

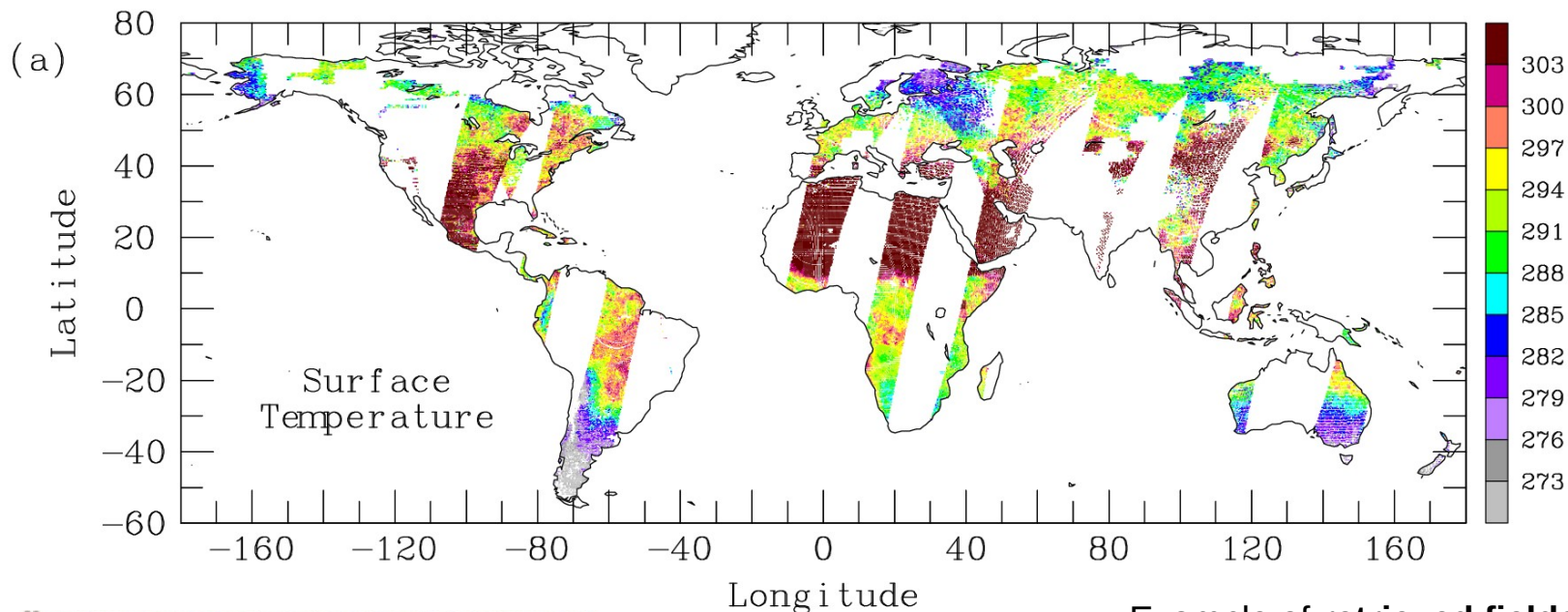
On the use of CM SAF FCDRs to retrieve LST and other surface variables

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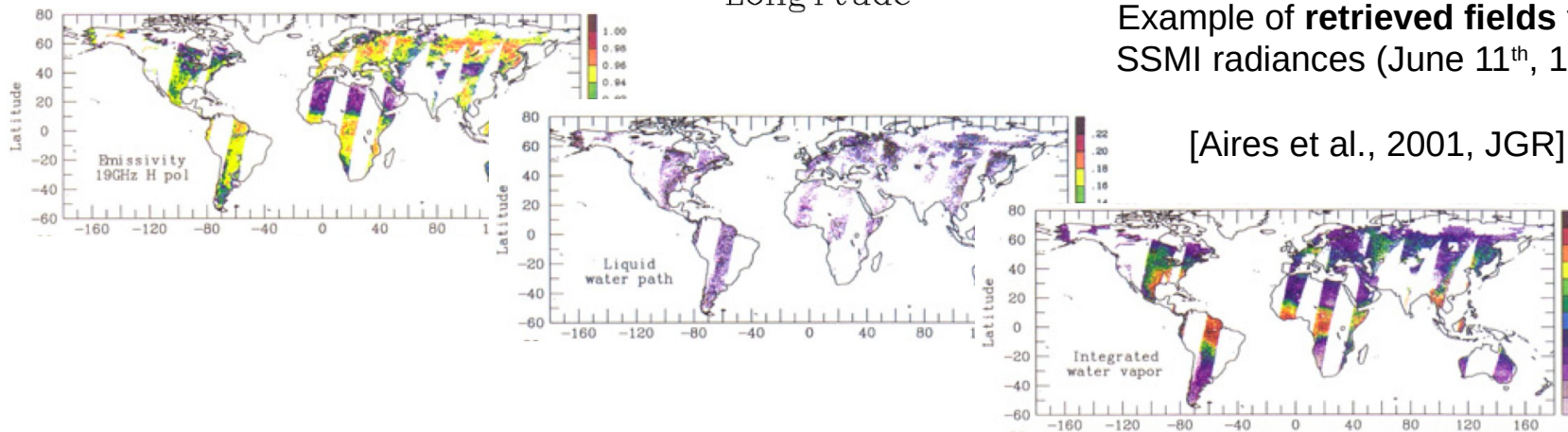
Background

- **Microwave radiances** from different satellite instruments have been at the core of our product developments for many years.



