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Low-frequency waves in the inner coma of 67P/Churyumov-Gerasimenko: Numerical simulations and observations compared

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Since the arrival at comet 67P/Churyumov-Gerasimenko the Rosetta Plasma Consortium (RPC) explores the cometary plasma environment. At the current stage, in the early escort phase, the cometary activity is low in comparison to the expected perihelion activity. This is why the plasma interaction between the comet and the solar wind is only weak, i.e. no bow shock or diamagnetic cavity is present. Instead, the RPC instruments measure quasi-coherent low frequency waves in the frequency range 20 to 80 mHz.

A similar wave activity is present in hybrid simulations performed with the A.I.K.E.F. code, which describes ions as particles and electrons as a fluid. The simulated waves are characterised by a wavelength of about 50 km and a frequency of 40 mHz. Besides the magnetic field fluctuations, variations of the cometary ion density are present in the simulation with the same frequency.

In this work we compare the actual observed waves at the comet with the simulated waves in order to study their characteristics and to understand their origin. The hybrid simulations, validated by comparisons with in situ observations, enable us to gain a global picture of the weakly active cometary plasma environment.