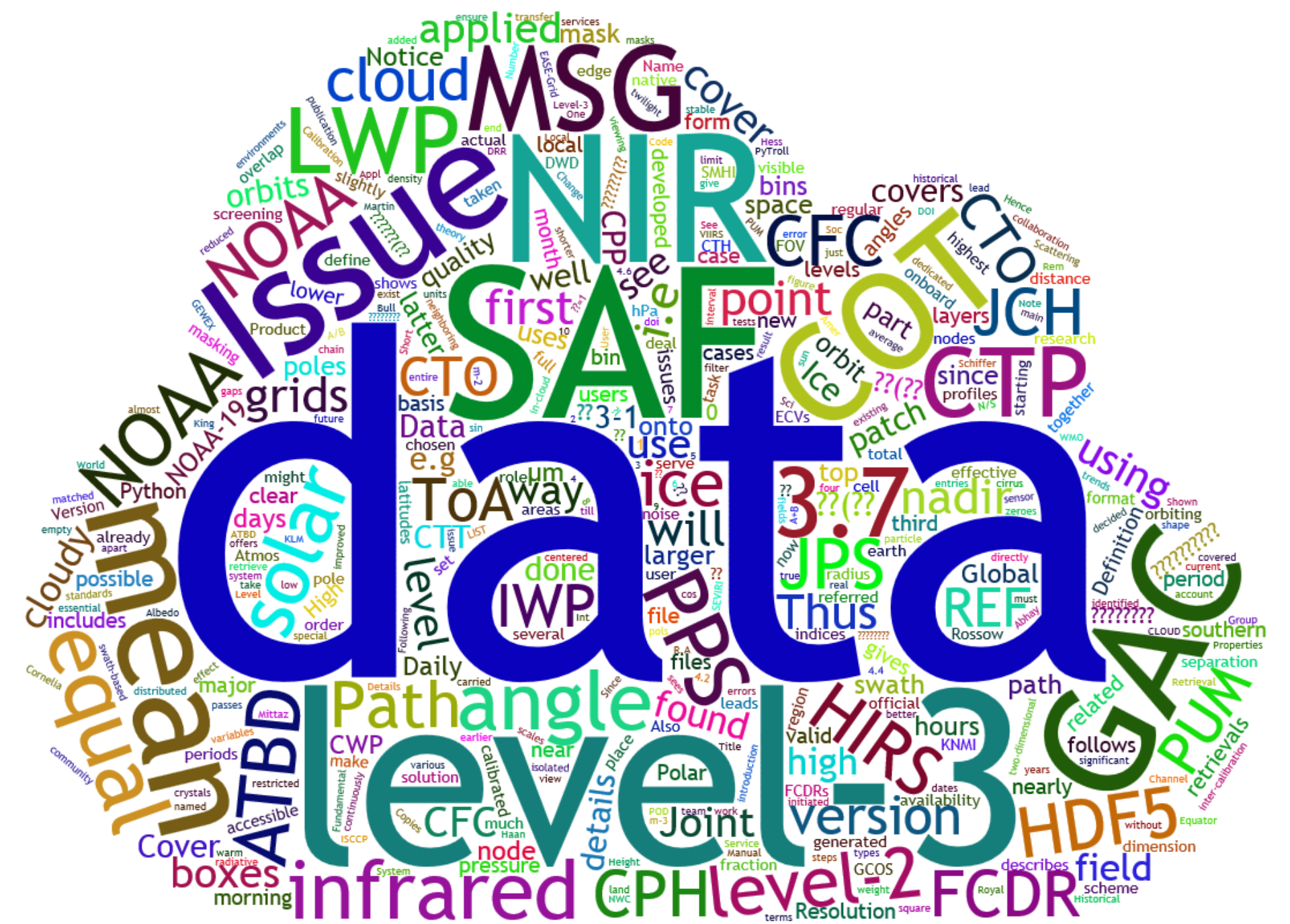
D. Bresch (2017)
Professor for Weather and Climate Risks
at ETH and MeteoSwiss

Common statements at the start of the interview:

«We get customer requests on temperature, precipitation and sunshine duration. We can answer those with surface station measurements.»

