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Ganymede paterae: a priority target for JUICE

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The JUpiter ICy moons Explorer (JUICE), the first large-class of the European Space Agency (ESA), is planned to launch in 2023, and one of its main goals is to make detailed observations of Jupiter's moon Ganymede. The mission will investigate the past and/or recent cryovolcanic and tectonic activity of the moon and the exchange processes with the subsurface and possibly with the ocean. Recently, the science team defined "potential cryovolcanic regions" as a category of high interest for observation by JUICE (Stephan et al., 2021). For preparation of the scientific return of the mission, it is important to study in detail the regions that are considered to be good candidates for past/present activity. Light material areas on Ganymede imaged by Voyager have been suggested to represent dark terrain resurfaced by cryovolcanic flows (e.g., Parmentier et al., 1982), while the dark terrain's speculated cryovolcanic origin was later disputed based on higher-resolution images of the Galileo mission. Additional Galileo data showed the significant role of tectonism in the formation of the light material areas, while the role of cryovolcanism remained inconclusive. Currently, small, isolated depressions called 'paterae', are the best candidate regions for cryovolcanic activity on Ganymede and suggested to be potential caldera-like cryovolcanic source vents (e.g., Spaun et al., 2001). Their nature has been interpreted as "possible cryovolcanic source vents for extrusion of clean icy material to form light material units" (Collins et al., 2013), and their small size is consistent with a cryovolcanic origin that operates on a local scale. The high-resolution JUICE camera, JANUS, in combination with other remote sensing instruments, is expected to resolve many of the mysteries concerning cryovolcanism on Ganymede and the origin of the moon's varied geologic features. The "potential cryovolcanic regions" identified by the JUICE team includes 19 out of 30 paterae mapped by Collins et al., (2013) using Voyager and Galileo images. In this study, with the aim to enhance the preparation of the JUICE mission and its science return, we present: a thorough view of all 19 paterae regions; a detailed geomorphological characterization and comparison between the Ganymede paterae with paterae from other planetary bodies; and a spectral assessment using Galileo NIMS data.