

The effect of active spacecraft potential control on three-dimensional measurements of electron distributions on board Double Star TC-1

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A database spanning more than two years has become available from the operation of the active spacecraft potential control on board the Double Star TC-1 spacecraft. The low, controlled potential helps to reduce disturbances in the measured electron distributions including effects by photo-electrons generated at the surface of the spacecraft. The applied method using an energetic ion beam is the same as in the Cluster mission, but the advanced version of the instrument allows to emit higher beam currents and to lower the potential further. While the main effects of the experiment are clear, the detailed analysis of the modifications of the electron distributions from the uncontrolled to the controlled case has so far been preliminary. The high requirements on accuracy, especially for differential measurements in multi-spacecraft missions, call for further analysis. As well-calibrated electron data from TC-1 have become available, including an extensive set of 3D distributions, this paper presents the effects of the potential control on them in many details, and for several plasma environments ranging from lobe to magnetosheath and solar wind. The results are also relevant for Cluster and future missions with a similar constellation of instruments.