«Scientists contact EUMETSAT, NASA or CM SAF directly. Customers to not ask us for satellite data»

«When I search for satellite data at EUMETSAT or NASA I am totally lost. I have no chance to understand the diversity and complexity offered.»




Created by wordclouds.com with cmsaf.eu and esa-cloud-cci.org

# Requirements on Fog / Clouds

Each autumn we get questions on fog occurence. We cannot answer them with station data alone.

- Could CM SAF produce a fog climatology over Europe in addition to total cloud cover?

- We have to automate the synoptic cloud observation. Satellites could spatially extend point information from Ceilometers and Pyrgeometers.

# Requirements on Frost

We use 2 m Temperature to diagnose frost risk. But frost often happens on the ground. Can satellites measure that?

- Could you build probability maps of frost from satellite data? Ideally during cloud free nights when frost happens.

- Frost is a recurring topic in our collaboration with the Peruvian weather service. Do you cover South America?

# Requirements on Vegetation and Drought

Our phenological observations are station based and difficult to extrapolate in space.

- Aren't there satellite-based vegetation climatologies? Would CM SAF be able to build operational LAI / NDVI?

Drought monitoring is a hot topic in our climate service, but currently we only use station data with potential evaporation.

- Couldn't CM SAF calculate spatially-resolved drought-Indicators for Europe and help us with communication?

# Requirements on Snow

Snow is a fundamental climate variable for an Alpine country like Switzerland. The public is not satisfied with site data.

- We would need a monthly gap-free snow climatology of the Alps at 1 km spatial resolution. Can CM SAF do that?

- The COSMO model needs to assimilate snow cover. Is there operational snow cover from any SAF?

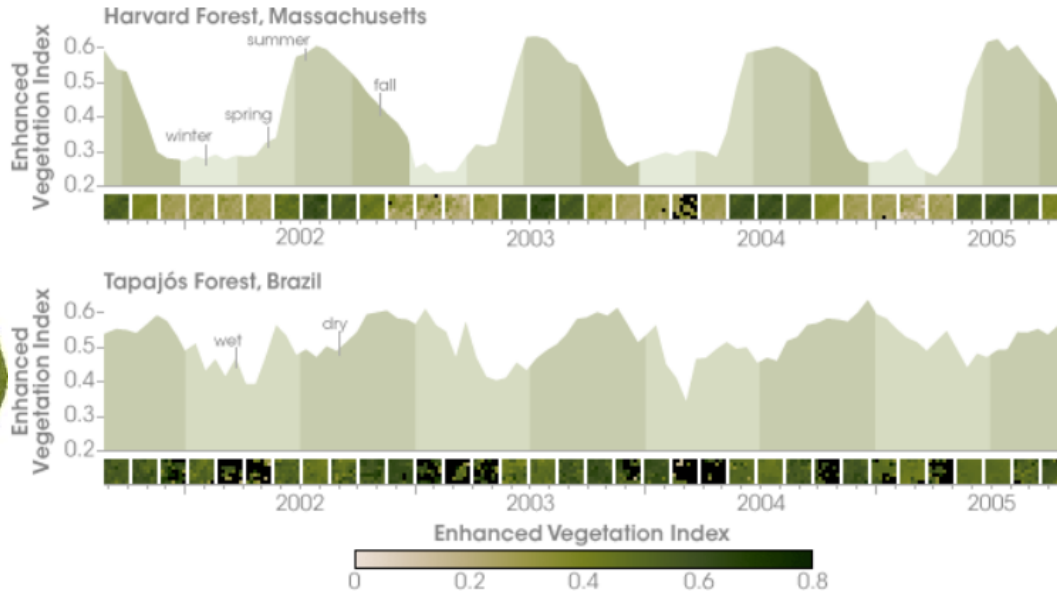
# Requirements on Accessibility, Usability and Presentation

- Where can we (as climatologists) online browse through gap-filled CM SAF anomaly maps without downloading?
- We need a real person to interpret and apply the data. Could we buy «consultancy» from CM SAF?
- Customers need explanation and not data. Could CM SAF build public visualizations of climate phenomena?