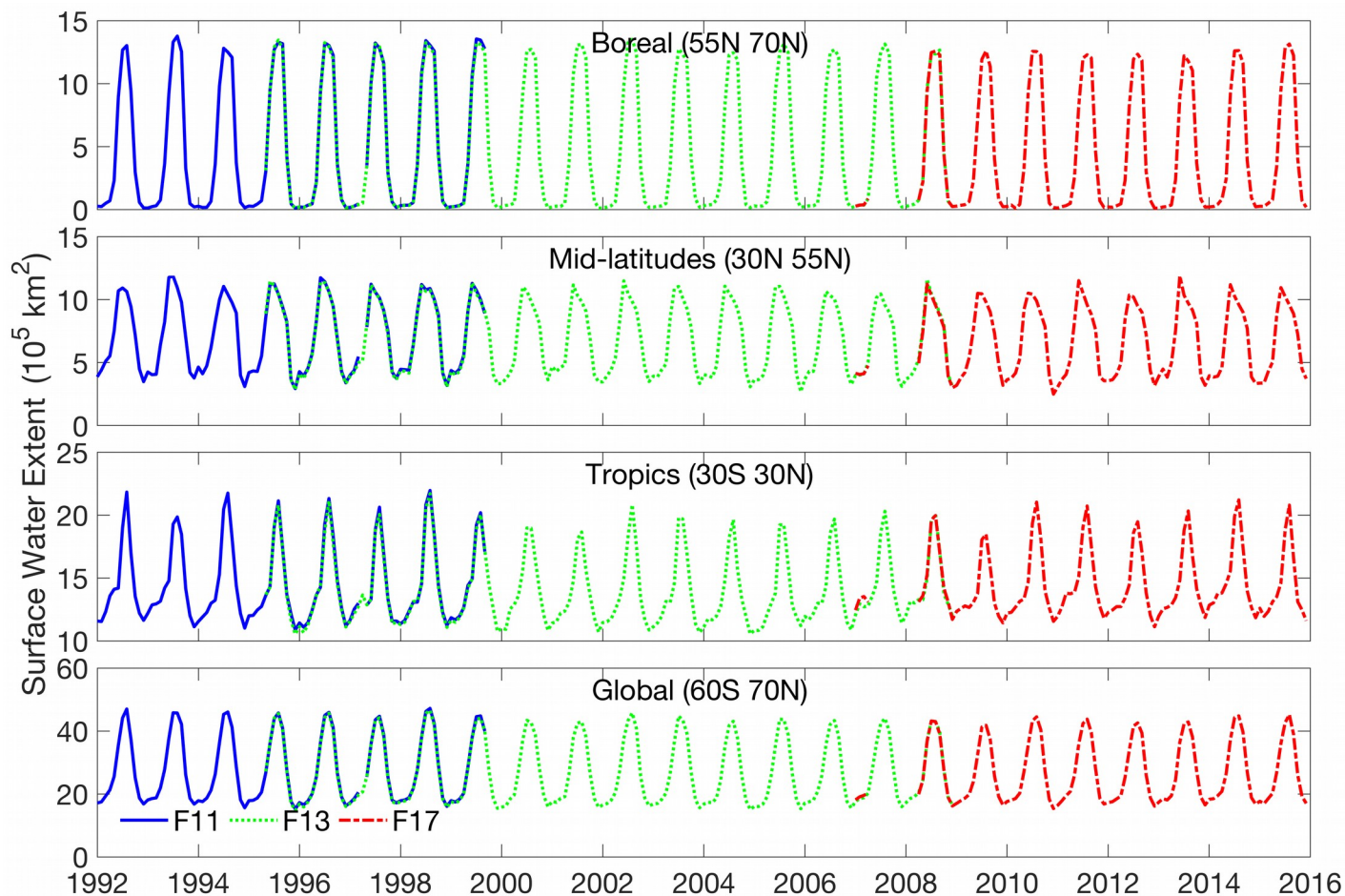
Example of **retrieved fields** from SSMI radiances (June 11th, 1993)

[Aires et al., 2001, JGR]



Background

- We typically use radiances from different instruments, so sensor **inter-calibration** has always been something to take into account.

