Koninklijk Meteorologisch Instituut

Institut Royal Météorologique

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Overview and status of the GERB instruments

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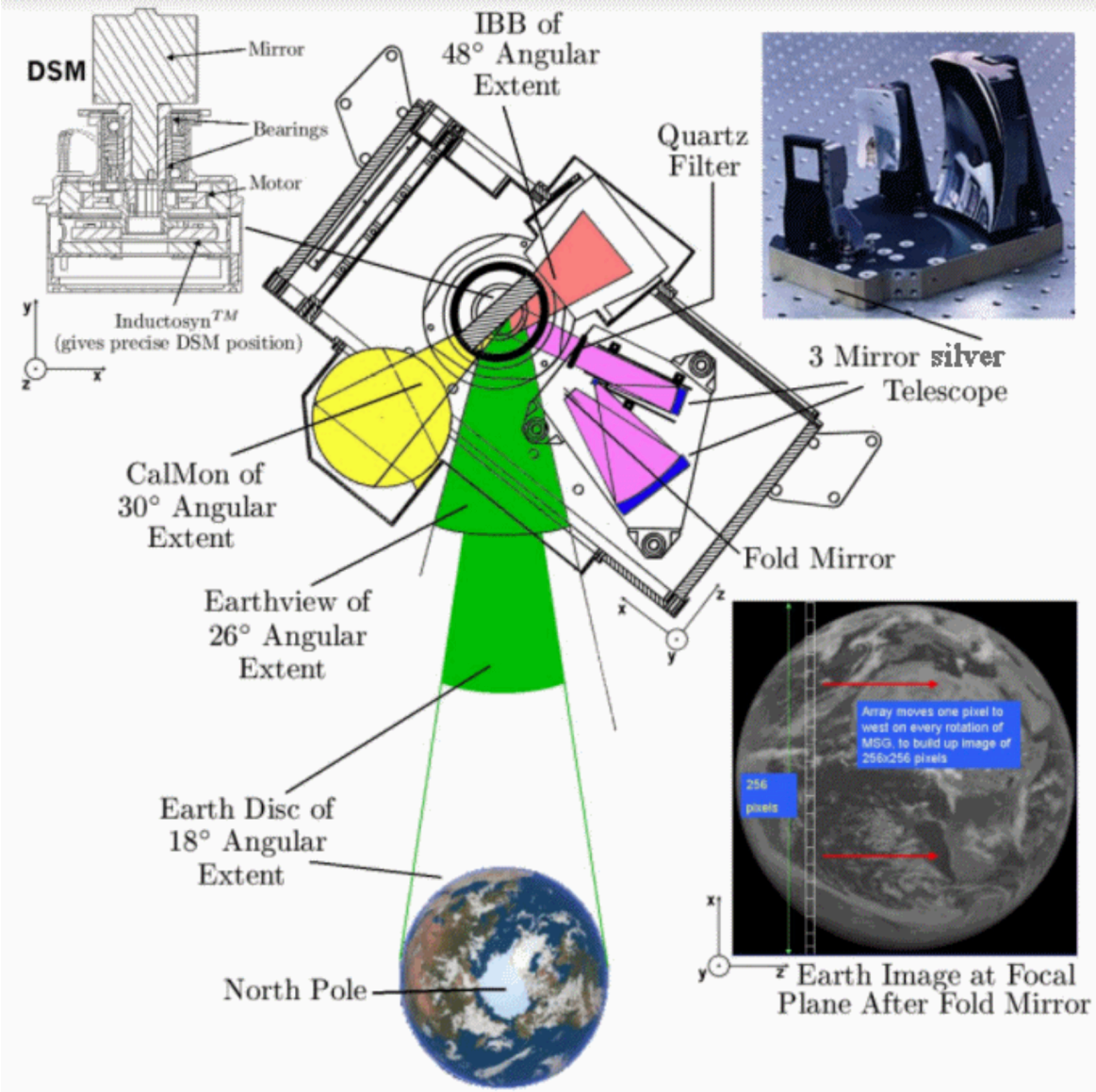
Introduction

GERB internals



- Positioned close to the rim of the geostationary Meteosat satellite
  - Endure 16g centrifugal force
  - Quite exposed to radiation
- 256 broadband sensors record vertical section of the image
- De-Spin Mirror (DSM)
  - Counteract rotation of the satellite
  - Allows to select horizontal section
- Each side of DSM alternatively used for recording a vertical section
- Measures TW and SW (with quartz filter)

