



Supporting EarthCARE instrument calibration through application and development of the calibration algorithms in the DISC Instrument Calibration and Monitoring Facility



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The main objective of the **Earth Cloud, Aerosol and Radiation Explorer (EarthCARE)**, is to take measurements of global profiles of **aerosols, cloud, precipitation** and associated **radiative fluxes** that could be used for reliable representation in weather forecasting and climate models. These measurements are provided by the missions' four instruments: the Atmospheric Lidar (**ATLID**, ESA), the Cloud Profiling Radar (**CPR**, JAXA), the Multi-Spectral Imager (**MSI**, ESA) and the Broad-Band Radiometer (**BBR**, ESA).

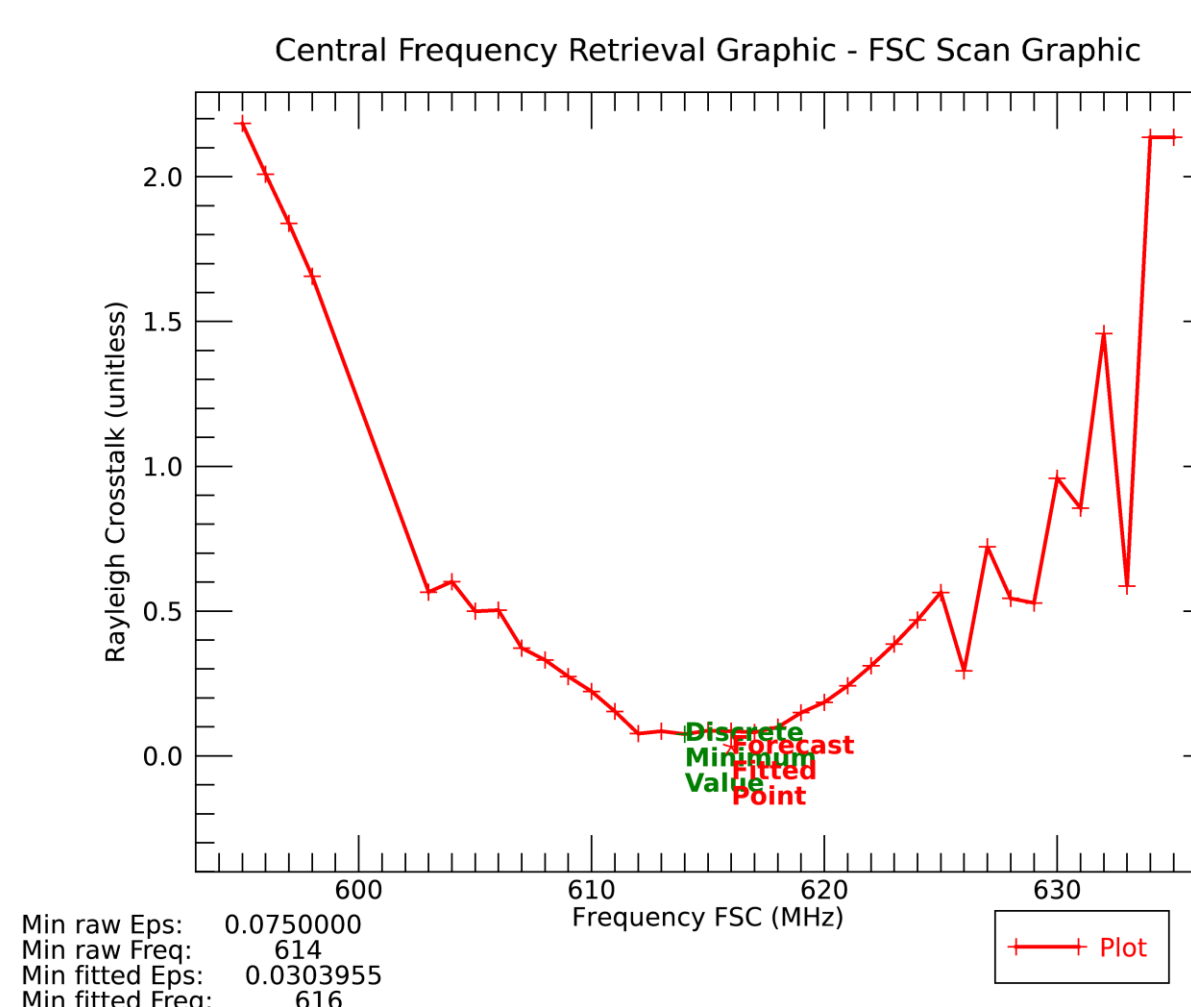
The **Instrument Calibration and Monitoring Facility (ICMF)** is a core and complex component of the EarthCARE DISC, responsible for providing monitoring and offline calibration activities. The operation of the ICMF, led by Telespazio UK with the support of Exprevia and NV5, allows for the update of calibration parameters, either supplied as inputs to the L0/L1 processing chain (on-ground) or uploaded to the instrument (on-board). On-ground updates are managed through Auxiliary Data Files (ADFs), while on-board updates are managed through Configuration Table Items (CTIs). This process involves dedicated calibration processors, tools for viewing and editing CTIs/ADFs, and dissemination functions — both automatic and on-demand — for distributing the updated files.

