
Noble gases in giant planets: inference from solar, cometary and meteoritic data

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Abstract

Noble gas elemental and isotopic abundances constitute a set of exceptional tracers for the origin and processing of solid matter and gases in the early solar system. Several space missions, together with laboratory analysis of meteorites, have permitted to define specific compositions such as the solar one, notably thanks to the Genesis mission that has sampled solar wind ions for 2.7 years. Noble gases trapped in meteorites define a common composition which is elementally and isotopically fractionated with respect to the solar composition (provided that solar wind is representative of the solar nebula, which is not granted). The laboratory analysis of material sampled and returned to Earth by the Stardust mission permitted to detect and quantify helium and neon in cometary material. The ROSINA instrument on board of the Rosetta mission spacecraft has analysed the isotopic and elemental abundances of argon, krypton and xenon in volatiles released by Comet 67P/Churyumov-Gerasimenko. The abundances of noble gases have been determined for the Jupiter's atmosphere by the Galileo probe, showing an underabundance of helium and neon relative to other noble gases. I shall discuss the potential sources of the atmospheres of giant planets in the light of the available data.

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