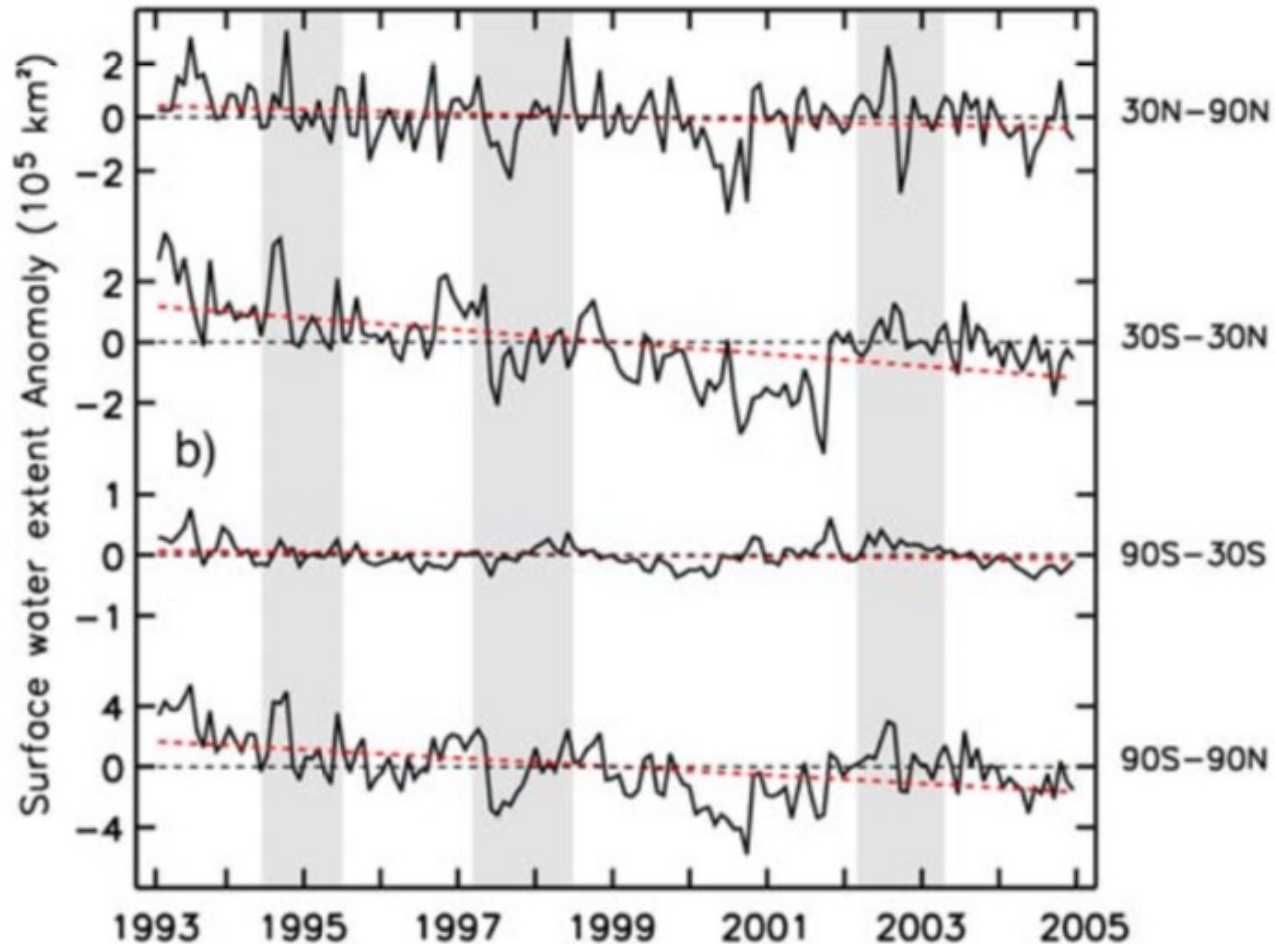


Example of zonal time series of surface water extent from the **GIEMS-2** product using SSM/I and SSMIS radiances from the CM-SAF **10.5676/EUM_SAF_CM/FCDR_MWI/V003**

[Prigent et al., JGR, in review]

Background

- Sensor inter-calibration is critical to have confidence in long-term **trends** when the data record involved different instruments.

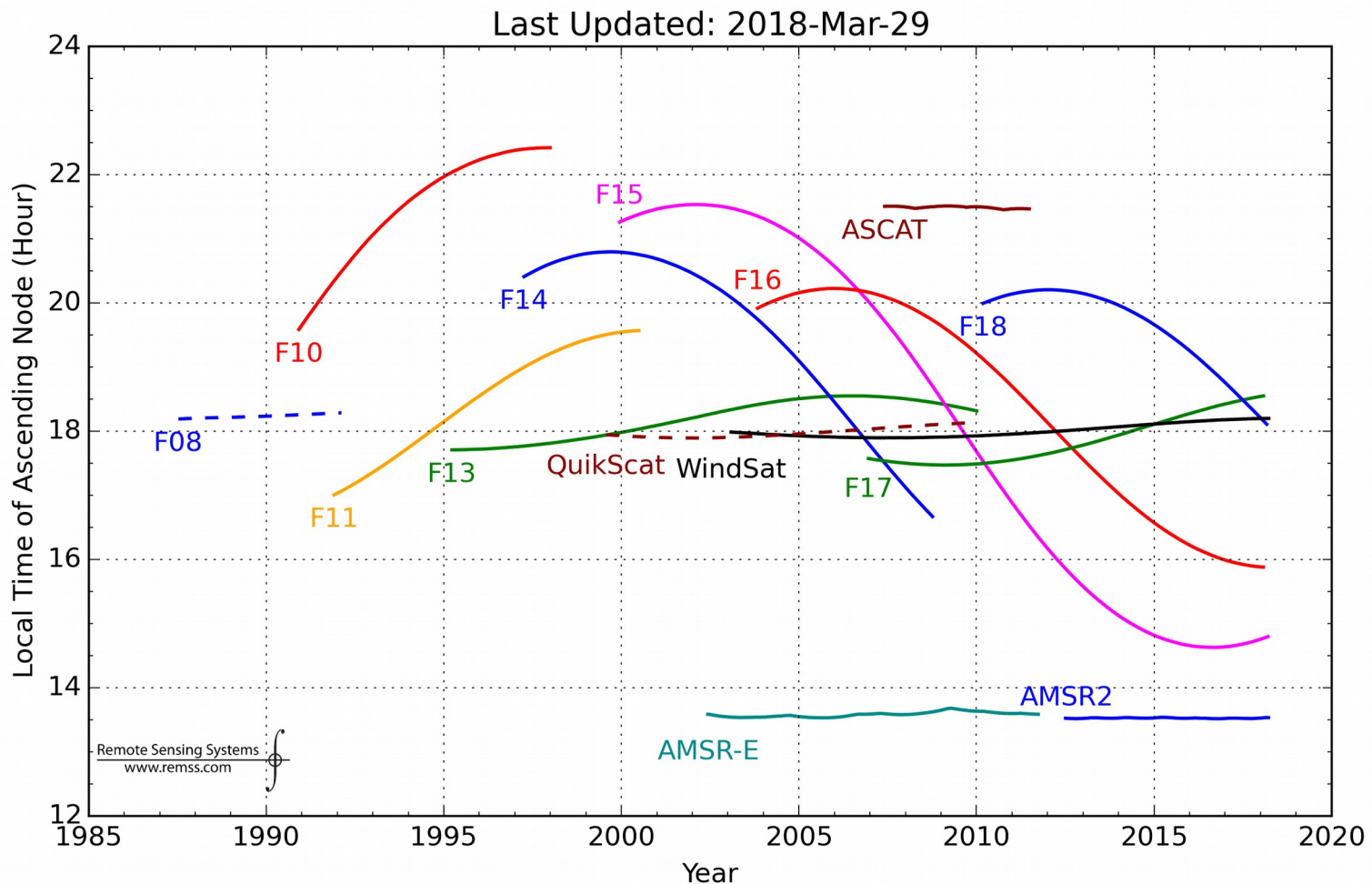


Example of deseasonalized anomalies of surface water extent from **GIEMS-1**, using F11 and F13 SSM/I radiances, together with a linear fit (red).