From these and other requirements concrete ideas were developed during the interviews for how the climate service could better and directly benefit from CM SAF.

4 of these ideas I'd like to share with you for discussion and possible implementation:

1) Communication and Visualization
2) Surprising Applications
3) Data access for non-Experts
4) The full cost of a Climate Service


Before the 2002 conference Huete had spent several years repeatedly tinkering with the data and the mapping technique. "When you see something you are not expecting, you have to ask yourself, 'What are all the possibilities for a remote-sensing product going wrong?'" Among the possibilities are things in the atmosphere that keep the satellite from having a clear view of the surface. "We checked for aerosols [particles in the air, such as smoke from biomass burning] and clouds, which can potentially reduce the vegetation signal obtained by satellites. Someone suggested that maybe there was flooding on the forest floor during the wet season, so we looked at that. We looked how the vegetation maps changed if the light [hitting a particular patch of vegetation] was direct or diffuse. We just kept re-doing and re-doing the data products," he says. Each time they made a change, they wondered if the dry-season green-up would disappear. But with each refinement, it stayed. His confidence grew, but Huete still wasn't sure. Was this for real? Or was it just a sign he was still doing something wrong?

Satellite vegetation maps should match well-known seasonal changes in ecosystems. Satellite measurements collected over ground-based research sites in Massachusetts (top) and Brazil (lower) are shown here as graphs and as a filmstrip of pictures. At Harvard Forest, the seasonal (48-day) satellite observations matched the scientists' expectations: the numbers were highest and the pictures were greenest in summer, lowest and brownest in winter. But over the Amazon, numbers on the graph and the greenness in the pictures went up during the dry season—when scientists expected the forest to be under stress. (Map by Robert Simmon and Jesse Allen, based on data from the Oak Ridge National Laboratory DAAC.)

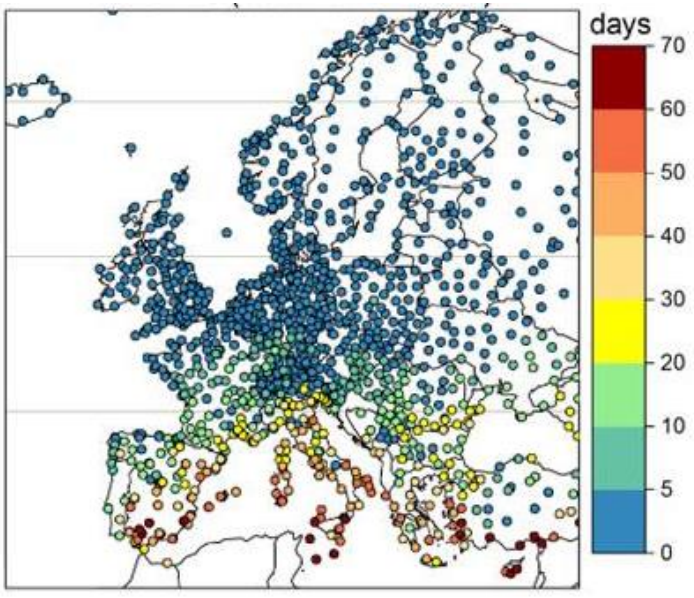
Robert Simmon & Rebecca Lindsey & Alfredo Huete (NASA Earth Observatory)

# CM SAF data is used for things we did never think about ...

H2020 Project «Heat-Shield»: Influence of climate change on the health of workers:

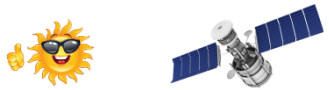
- Need to correct seasonal forecasts and climate scenarios
- Problem: Heat Stress Indicator requires T, Rh, W, Rad

Heat Stress Days (2071-2100)




T, Rh und W from station data

Global Radiation: CM SAF (SARAH)

