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A walk around a comet with the Rosetta Plasma Consortium

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Comets present a variety of plasma phenomena, which the Rosetta Plasma Consortium (RPC) is in a unique place to investigate. In particular, the possibility of long term in-situ monitoring of the evolution of the coma and its various plasma regions from a spacecraft moving at walking speed (meters per second) has no counterpart on any other space mission. In addition to much more details on the physics of features discovered on flyby missions like Giotto, e.g. the contact surface and ion pick-up processes, it will be possible to see how they evolve, study their stability, and to discover any entirely new phenomena. In this presentation, we show some data and results obtained earlier in the mission and recently during the recommissioning of the RPC after hibernation, with our expectations for the comet phase, particularly early activity signatures in the coming months. Among the first signs of cometary activity we expect to be ring and shell distributions of pick-up cometary ions directly detectable by the Ion Composition Analyzer (RPC-ICA) and the Ion and Electron Sensor (RPC-IES), and the ion cyclotron waves they generate should be picked up by the Fluxgate Magnetometer (RPC-MAG). Early electron density enhancements will be visible in the spacecraft potential accessible by the Langmuir probes (RPC-LAP) and any associated high frequency waves by the Mutual Impedance Probe (RPC-MIP).