[Papa et al., 2011, GRL]

Background

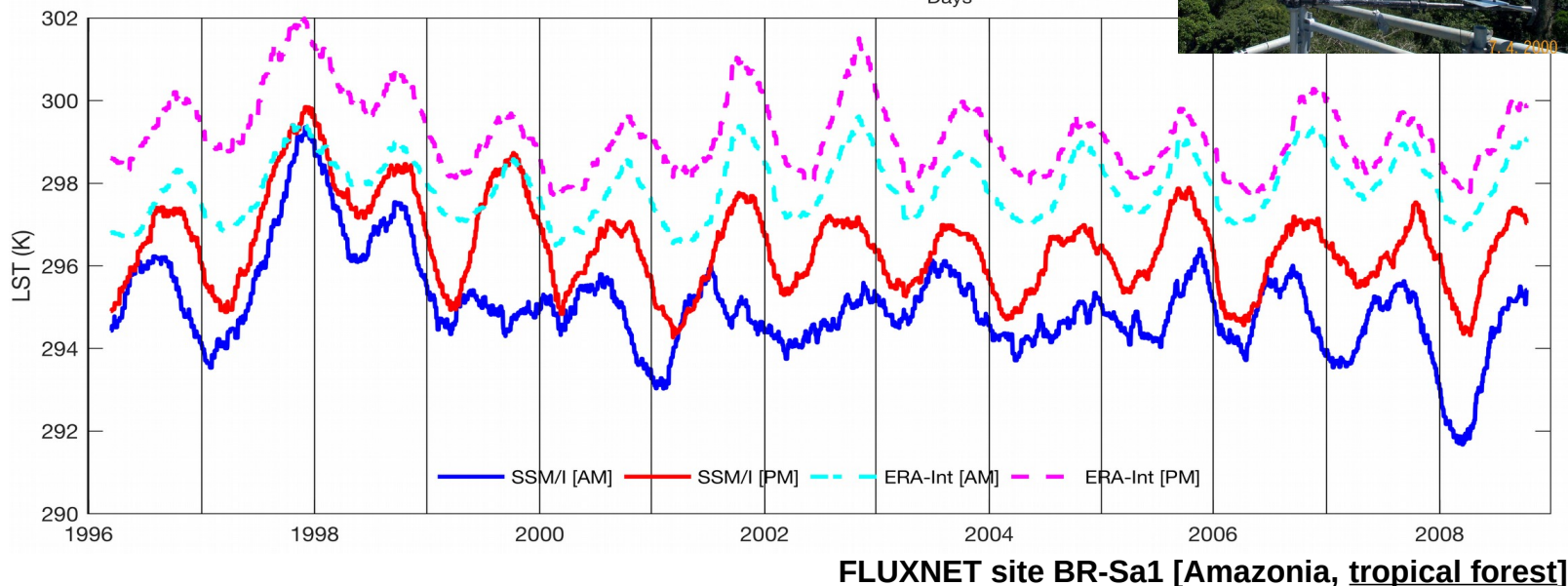
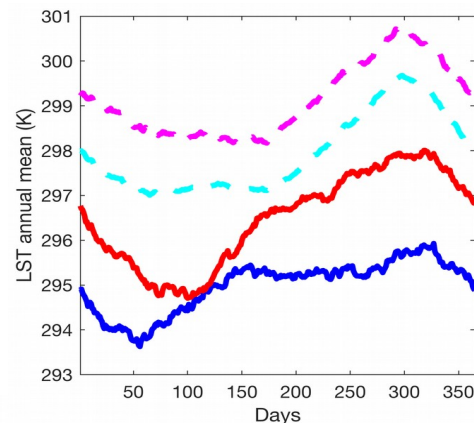
- In the past we sourced the MW radiances from different archives (RSS, NSIDC, ...), we have now switched to the **CM-SAF FCDR-MWI** for our long-time series SSMI-based products.



Background

- Our most recent effort is the production of a +20 year data record of land surface temperature from SSM/I-SSMIS observations for the **ESA LST-CCI** project, currently under development.

Some preliminary results of applying the MW algorithm to F13 SSM/I radiances from the CM-SAF FCDR MWI at a selected location.

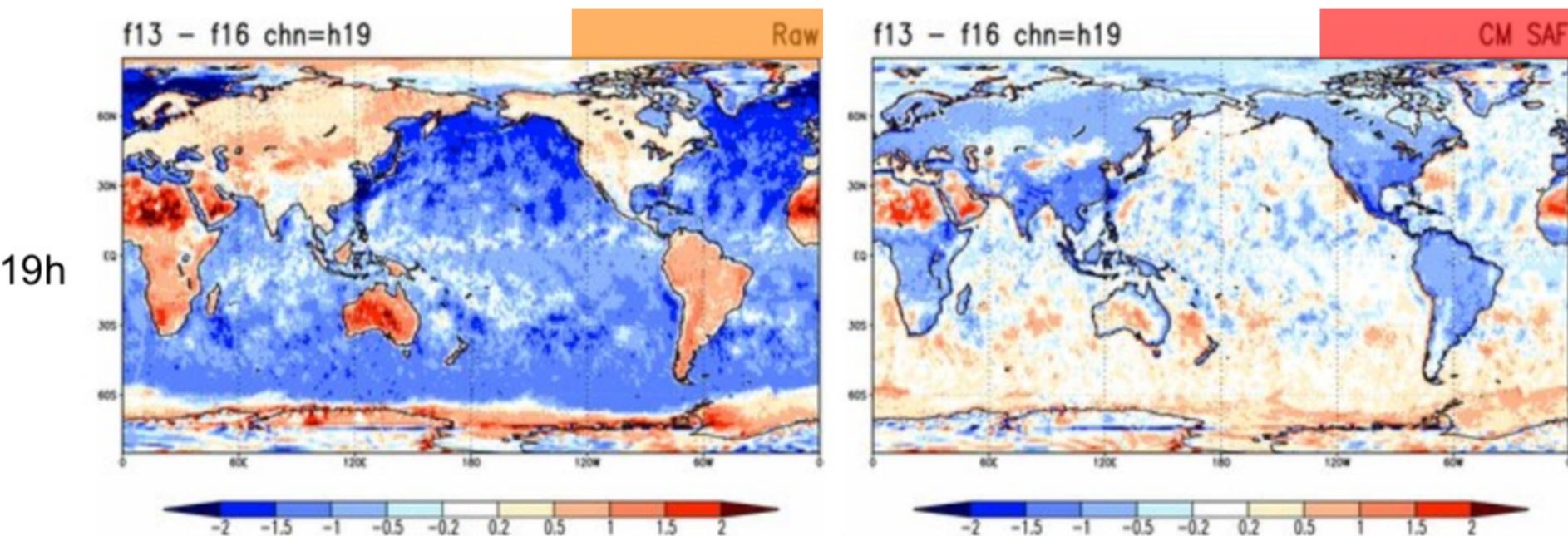


Our experience so far:

- Easily accessible archive, with a file transfer system that works very well.
- Data can be accessed very quickly after filling up a data request at the web interface.
- Very well documented, with useful data user manuals.
- Excellent formatting of the data, with useful variables to follow the calibration process.
- Very responsive developers for any queries concerning the data.

For some of our applications, some difficulties:

- Sensors inter-calibrated over the oceans due to the difficulties of capturing the diurnal cycle of temperature over land, limiting the **range of temperatures** included in the calibration.

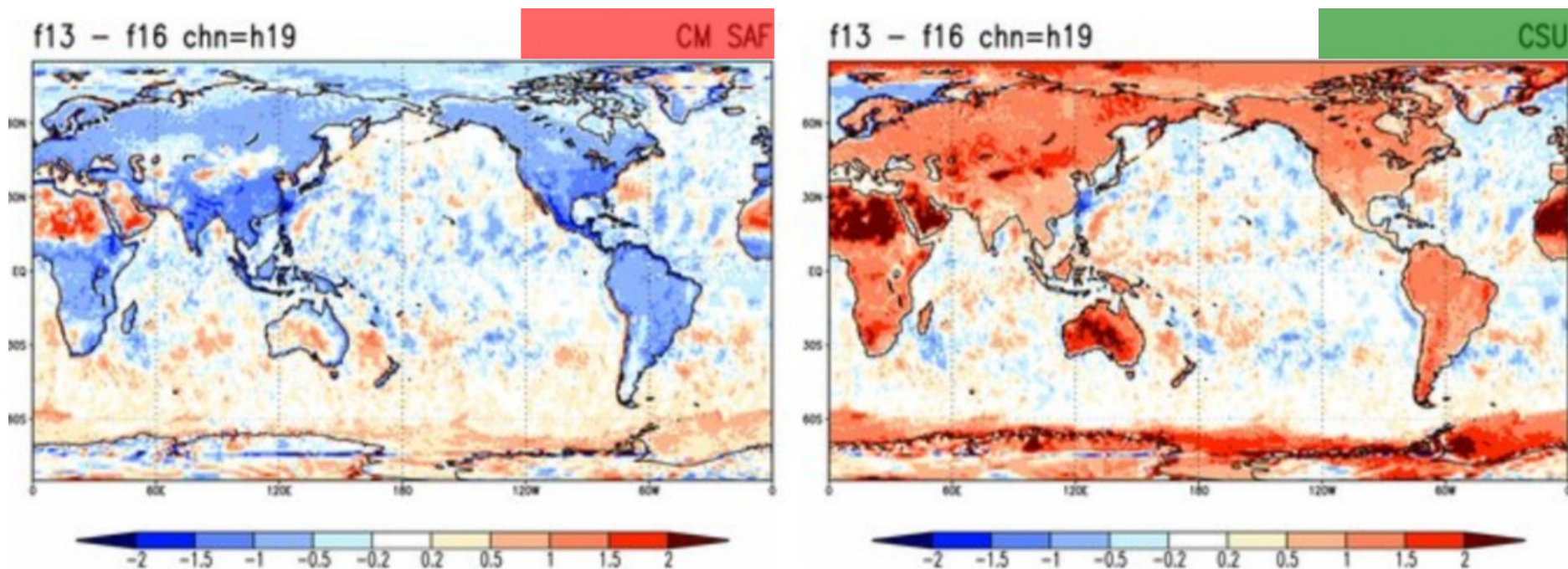


Climatological mean of TB differences at 19 GHz H-pol between SSM/I F13 and SSMIS F16 for the raw data (left) and CM-SAF calibration (right)

[SAF/CM/DWD/VAL/FCDR_SSMIS]

For some of our applications, some difficulties:

- As most of our products are for **land applications**, it is likely that the inter-calibration is less “effective” in our datasets