Meteosat schedule

	S/C	i = 8°	Propellant EOL	Baseline End of service	Re-orbiting
GERB-2	Meteosat-8	Jun 2022	Jan 2023 (i=8.3°)	FES June 2022	October 2022
GERB-1	Meteosat-9	Apr 2025	May 2026 (i=8.8°)	RSS Apr 2022 FES Apr 2025	May/June 2025
GERB-3	Meteosat-10	Sep 2030	Mar 2031 (i=8.4°)	RSS end 2022 FES Q2 2030	September 2030
GERB-4	Meteosat-11	Dec 2033	Mar 2034 (i=8.3°)	RSS end 2026 FES Q4 2033[2]	January 2033

L=41.5° E

L=0°

Table 1: End of Service(s) and Re-orbiting dates

- Operational: inclination maintained within 2°
- Meteosat-8 in best effort operation

Meteosat schedule

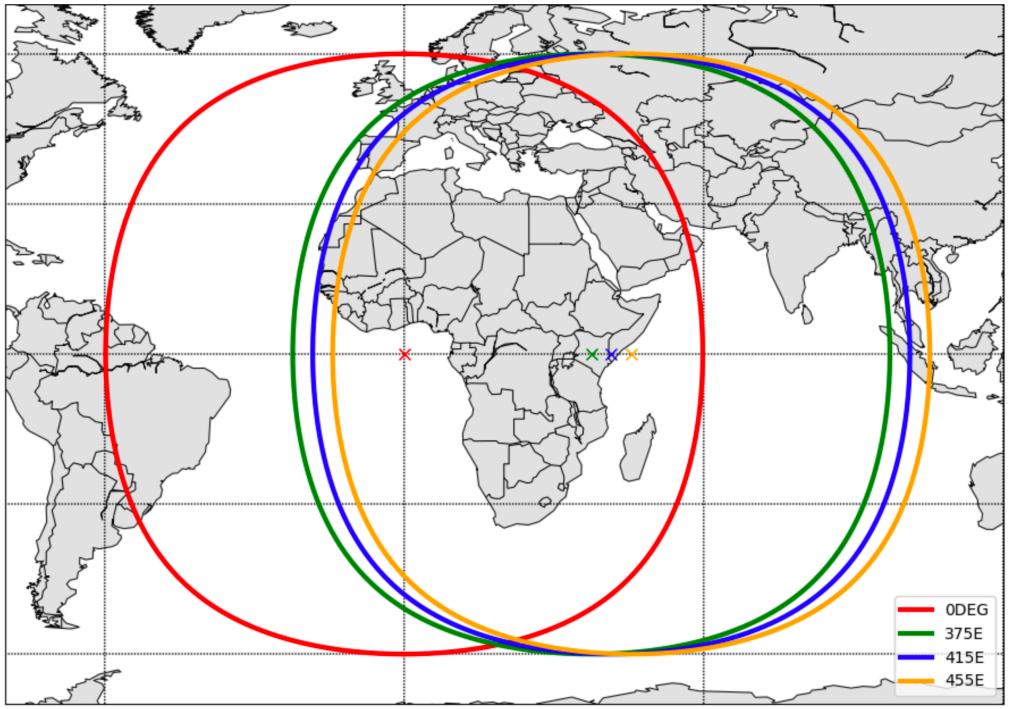


Figure 1: Useful Field of View (±60° longitude and latitude from sub-satellite point) for Meteosat-8 at 41.5°E (blue) and Meteosat-9 at either 37.5°E (green) or & 45.5°E (yellow) as well as Meteosat-11 at 0° (red).

- Meteosat-9 will replace Meteosat-8 in 2022
- Will use a different longitudinal position
  - Only 1 move of 1 satellite needed
  - 37.5 E and 45.5 E considered
- Most probable position 45.5 E
  - Favoured by most member states
  - Needs less propellant to maintain position
- Operate in parallel for 2 months

