

## Height dependences of Enceladus plume observed by Cassini RPWS/LP

# Shotaro Sakai[1]; Michiko Morooka[2]; Jan-Erik Wahlund[3]; Shigeto Watanabe[1]  
[1] CosmoSciences, Hokkaido Univ.; [2] Tohoku Univ., PPARC; [3] IRFU

We present the in-situ observations of the Enceladus' plasma environment obtained by the Cassini Langmuir Probe. Previous results of the flybys in 2008 showed that the electron densities were less than 1% of the ion densities in the plume. This is because that the electrons are attached to the plume dust of nano- to micro- meter size and those negatively charged dust are electrically coupled to the background magnetospheric plasma. Here we used five flybys, where Cassini passed across the plume of different altitudes, to determine the altitudinal profile of the plasma densities, electron temperatures, ion speeds, and the spacecraft potential as a proxy to the electrical potential of dust grains. Combining all the results from the five flybys, the diameter of the plume was  $\sim 1.6 R_E$  at  $Z = -1.3 R_E$ , and  $\sim 7.1 R_E$  at  $Z = -11 R_E$ . The plume was broader in the downstream at high altitudes. The electron density was smaller than the ion densities in the plume region, which was consistent to the previous observations near the E ring and Enceladus. The ion density and the density ratio of the electron to the ion were  $\sim 10^4 \text{ cm}^{-3}$  and  $< 1\%$  at the low altitude of  $Z = -1.3 R_E$  while they became  $\sim 10^2 \text{ cm}^{-3}$  and 50% at the high altitude of  $Z = -7.3 R_E$ . The plume signature was identified at least at  $Z = -12 R_E$ . The spacecraft potentials were overall negative, however, we found a few cases of positive potential just above the south pole. This can be due to that the charging of dust doesn't achieve a static state since dust has just been released from Enceladus. The estimated negative charged dust density was  $\sim 100 \text{ cm}^{-3}$  at the low altitude and decreased to  $0.3 \text{ cm}^{-3}$  at the high altitudes.