Plasma properties of suprathermal electon populations near comet 67P with Rosetta

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Rosetta measurements have shown that the plasma in the vicinity of comet 67P/Churyumov–Gerasimenko is characterized by three different electron populations: cold (T < 1eV), warm (5-10 eV) and hot (few 10s eV). In this work, we have studied and compared the warm and hot suprathermal electron populations observed by Rosetta. After having extracted estimates for the warm and hot electron densities and temperatures using the RPC-IES electron data, we have compared and validated the results using measurements from the RPC-MIP and the RPC-LAP instruments.

We have observed that near perihelion (i.e. when the neutral cometary outgassing rate is high) the warm and hot electrons are well characterized by a double-kappa distribution, while at large heliocentric distances (i.e. low outgassing rate) a double kappa description works out only about 10% of the time. The warm and hot populations show different properties with both heliocentric distance and cometocentric distance. Regarding heliocentric distances, while the warm electron population temperature is rather constant and its density follows the cometary outgassing rate, the hot population is observed to become much denser and hotter near perihelion. Regarding cometocentric distances, the warm electron population density is shown to vary with the radial distance from the comet's surface similarly to the total electron density, while the hot population density decreases much faster than the warm population density with cometocentric distance. The temperature of both populations does not show any dependence on the radial distance from the cometary surface.