GERB De-Spin Mirror operation

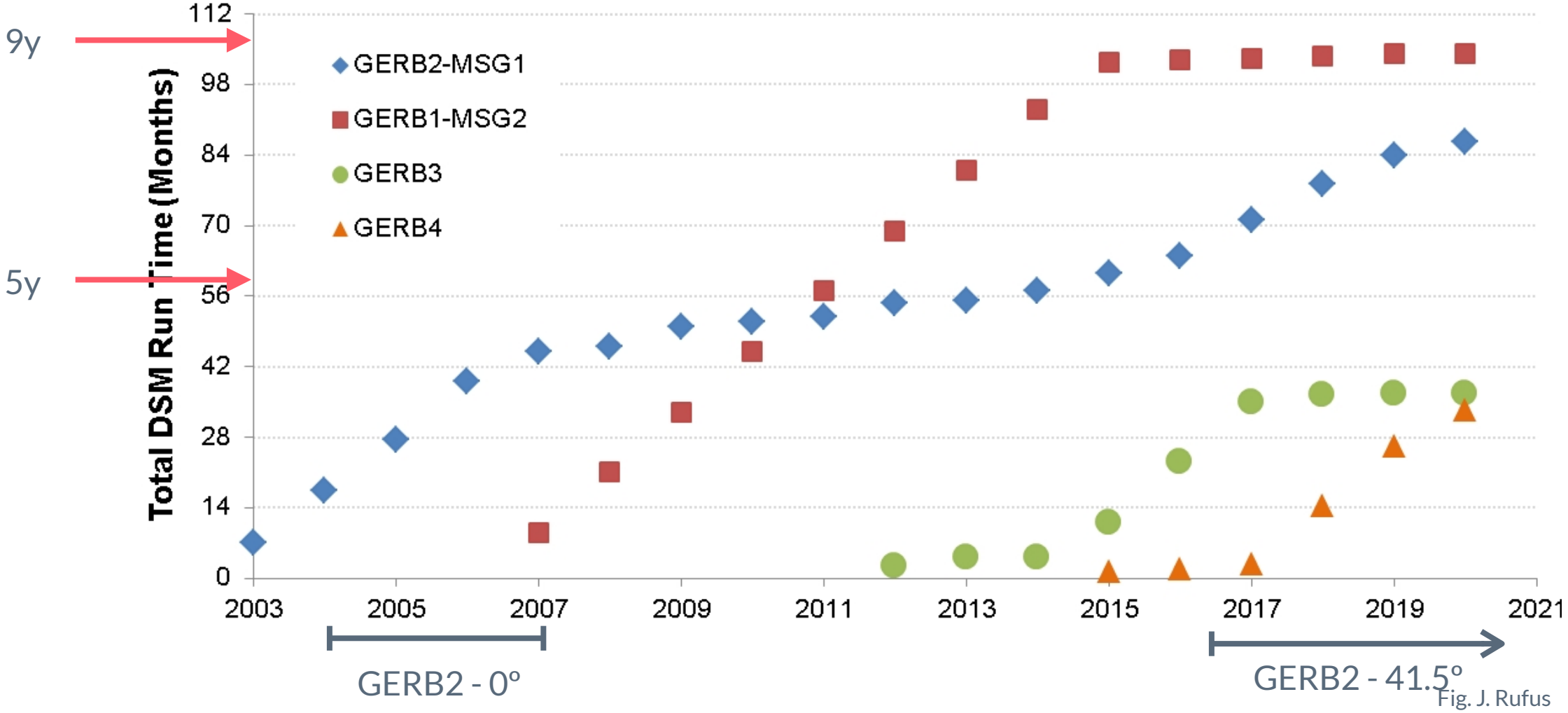


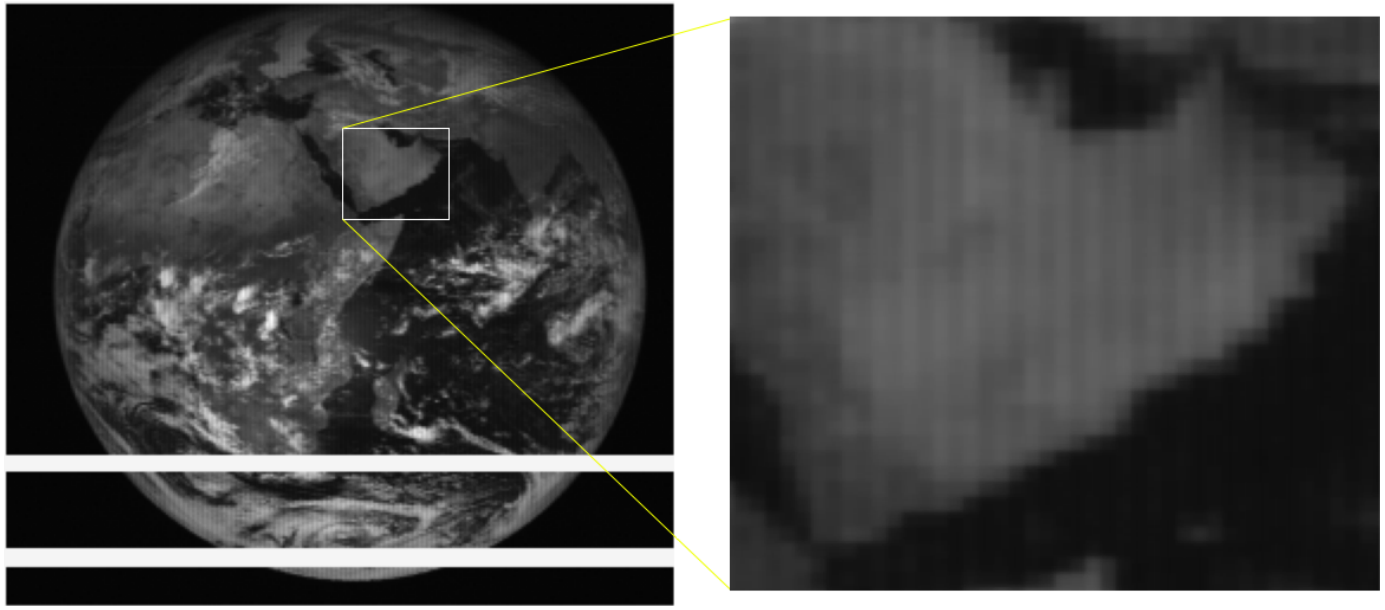
Fig. J. Rufus

Designed life expectancy DSM: 3.5 years

Status of GERB 1-4

GERB2 (Meteosat-8)

- Primary instrument at longitude 0° from from April 2004 - May 2007
