Neutral & Ion mass spectrometer for future Venus mission

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Venus formed in the same part of our solar system as Earth, apparently from similar precursor materials. Although both planets of inner solar system are of the same size and near to each other, their differences are profound. Venus is one of the most geologically active planets in our Solar system. Its surface is rather young and it appears that is has been completely altered by a global outbursts of volcanic activity. Since Venus lacks an internal magnetic field, the upper atmosphere is interacting directly with the Solar wind. As a result, via a complex process, part of atmosphere is escaping to space. Particles escape from the atmosphere when their kinetic energy exceeds the gravitational binding energy and they move along an upward trajectory without colliding with another atom or molecule. This may have been the mechanism that has removed the water and other volatiles, which are likely to have been present after the formation of the planet. The deuterium abundance is much higher on Venus than on Earth, which indicates that large amounts of hydrogen have been lost in the past.

In order to measure the composition, structure, variability and thermal state of the Venus atmosphere and its dynamics, we are developing a neutral and ion mass spectrometer (NIMS) for future orbiter mission to Venus. This instrument will carry out the in-situ measurements of neutral species and ions, present in the trajectory of the spacecraft in the mass range of 1-200 amu with $\Delta m/m$ better than 0.5. This instrument is Quadrupole mass-spectrometer. In this paper, we will present the results of the laboratory model, simulation results and its salient features.