EGU21-12277
https://doi.org/10.5194/egusphere-egu21-12277
EGU General Assembly 2021

Small scale structures in the footprint tails of the Galilean moons observed by JIRAM

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The Jovian Infrared Auroral Mapper (JIRAM) 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 highly elliptic orbit of Juno and the unprecedented resolution of the JIRAM imager allowed to retrieve
wealth of details about the morphology of moon-related aurorae. This phenomenon is due to the jovian magnetic
field sweeping past the Galiean moons, which generate Alfven waves travelling towards the ionosphere and set
up field aligned currents. When the associated electrons reach the ionosphere, they interact with the hydrogen
and make it to glow. In particular, the tails of the footprints showed a spot-like substructure consistently, which
were investigated using the L-band of the imager from perijove 4 to perijove 30. This feature was observed close
to the footprints, where the the typical distance between spots lies between 250km and 500km. This distance
decreases to 150km in a group of three observations in the northern emisphere when each moon is close to 250 □
west longitude. No correlation with orbital parameters such as the longitude of the moons was found so far,
which suggests that such morphology is almost purely due to ionospheric processes.
Moreover, during PJ 13 a long sequence of images of the Io footprint was shot and it revealed that the
secondary spots appears to corotate with Jupiter. This behaviour is observed also during orbits 14 and 26.

During these sequences JIRAM clearly observed the Io footprint leaving behind a trail of ”footsteps” as bright
spots.
The characteristics of these spots are incompatible with multiple reflection of Alfven waves between the two
emispheres. Instead, we are currently investigating ionospheric processes like the feedback instability (FI) as a
potential candidate to explain the generation of the observed small scale structure. This process relies on local
enhacement of conductivity in the ionosphere, which is affected by electron precipitation. Order of magnitude
estimates from the FI are compatible with the inter-spot distance and the stillness of the spots.