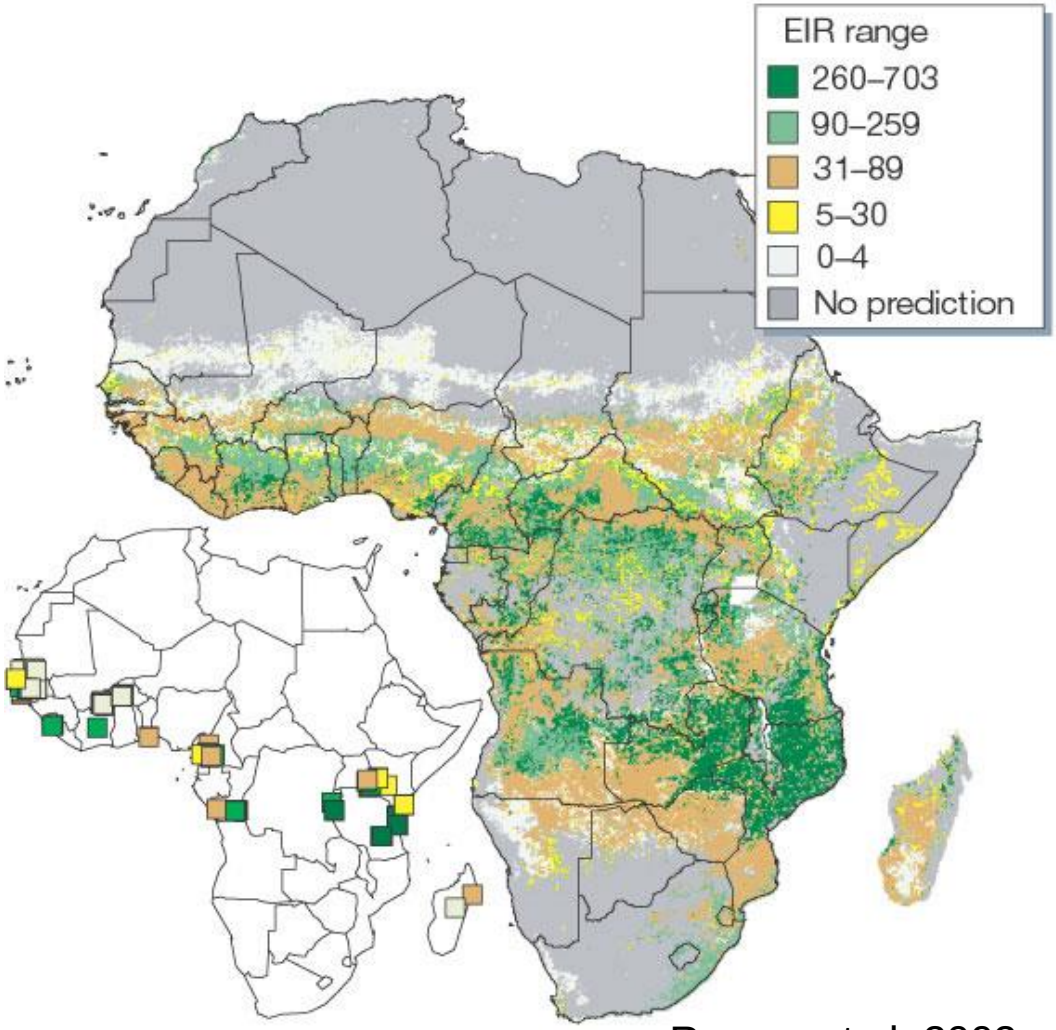


= Satellite data directly valuable for adaptation strategies to climate change



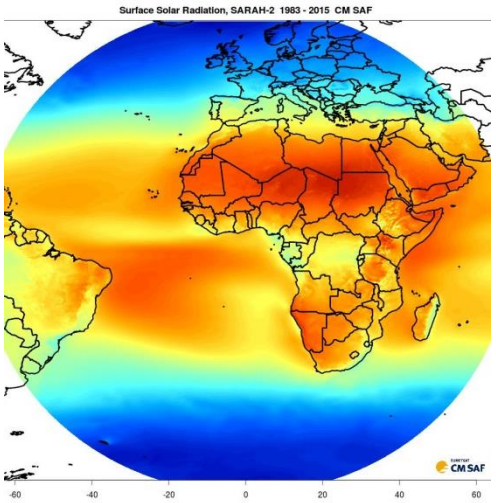
Ana Casanueva, Christoph Spirig, Sven Kotlarski (MeteoSwiss)

