

Solar Wind Particle Distributions Measured by the SWA sensors on the Solar Orbiter Spacecraft

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The Solar Wind Analyser (SWA) suite of sensors on the Solar Orbiter spacecraft is able to make measurements of ion and electron distributions in the solar wind with high-time and high-angular resolution. Full 3D sampling of the ion and electron distributions can be performed at a 1-second cadence, while reduced distributions (e.g. 2D electron pitch angle distributions) can be recorded in burst modes in fractions of a second. In this presentation, we focus on recent work to improve the quality of the electron measurements and the diagnostics of the ambient plasma properties that can be derived from them. For example, we describe our efforts to extract the natural solar wind distributions from the electron populations that are generated from the spacecraft surfaces and to remove the effects of the complex electrostatic environment surrounding the spacecraft itself. We illustrate how the measured distributions are impacted by these effects and how these are currently mitigated. We also summarize some recent scientific results supported by the measurement of these distributions by the SWA suite in the inner heliosphere. These include recent work to understand how and when the electron distribution observed at Solar Orbiter may retain information about the conditions in the solar coronal source region by comparison to the contemporaneously observed heavy ion charge states which are known to be frozen-in to the solar wind flow close to their source.