Small scale morphology of the footprint tails of Io, Europa and Ganymede observed by JIRAM

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The Jovian Infrared Auroral Mapper on board Juno is a spectro-imager which is observing the atmosphere of Jupiter and its auroral emission using its two imagers in the L (3.3-3.6μm) and M bands (4.5-5.0μm) and a spectrometer (2-5 μm spectral range).
The high spatial resolution of the imager allowed to observe the detailed structure of the auroral signature related to the Galilean moons. The interaction betwwen the moons and the planetary magnetic field generates Alfven waves that travel along the magnetic field lines as field aligned currents (FACs). The electrons associated to the FACs precipitate onto the ionosphere, where they trigger a chain of chemical reactions that result in auroral emissions. The location where the main precipitation occurs is known as footprint, which is followed by a fading auroral arc known as footprint tail. JIRAM observed a dot-like substructure consistently in the footprint tails of Io, Europa and Ganymede using its L-band filter, which was analyzed through images acquired from perijove 4 to 30. The typical distance between the sub-dots lies mostly between 200 and 500 km, with no apparent correlation with the phase of the moons or the hemisphere. Furthermore, a sequence of images of the Io footprint tail captured during PJ13 revealed that the sub-dots are corotating with the magnetic field of Jupiter. The same behaviour was observed during two shorter sequence (orbits 14 and 26).
We suggest a feedback process between the ionosphere and the magnetosphere as a potential cause for the sub-dots. Such process is triggered the local increase of the ionospheric conductivity associated to the FACs in a region where Pedersen and Hall currents flow. We report order of magnitude estimates showing that the feedback process is compatible with the observed distance betwwen sub-dots and their dynamic.