



## **Study of Electron Acceleration by Lower Hybrid Waves at Comet 67P**

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We report on the observation by the Ion and Electron Sensor (IES) of energetic ( $>1$  keV) electrons in the plasma environment of comet 67P. Most of the electrons in the cometary coma are expected to be of solar wind or photoionization origin so should be  $<$  tens of eV. During the Vega flybys of comet Halley,  $\sim 1$  keV electrons were observed and these were explained as having been accelerated by lower hybrid (LH) waves resulting from the two-stream instability involving the solar wind and pickup ion flows. These waves resonate with the cyclotron motion of the ions and the longitudinal motion of electrons and are the order of several Hz, at least in the case of 67P. We postulate that the energetic electrons we have observed on Dec. 3, 2015 are also the result of such a process and that Landau damping causes the abrupt decrease in this energy (also seen at Halley). Studies using measurements by the Langmuir probe instrument on board Rosetta identified occurrences of LH waves on October 10, 2015 although IES did not see high energy electrons during that period. However, we do see electrons accelerated to 100s of eV at times, which could also be the result of acceleration by LH waves produced under other conditions.