

Ice Caves on Extraterrestrial Bodies: What Are the Prospects for Speleogenesis and Detection?

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Potential mechanisms for creating cavities in icy extraterrestrial bodies have been tentatively explored by several authors. On one hand we have examples of mechanisms that create caves in water ice here on Earth. In addition, there may be unique mechanisms on other Solar System objects that do not occur on Earth but might produce cavities, e.g. sublimation of comets upon perihelion passage. The methods of detecting such cavities depend upon the nature of the icy body in question, the potential for orbital or landed missions to visit those bodies in the future, and remote or landed methods for detecting the presence of cavities and ways of interrogating them. Robotics, muon imaging, ground penetrating radar, and other techniques may be necessary in addition to high-resolution multispectral imaging. What are the prospects and what may we expect over the course of the next few decades from planetary exploration as it relates to extraterrestrial caves in ice?