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Harmonic magnetometer baseline derivation in the ECLAT project

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In the EU FP7 project 'European Cluster Assimilation Technology' (ECLAT), a novel method for deriving the baselines, or 'quiet day curves', of magnetometer data has been developed. The full baseline is composed of two main components: the diurnal baseline and the long-term baseline.

For the diurnal baseline, first 'templates' are derived, based on the lowest few harmonics of the daily curves from the quietest days. The diurnal variation of the baseline is obtained by interpolating between these templates. This method ensures a smooth baseline at all times, avoiding any discontinuities at transitions between days or months.

The long-term baseline is obtained by interpolating between the daily median values. This way, the baseline is ensured to follow long-term trends, such as seasonal and tidal variations, as well as equipment drift. The daily median values are calculated for all days expect the most disturbed ones; a procedure is included to ensure that these median values are unaffected by disturbances.

This procedure avoids many problems associated with other existing baseline procedures, and makes magnetometer data suitable for the calculation of ionospheric equivalent currents. Even data from remote unmanned magnetometers, which exhibit unrealistic equipment drift, can be made suitable this way, which can be valuable contributions to the equivalent current database.