TPMU - PROBA II microsatellite measurement - data recalibration using polynomial regressions via Vandermonde matrix

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We present statistical analysis of recalibrated TPMU - PROBA II microsatellite long-term measurement of the floating potential FP and the electron temperature Te in comparison with the Te and the FP measured data with Swarm Langmuir Probes and IRI model computed data. The analysis is performed for all seasons from year 2010 until now.

Thermal Plasma Measurement Unit (TPMU) scientific instrument was developed for PROBA II microsatellite and launched in November 2009. The device is working with limitations of scientific measurements caused very probably by installed on-board software. The measurement of the floating potential is not affected. This behaviour of the instrument is stable and lasting since begin of the mission. Measured floating potential FP and the electron temperature Te data are completed with orbital parameters.

We implemented the stochastic method of polynomial regressions via Vandermonde matrix. In order to evaluate the resulting model at specific data points, Te data measured by the Swarm Langmuir Probes in similar space-time coordinates and the IRI (International Reference Ionosphere) model computed Te data in identical space-time coordinates with TPMU - PROBA II instrument we used.

The recalibrated Te data react physically in presented intervals. Use this procedure we improved physical characteristics of data and we significantly reduced their systematic distortion. This recalibration opens opportunities to scientific interpretation of measured data.