



## Investigation of Europa's Exosphere

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The European Space Agency has selected the Jupiter Icy Moons Explorer (JUICE) mission to fly to the Jupiter system and visit the moons Europa, Ganymede, and Callisto. One of the selected scientific instruments is the Particle Environment Package (PEP) that includes a Neutral gas and Ion mass spectrometer (NIM). NIM will measure the composition of the exospheres of these three moons during flybys and in orbit of Ganymede.

Since all these exospheres are in direct contact with the surface of the respective moon, the chemical composition of the surface can be inferred from of the exospheric measurements. Knowing the chemical composition of the surface, and accounting for radiation induced chemistry at and near the surface, one can compare with models of the formation of these icy satellites from the proto-planetary disk from which Jupiter and the icy moons formed. In addition, if the JUICE flyby trajectory allows sampling the recently discovered plume on Europa with NIM we can measure the composition of Europa's ocean, which again can be compared to formation models, which would provide strong constraints on its formation conditions.

We will present Monte Carlo calculations of Europa's exosphere including all relevant processes to release particles into the exosphere, which are sublimation, sputtering, and the plume release. For the surface composition we compiled composition data from existing spectroscopic observations and from formation models. We derive density profiles for different scenarios (e.g. day / night, in co-rotation flow, ...), and make predictions on the expected NIM measurements for the planned Europa flyby trajectories of JUICE