- Instrument operated at longitude 41.5° E from September 2016 - …
- Oldest instrument
  - Has dead pixels
  - One side of the rotating mirror has aged considerably more

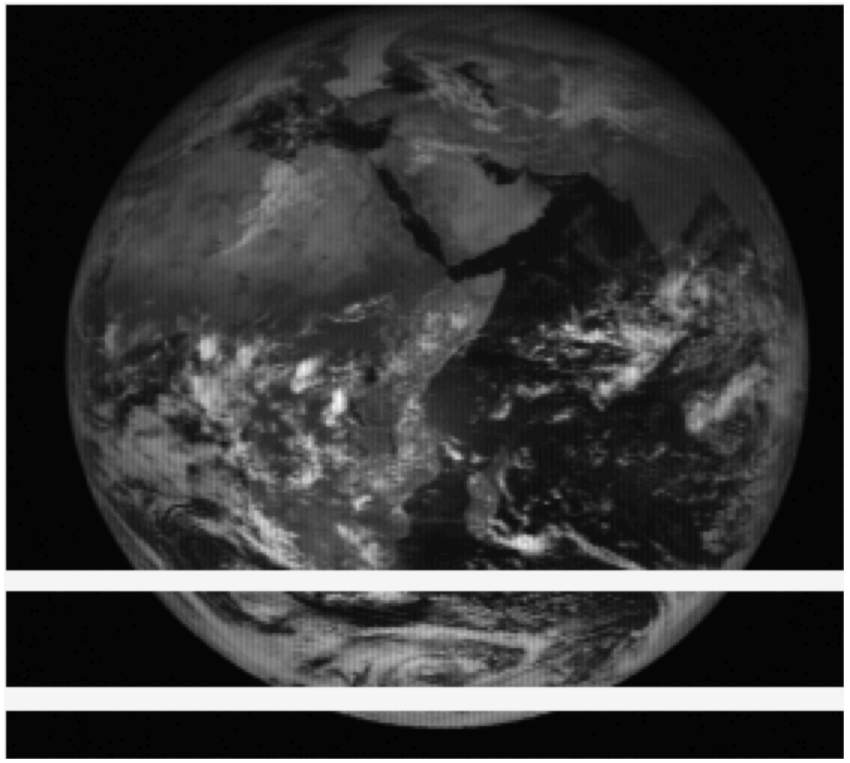


GERB2 (Meteosat-8)