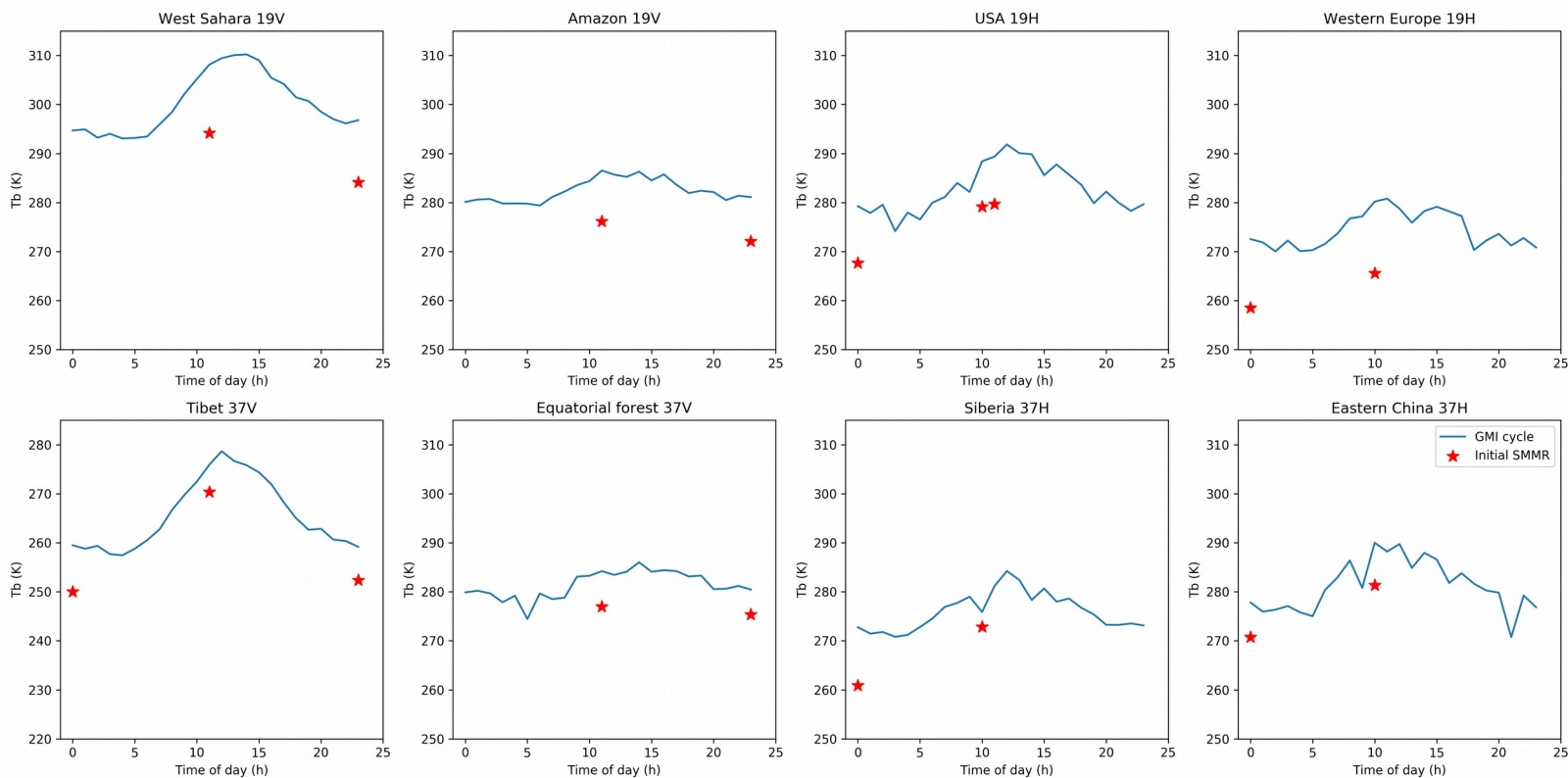


Climatological mean of TB differences at 19 GHz H-pol between SSM/I F13 and SSMIS F16 after the CM-SAF (left) and the CSU (right) calibrations.

[SAF/CM/DWD/VAL/FCDR_SSMIS]

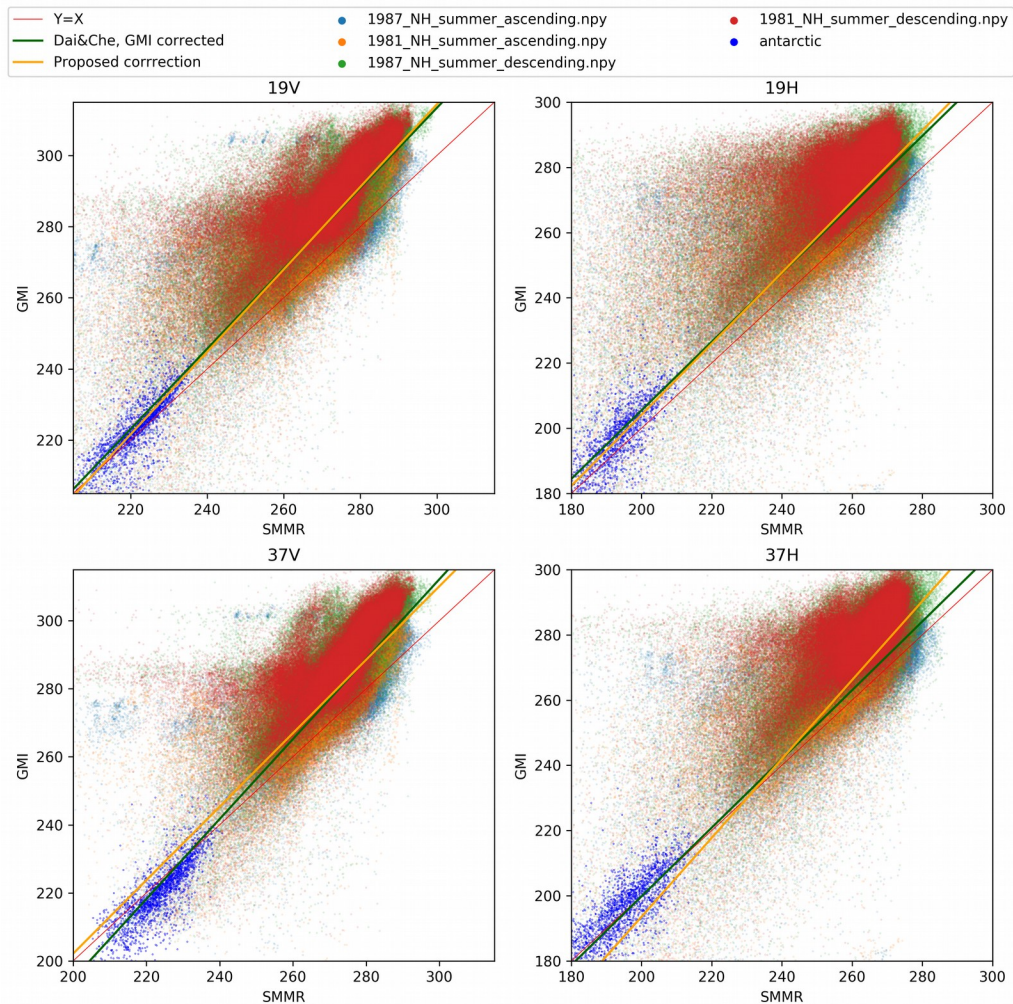
For some of our applications, some difficulties:

- Apparent discrepancy between TB from SMMR and GMI over land



July and August averaged GMI diurnal cycle at different frequencies compared to SMMR Tb over the same location.