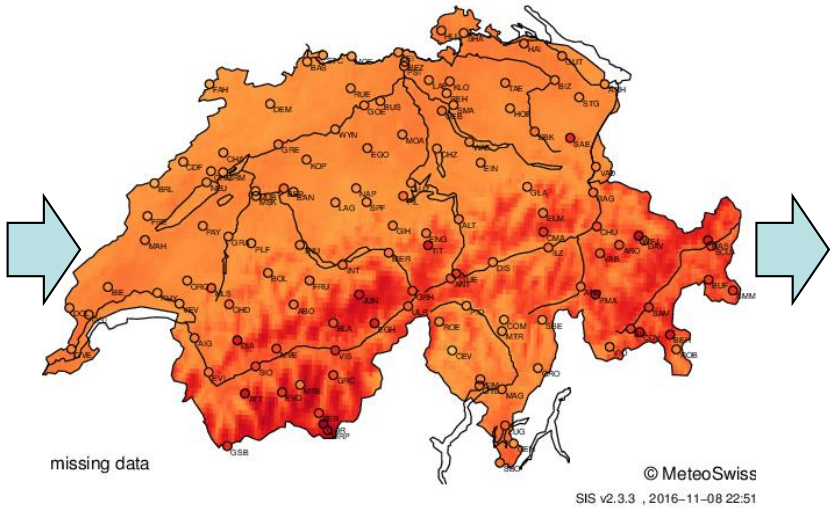
# Simplification of data access. Example: Google Earth Engine

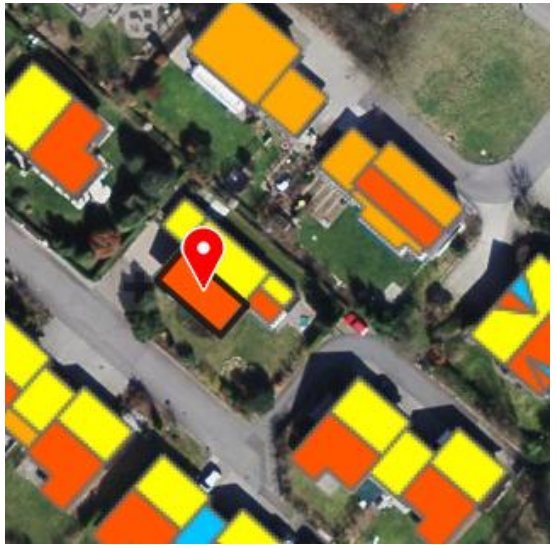



Rogers et al. 2002

# National Center for Climate Service: The long path to the end user



CM SAF SARAH | Heliomont: SIS in Terrain & over Snow | # of solar-heated showers

- 2002-2007: CM SAF Algorithm for Europe+Africa (EUMETSAT)
- 2007-2012: Extension for Alpine Terrain (MeteoSwiss)
- 2012-2017: Application for the end user (Government / Cantons)

➢ 60% of the path happens after CM SAF: fair distribution of work?



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# Serious hints for your own digestion

**Mandate «Put EUMETSAT data in value» is fulfilled: UNFCCC → GCOS → national climate services (NCCS).**

1. Applications need substantial ressources and knowledge

- Include climate service driven applications in work packages of satellite projects (WMO → GFCS → NCCS)

2. Realistic requirements available from the climate service

- Synchronize requirements with projects (other NMHSs?)
- Active participtation of NMHSs with their space agency

3. Communication, integration, untouched user groups

- Enable emotions and non-scientific user applications
- Bring users to the data (Google EE, CDS, WMS, ...)