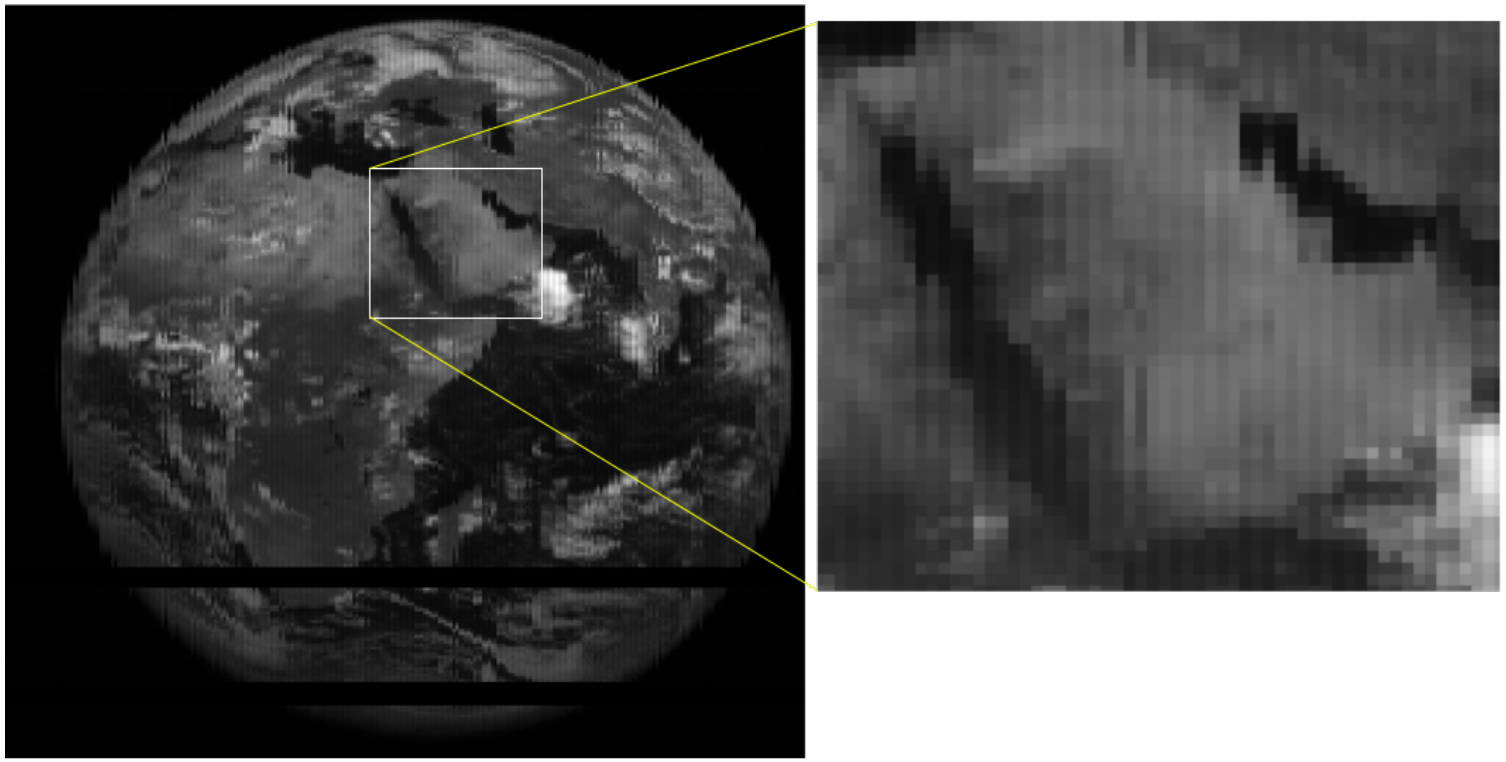
- SSU obscured from mid February -> mid August
  - SSU and ESU determine when the satellite has made a complete rotation
  - SSU is more accurate
  - Use ESU for recording when SSU is obscured
  - ESU signal has noise -> jitter -> inaccurate pointing
  - ESU signal jitter can be determined from satellite parameters
  - SSU images taken with 282 columns (standard)
  - ESU images taken with 564 columns
    - Retain only 282 columns taken with the ‘good’ DSM face

SSU=Sun Sensor Unit ESU=Earth Sensor Unit

GERB2 (Meteosat-8)

