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The Jovian InfraRed Auroral Mapper (JIRAM) on board Juno: Performances and results

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The activity of JIRAM, the Jovian InfraRed Auroral Mapper on board Juno, falls under the scientific responsibility of the Institute of Astrophysics and Space Planetology of INAF. The instrument incorporates a spectrometer and a camera that work in the field of infrared wavelengths between 2 and 5 microns. For the Juno mission, it has been set for providing maps on the infrared aurora generated by the H3+ ion and methane, the thermal emission of the planet near the 5 micron spectral window and the characterization of the planetary emission in the aforementioned spectral range with a resolution of 9 nm. The camera has a field of view of 6° x 3.5° and the single pixel field of view is about 240 μrad corresponding to a spatial resolution of the instrument, at a reference pressure level of 1 bar on Jupiter, that can vary from 2 km to 300 km depending on the distance of the spacecraft from the planet. The primary objectives of JIRAM on Juno are the study of the polar aurorae and the atmosphere of Jupiter up to the depths (depending on the presence of clouds and atmospheric opacity) of 3-5 bar in terms of chemical composition related to some minority gases (water, ammonia and phosphine), microphysics (clouds) and atmospheric dynamics. The hardware and the software of the instrument have been realized in Italy according to the scientific goals of the Juno mission at Jupiter. Results from the mission will be presented to show the capabilities of the instrument which can be used and opportunely specialized for those future missions that would require a remote sensing instrument able to operate in the JIRAM spectral range.

Figure 1: JIRAM optical head. It is mounted on the Juno spacecraft aft deck. All the white panels are radiators for both the detectors and the body of the instrument. JIRAM is passively cooled down to 80K

Recent Publications

1. Adriani A et al. (2018) Clu¬sters of cyclones encircling Jupiter's poles. Nature. 555(7695):216-219.
2. Mura A et al. (2017) Infrared observations of Jovian aurora from Juno's first orbits: main oval and satellite footprints. Geophys. Res. Lett. 44. Doi:10.10002/2017GL072954.
3. Bolton S J et al. (2017) Jupiter's interior and deep atmosphere: the initial pole-to-pole passes with the Juto spacecraft. Science. 356(6340):821-825.
4. Connerney J E P and Adriani A (2017) Jupiter's magnetosphere and aurorae observed by the Juno spacecraft during its first polar orbits. Science. 356(6340):826-832.
5. Adriani A et al. (2017) Preliminary JIRAM results from Juno polar observations: 2. Analysis of the Jupiter southern H3
6. emissions and comparison with the north aurora. Geophys. Res. Lett. 44. Doi:10.1002/2017GL072905.

Biography

Alberto Adriani is the Principal Investigator for the JIRAM (Jovian InfraRed Auroral Mapper) experiment, funded by the Italian Space Agency (ASI), on board Juno, a NASA mission to the planet Jupiter; he is also Co-Investigator of the Juno NASA Project and of the project MAJIS and JANUS in the ESA Cosmic Vision mission JUICE. He has more than 30-years-experience in the development and use of optical instrumentation for studying earth and planetary atmospheres by means of observations from different ground-based, airborne, balloon-borne and space-borne platforms. He has collaborated with various scientists from many different institutions in Europe and the USA. He got his degree in Physics at the University of Rome "La Sapienza", Italy, in 1978. He is presently working at the INAF Institute for Space Astrophysics and Planetology in Rome.

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