

Sub-millimeter observations of icy bodies toward understanding of planetary formation and cosmochemistry

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The present-day composition of regular icy satellites consists of combinations of initial conditions and subsequent evolution. These icy satellites are considered to have been formed in a circumplanetary disk associated with giant planet formation. Thus, icy satellites that are not geologically active, such as Callisto, would serve as solar system fossils, which may preserve the information of the protoplanetary disk and planetary formation. On the other hand, geologically active satellites, such as Europa and Enceladus, would provide particular geological processes and consequent products of geochemical reaction. Sub-millimeter observations are capable of providing unique isotopic and chemical compositions of gas molecules in atmospheres and plumes of the icy satellites. In this paper, we discuss key observational targets and their importance for planetary formation theory and geo/cosmochemistry, especially focusing on sub-millimeter observations of Galilean satellites by the Jupiter Icy moons Explorer mission, JUICE.

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