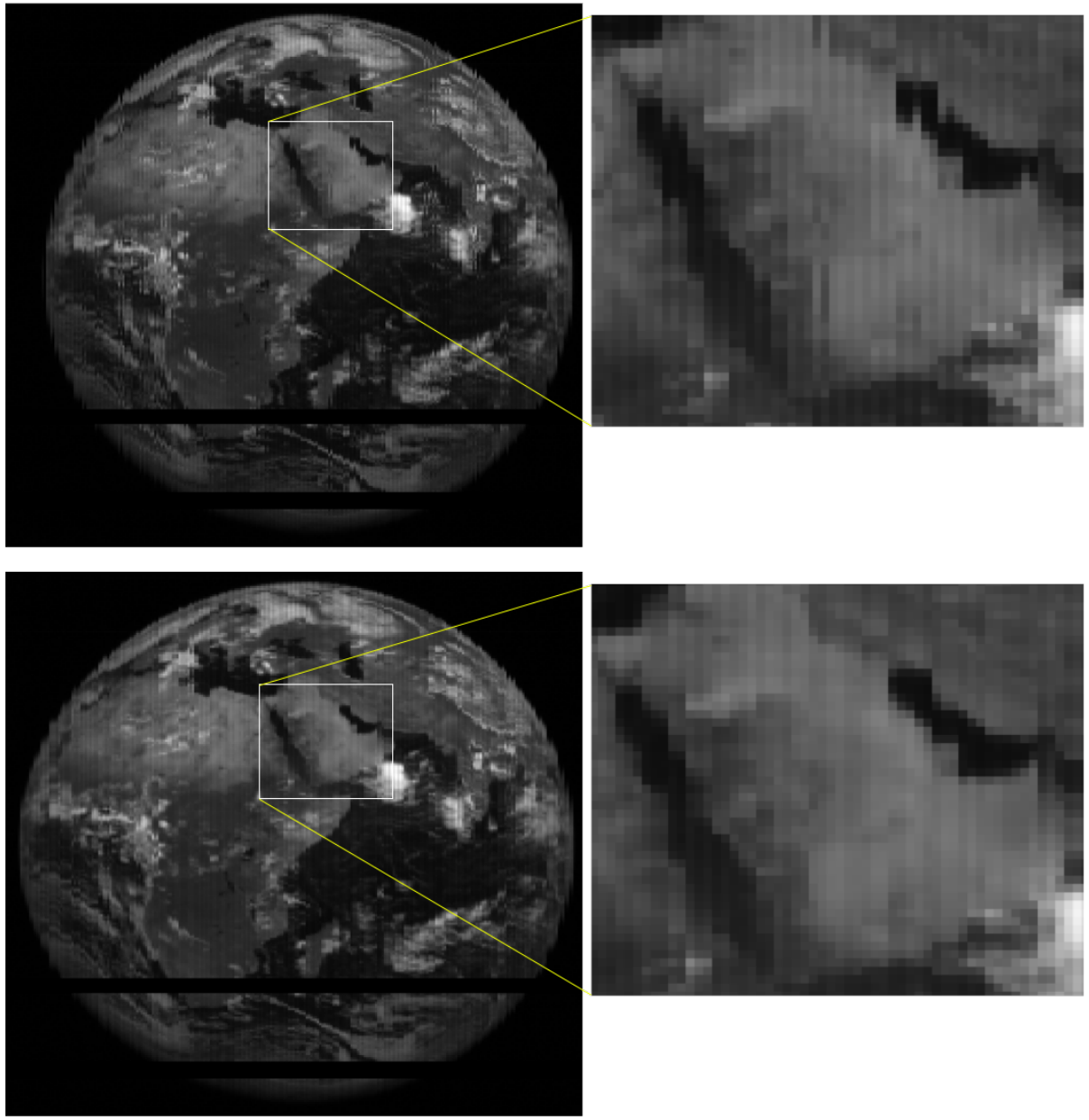


SSU



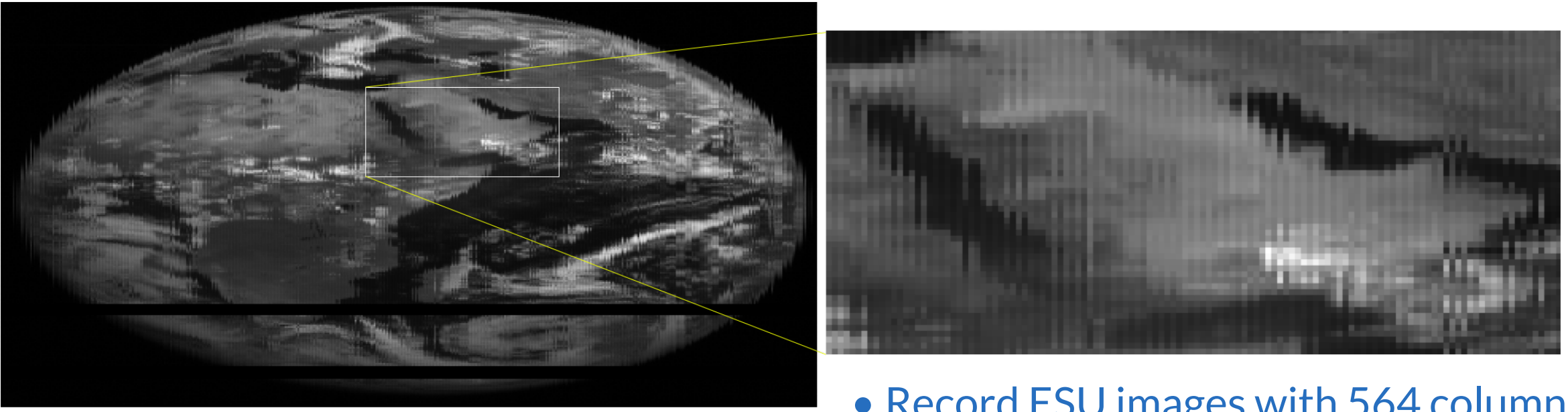
ESU

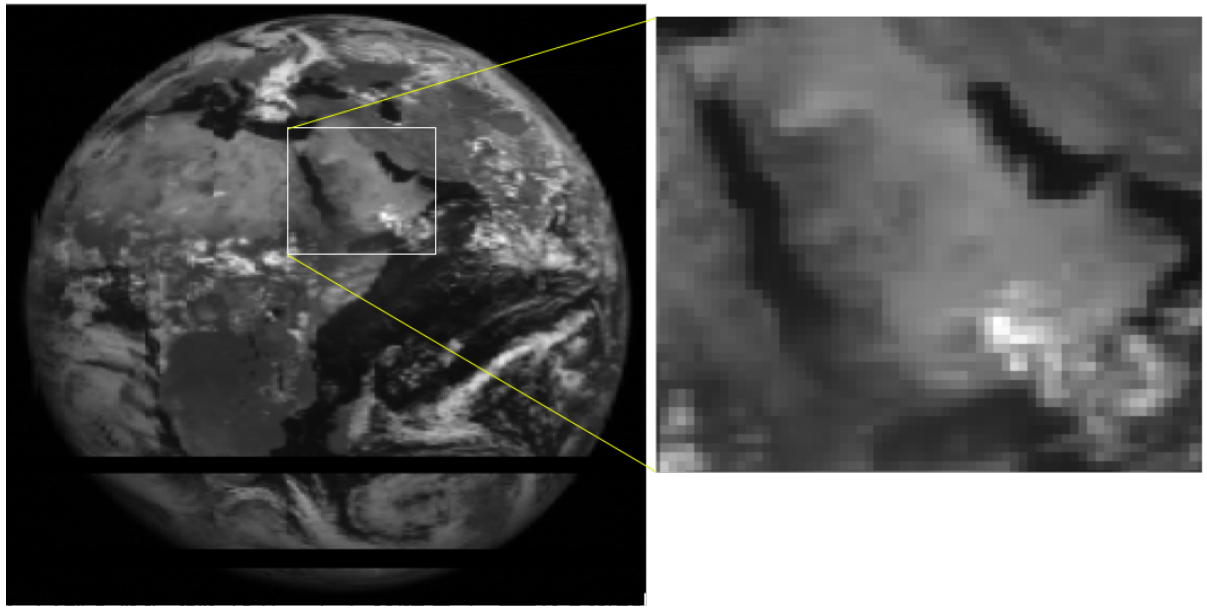
GERB2 (Meteosat-8)



- Correct column position by using available satellite information
- Reorder columns
- Interpolate to wanted position using only columns with the same face of the DSM
- Still problem of different response of both DSM faces

GERB2 (Meteosat-8)