ICMF Calibration Processors

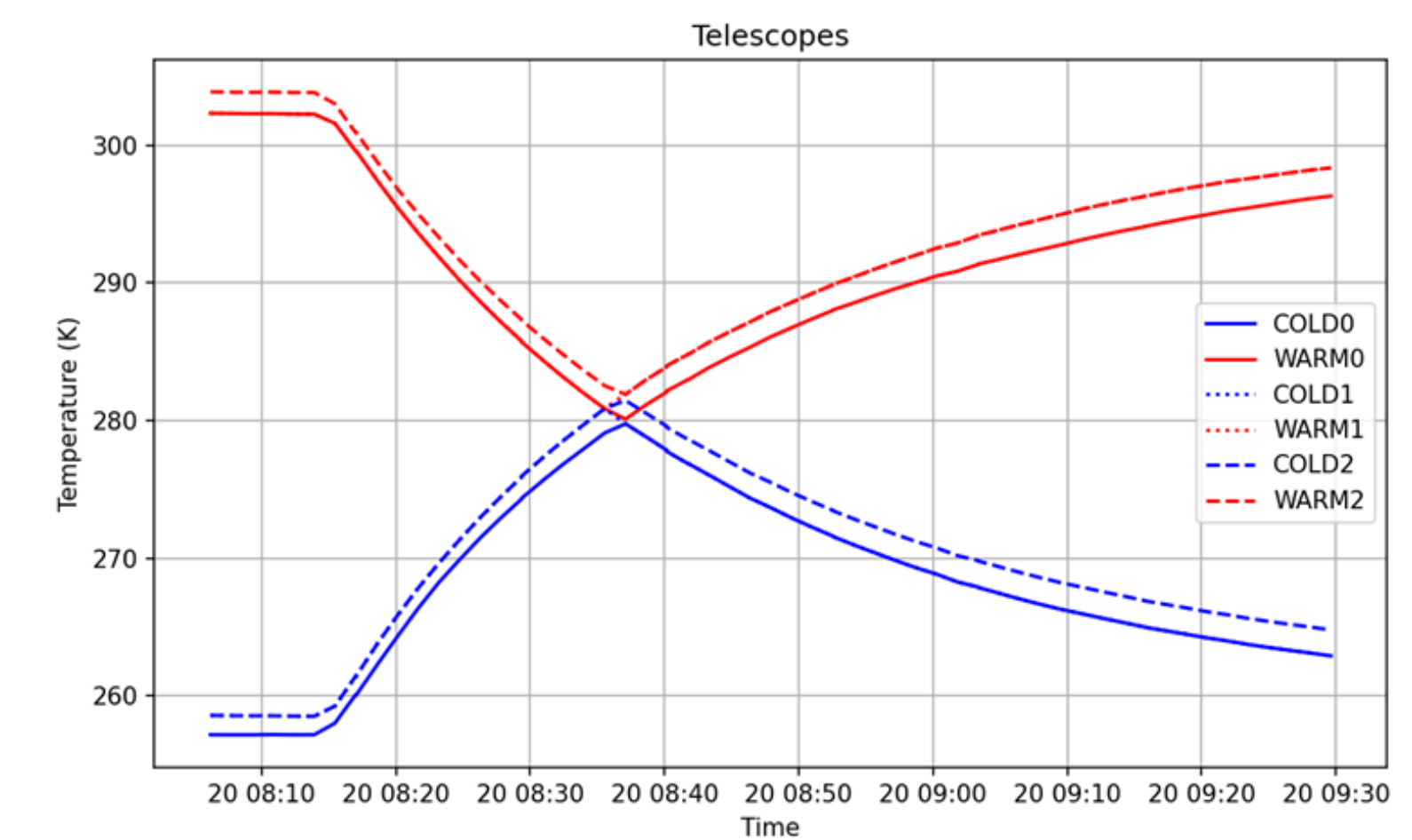
The ICMF calibration system, whose maintenance and evolution are provided by the EarthCARE DISC Task 3 team, is composed of:

- **16 calibration processors for ATLID:** Fine and Coarse Spectral, Dark Current, Spectral Cross talk, Rayleigh Channel Absolute, Nominal and Vicarious Mie Co Polar Channel Absolute Calibration, Mie Cross Polar Channel Absolute, Dark signal Non-Uniformity (CAS), Fine and Coarse Co-Alignment, Fibre Spot Position in DFA Detectors, CAS PRNU check, Correction of dt3_fix (ACDM Master Clock), Laser Cavity Offset (contingency) and Emission Defocus Calibrations.
- **5 calibration processors for MSI:** VNS Sensitivity and Correction Factors, TIR (Thermal Infra Red) Offset Monitoring and Correction, TIR Sensitivity Check and Compensation, TIR Unresponsive Element Identification Test and TIR Ancillary HKTM Drift Inspection.
- **6 calibration processors for BBR:** Sun Calibration, BB Temperature Inversion (linearity check), BB Thermal Stability, Warm BB Powers and Close Loop Calibration.

