



# The Ionospheres and Plasma Environments of the Galilean Satellites of Jupiter

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## Abstract

During the Galileo Jupiter orbiter mission, the plasma environments of Io, Europa, Ganymede, and Callisto were probed with the S-band (~13cm wavelength) radio signal during earth occultations of the Galileo spacecraft. There were 6 occultations by Io, 5 by Europa, 4 by Ganymede, and 4 by Callisto. In the case of Io, a well developed ionosphere was observed during all occultations, and this is attributed to the presence of a robust underlying neutral atmosphere supplied by Io's volcanoes.

On Europa, Ganymede, and Callisto, the results were different. Appreciable amounts of tenuous plasma were observed only on some occultations, occurring mostly when the Jupiter magnetospheric plasma ram was impinging on the sunlit hemisphere of the satellite. This suggests that a transient neutral atmosphere on these bodies is created by the impingement/spallation of the icy surfaces by magnetosphere ram particles, and it can only be observed by radio occultation when it is ionized by solar EUV. On Ganymede, the presence of an intrinsic magnetic field appears to shield the surface from Jupiter's magnetosphere, thus preventing the formation of an ionosphere.

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