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The Cassini Radio & Plasma Wave Science (RPWS) view of the Enceladus Space Environment

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A physical picture of the interaction between Saturn's magnetosphere and the moon Enceladus space environment is presented based on Radio and Plasma Wave Science (RPWS) observations. The space environment around Enceladus consists of several different regions with a diversity of active physical processes. Foremost, the southward exhaust plume reveals a cold, dense, conductive and dusty plasma environment where the magnetic field is piled-up. Plasma acceleration processes are active at the plume edges, and constitute an important part of the electrodynamic MHD dynamo, giving rise to Auroral hiss emissions as well as a magnetic footprint pattern in the high-latitude atmosphere of Saturn. The Enceladus wake is filled with negatively charged dust that depletes the region from electrons by water grain attachment. The grains around Enceladus can be picked-up by the magnetospheric co-rotation electric field. The charged water grains then populate the region in Enceladus orbit around Saturn and create the E-ring. Depending on the size of the grains, different grain evolutions occur and different dynamics of the grains are expected. The Enceladus plume as well as the plasma disc surrounding the E-ring constitutes complex natural laboratories for dust-plasma interaction, which has important implications also for the newly discovered Europa plume and associated plasma disk material around Jupiter to be investigated by the ESA JUICE and the NASA Europa Clipper missions. We present a detailed account of the Cassini RPWS observations around Enceladus with associated physical interpretations.