

Reprocessing and Quality Control of Heritage Third Party Optical Earth Observation Missions

Samantha Lavender¹, Sabrina Pinori², Chris Doyle¹ and Kajal Haria¹



1 Telespazio UK, Luton, UK

2 SERCO, Frascati, Italy

Sam.Lavender@telespazio.com

IDEAS-QA4EO 

Role of IDEAS-QA4EO in dataset Quality Control

- The European Space Agency (ESA) is responsible for the reprocessing and distribution of Earth Observation (EO) data from both their own satellite missions and the Third Party Missions (TPM) programme.
- ESA supported missions that have been inactive for over 5 years are covered via ESA's Heritage Space Programme.
- These historical datasets can be extremely valuable as they may have been collected when limited satellites were in orbit or offer unique capabilities.
- Support for the reprocessing activities of such missions is provided by the IDEAS-QA4EO service, whose responsibilities include the iterative QC of test datasets.
- An overarching aim is to allow the historical data to be accessible by the scientific community in a recognisable file format, with metadata and documentation supporting an understanding of known limitations and anomalies.



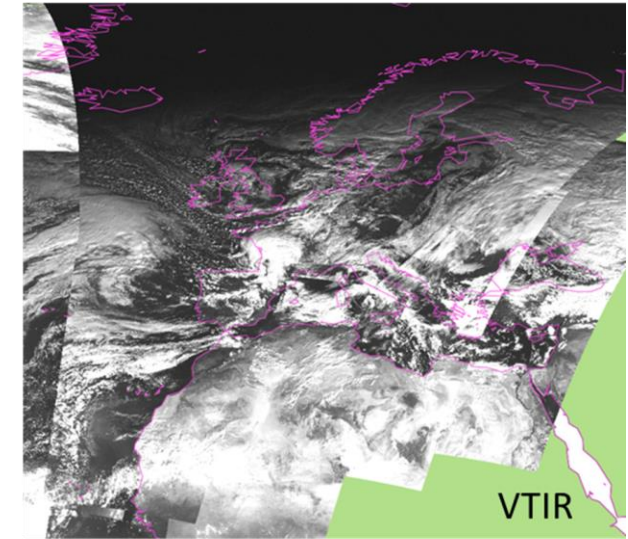
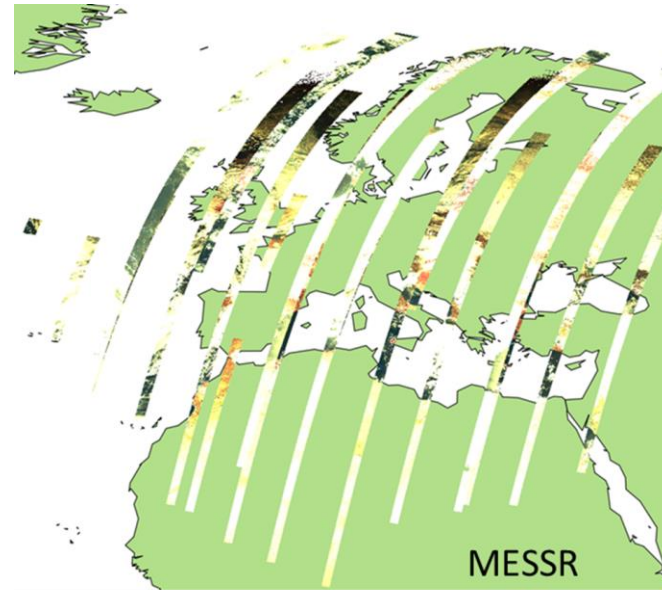
Challenges

- Difficulties can be faced in bringing historical datasets up to the standards of modern missions.
- Reprocessing challenges occur as documentation may be limited, and the Level 0 datasets may not have associated with them all the ancillary data needed.
- Also, the reprocessing activities consider what would make the dataset most useful to end users. This involves choosing an appropriate output format and including metadata files that allow quick access to information to support automated and/or cloud-based processing.
- As an example, the following slides will showcase the reprocessing of the Marine Observation Satellites (MOS-1 and -1b)



MOS-1 and -1b Reprocessing

- Multispectral Electronic Self-Scanning Radiometer (MESSR) and Visible and Thermal Infrared Radiometer (VTIR) products from the National Space Development Agency of Japan (NASDA) received by ESA during the 1980s and 90s.
- MESSR is like the USGS Landsat missions: swath width of 100 km, 50 m spatial resolution, and four bands.
- VTIR is like the data from the NOAA AVHRR missions: 1500 km swath width, 0.9 to 1.1 km spatial resolution, and four bands.
- Outputs are highly sensitive (in terms of geometric accuracy) to the Time Correlation files updated during the processing.