For some of our applications, some difficulties:

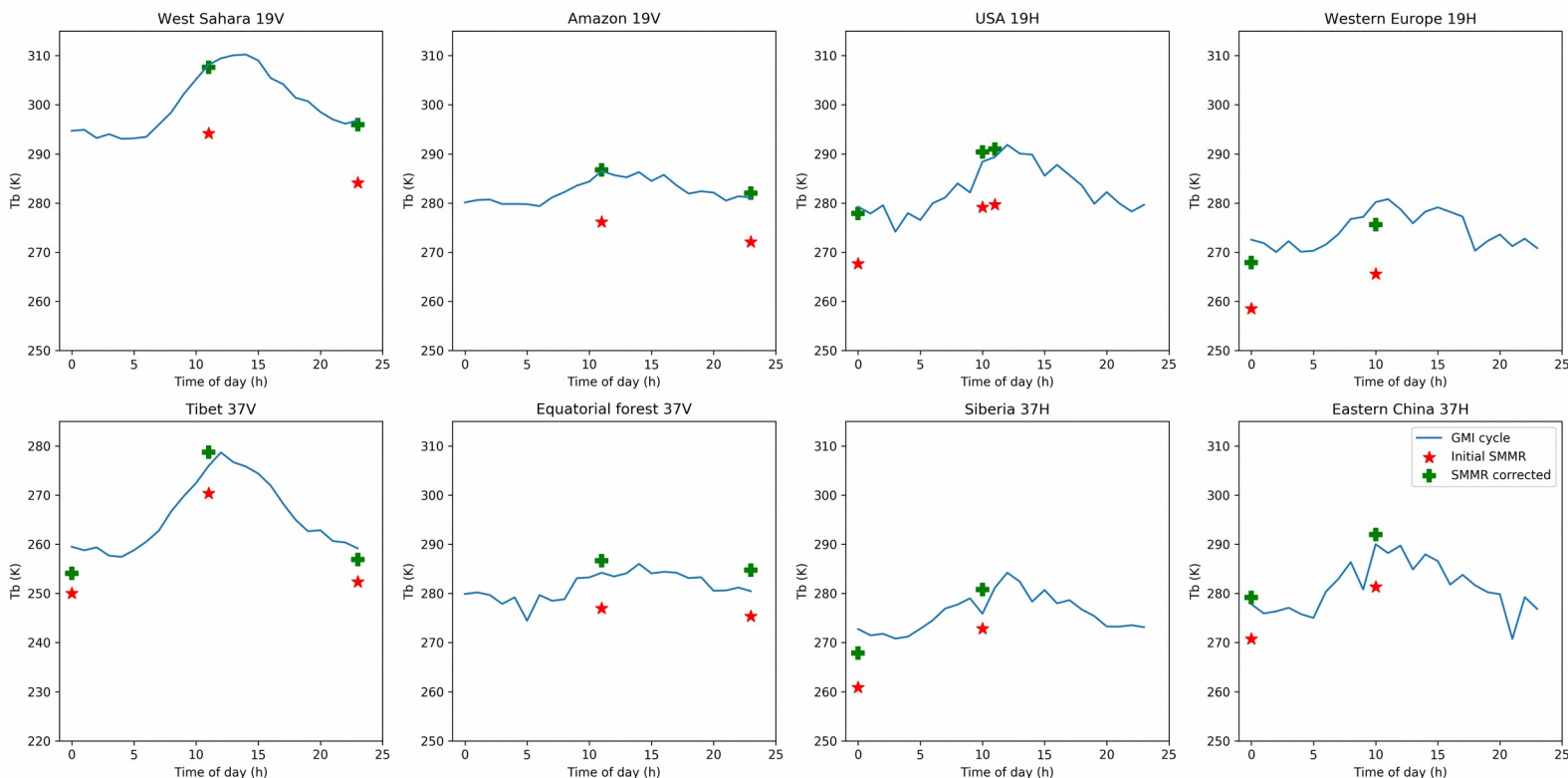


How to intercalibrate with limited model, a lack of surface knowledge and few overlap periods ?

Scatter plot of gridded GMI/SMMR coincidental measurements. Proposal for a correction to intercalibrate Tb over land in orange.

For some of our applications, some difficulties:

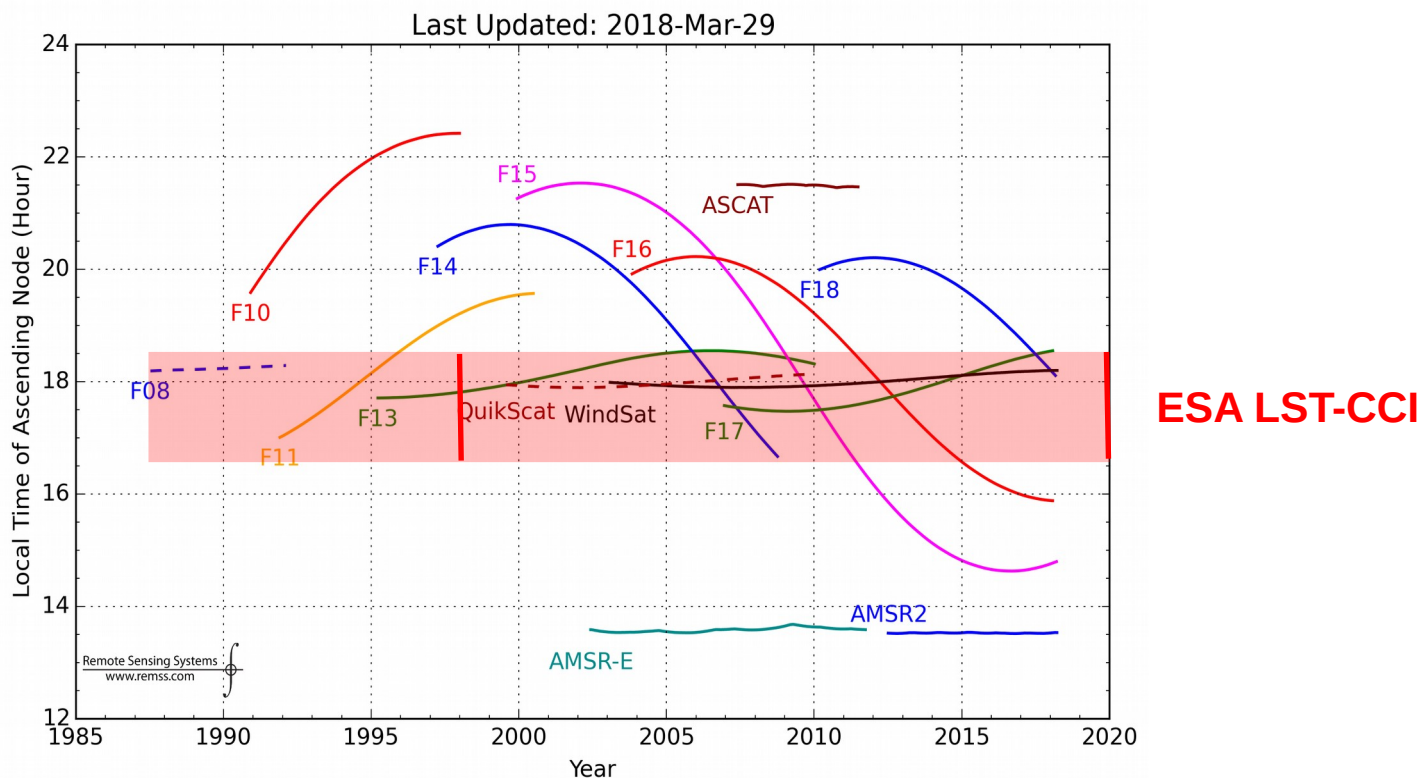
- Apparent discrepancy between TB from SMMR and GMI over land



July and August averaged GMI diurnal cycle at different frequencies compared to SMMR Tb over the same location, with the proposed correction.

For some of our applications, some difficulties:

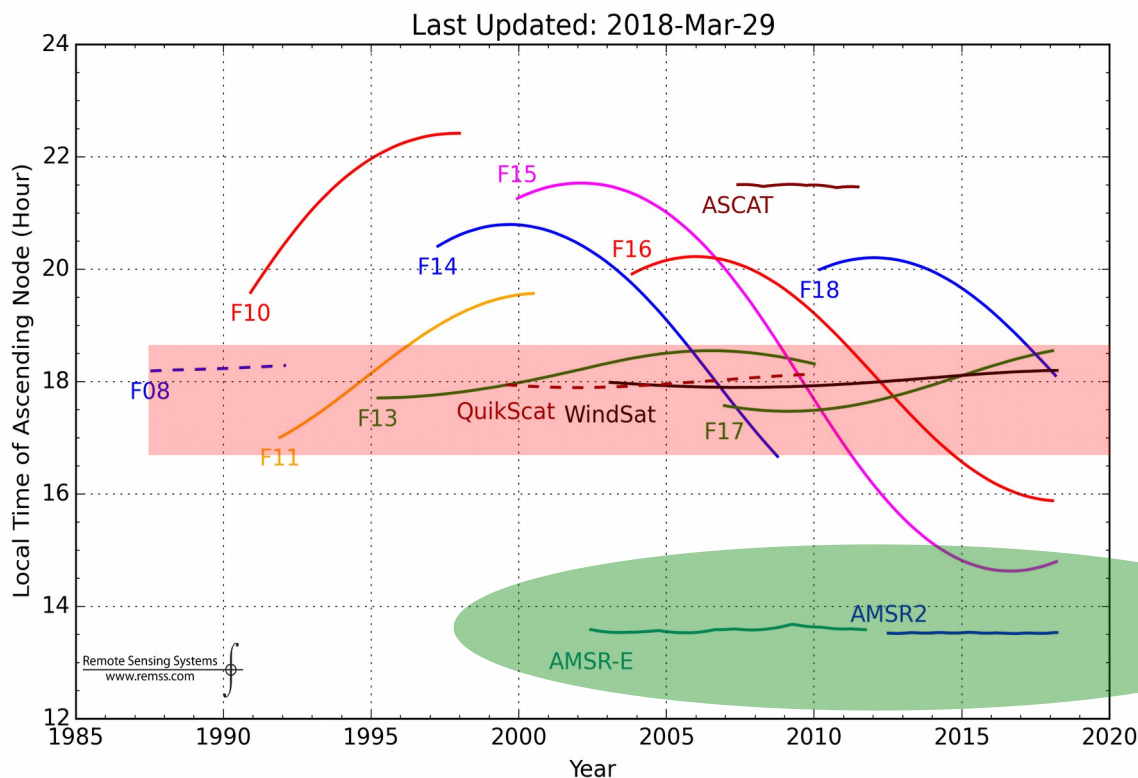
- Some **latency** in the processing of the newest years subject to the production cycles of CM-SAF and their allocated resources



For the ESA LST-CCI MW dataset we should officially cover the 1998-2020 period, with the potential to be extended to earlier years, but we may have to adapt to CM-SAF data production.

For some of our applications, some difficulties:

- We also use some other MW sensors for our developments, so an extension of the calibration to other microwave imagers will be welcomed.



For instance, there may be a possibility for a future processing of the **AMSR** family of instruments in the framework of the ESA LST-CCI project

- We have been developing products based on microwave imager radiances for the last 20 years, including variables such as land surface emissivities, land surface temperature, surface water extent, etc.
- Since the availability of the CM-SAF FCDR-MWI, we have adopted this data record as our main source of SSM/I and SSMI/S radiances for our product developments.
- Very positive experience as users of this FCDR, with easy access to the data, useful documentation, handy data packaging, and excellent support from the FDCR developers.
- Given that we mostly work with land applications, the ocean-based inter-calibration poses some challenges for us.
- Welcome developments would be a shorter latency to get the latest years, and an extension to other microwave imagers.