

Temporal Variability of SO and NaCl in Io's Atmosphere Observed through the Submillimeter Array

Io, Jupiter's most volcanically active moon, has a dynamic atmosphere primarily composed of sulfur dioxide (SO_2). Minor atmospheric components, such as sulfur monoxide (SO), sodium chloride (NaCl), and potassium chloride (KCl), are likely produced by volcanic outgassing. Some SO also originates from the photodissociation of SO_2 . These components serve as indicators of atmospheric processes and volcanic activity. Our study aims to investigate the temporal variability of these minor species using three tracks of SMA observations obtained in 2022 to gain a better understanding of their sources, sinks, and roles in Io's atmospheric dynamics. We consistently detected three SO lines across all three observation tracks. NaCl was detected on two of the three observation days, while KCl remained below the detection threshold. We will derive the column densities through radiative transfer analysis and compare them with the simultaneous SO_2 measurements. The relative abundance ratios between SO and SO_2 will provide further insights into distinguishing the sources between direct volcanic release and secondary production through atmospheric chemistry. Additionally, the variability in NaCl detections suggests that there may be temporally or spatially localized volcanic activity.

Section

Solar System/Exoplanets

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