Example plots from the calibration processors

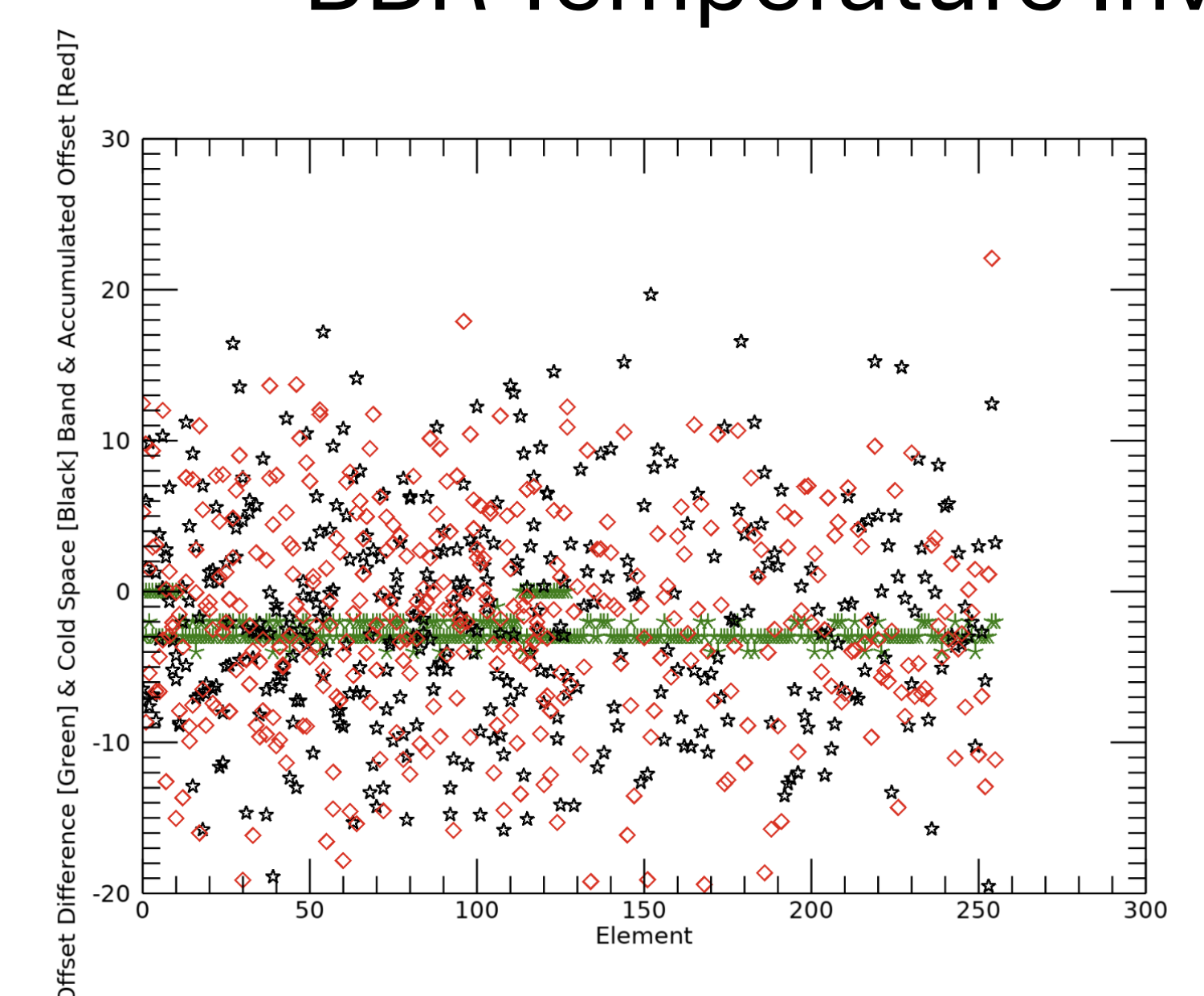


ATLID Fine Spectral Calibration



BBR Temperature Inversion

MSI TIR Offset Monitoring and Correction



Day-to-Day Activities

The ICMF team works:

- Closely with the **Instrument Working Groups**, sharing calibration processor outputs and agreeing on calibration updates.
- Where calibration activities are operational, the ADF/CTI updates are sent to the ground segment after **Quality Control** checking.
- As part of reprocessing activities, new ADFs are generated to support improved calibration of the data.
- Ongoing work aims to streamline and improve the ICMF activities, improving calibration outputs.