Complexities of processing



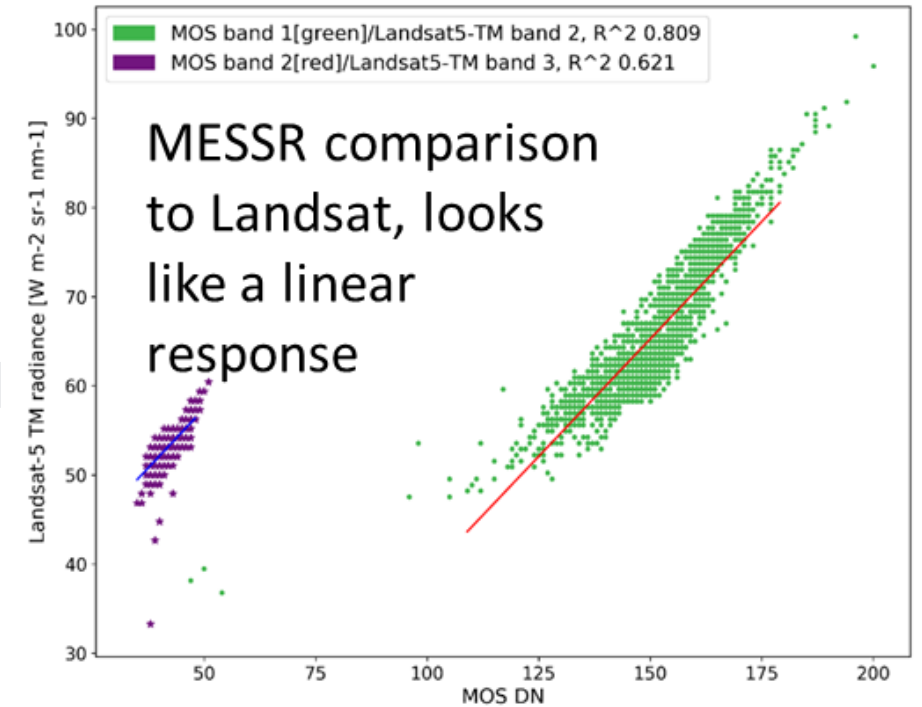
- **Forward processing**, MESSR orbit with Ground Control Points (GCPs) generates corrected Time Correlation (TC)
- Next MESSR orbit uses the previous TC data and confirms if the GCPs can be found
- VTIR orbit co-incident with MESSR uses the MESSR generated TC data

- **Backward processing**, reprocesses MESSR orbits without GCPs for which there was too large a TC data gap to use forward processing
- VTIR co-incident with the newly processed MESSR orbits use the additional TC data



Status and future updates

- As a summary of the QC, for the backward processing there was an increase in the number and percentage of the higher quality geo-referenced products compared to the forward processing.
- There were some missing Level 1 products due to too large a gap in the TC file coverage, and so further reprocessing activities are being undertaken.
- Both datasets have limited radiometry. A preliminary cross-comparison for MESSR data (see figure, top right) showed radiometric correction may be possible. However, work is needed to understand if the required ancillary data is available and can be extracted from the ESA archive, so the first release of the datasets will not be radiometrically corrected.



Conclusions

- As outlined for the MOS missions:
 - The reprocessing of heritage optical missions often requires the development of a new processor.
 - This processor requires the gathering of information from multiple sources and an iterative process to test the new processor before the full reprocessing occurs.
 - The reprocessing needs not only the Level 0 source data but also ancillary sources of information that support the accurate geometric registration and radiometric calibration.
 - Knowledge of ancillary sources may have been lost over time.
- With the increased popularity of Analysis Ready Data (ARD), reprocessing campaigns are also considering whether datasets can be processed to Level 2 and stored to comply with the CEOS ARD specifications.





THANK YOU
FOR YOUR ATTENTION

telespazio.co.uk