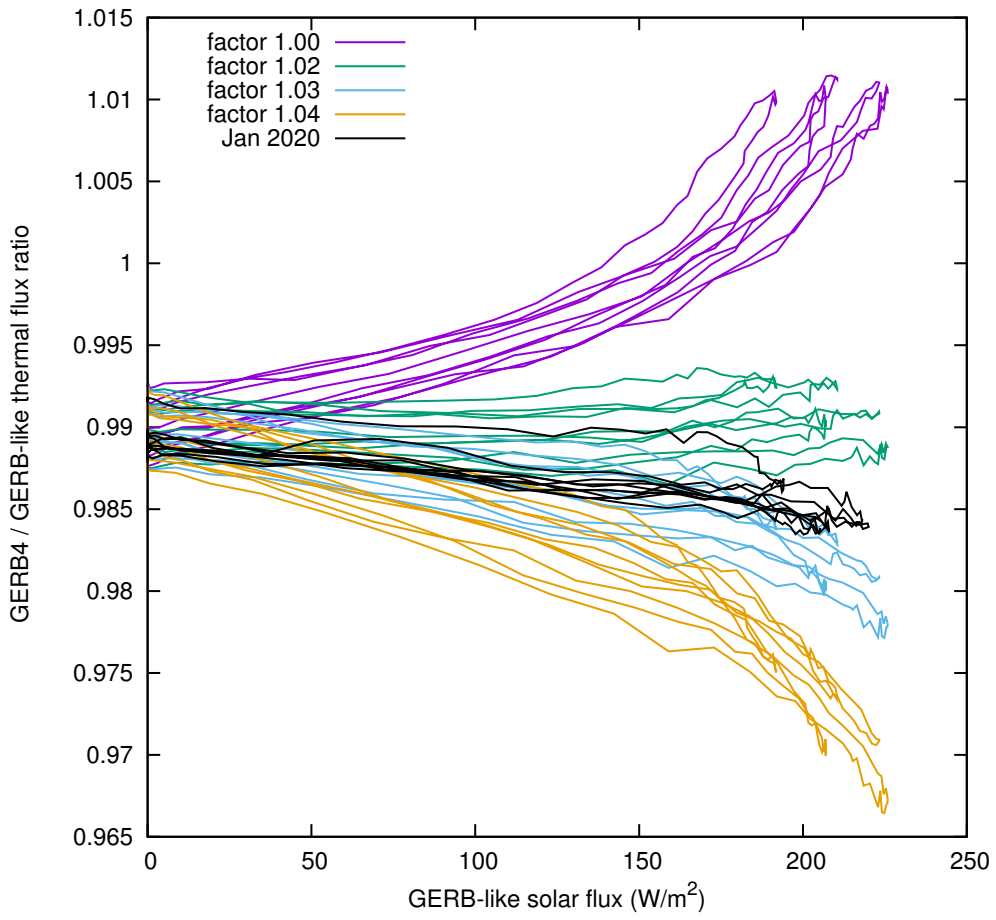
- Record ESU images with 564 columns
- Reorder columns
- Drop columns taken by ‘bad’ face of the DSM
- Interpolate columns to wanted position

GERB 1, 3

- GERB1 (Meteosat-9)
  - Primary instrument from May 2007 - Jan 2013
  - Currently switched off
- GERB3 (Meteosat-10)
  - Primary instrument from Jan 2013 - Feb 2018
  - Rotating mirror blocked from Apr 2013 - Feb 2015 -> ageing of exposed mirror side
  - Different ageing of DSM faces corrected
  - A number of periods with quartz filter problem (see GERB-4)
  - Currently in SAFE mode

GERB 4 (Meteosat-11)

- Primary instrument at longitude 0° from Feb 2018 - …
- Both sides of rotating mirror not completely parallel
  - Vertical shift of 0.8 pixel between odd and even columns
  - Corrected
- Some periods operated with quartz filter not completely in place
  - Uniform darkening of the SW signal
  - Overestimation of the LW signal



More details in talk of Christine Aebi about data validation

COVID-19

Impact of COVID-19

- Until now all members of the GERB team still in good health
- Mostly working from home with remote access to the institutes
  - Impact on working conditions strongly depending on the family situation
    - Schools closed mid-March, partially reopened in June
  - Impacted by level of data availability
- Access to the premises discouraged or difficult (government decision)
  - Technical problems take more time to be solved
  - Operations that need physical access not obvious
  - Data needed to correct GERB2, GERB3 and GERB4 images delayed
  - Reprocessing of GERB data stalled

THANK YOU

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