

Surface pattern of tectonic features as potential markers of Mimas' stealth ocean

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The theory about a young, evolving “stealth ocean” under the ancient-looking surface of Mimas, one of the moons of Saturn, triggered the revisit of the icy satellite and the development of a Cassini image-based, revised geological map. The re-mapping of Mimas's surface tends to fill the decades-long growing gap since the publication of the first Voyager image-based pioneering maps and provides an up-to-date synthetic interpretation of the revised and newly discovered features. Despite the early stage introduction of the map, it already indicates some key features that may play a significant role in the reconstruction of Mimas' (surface) evolution. The Herschel-crater forming global-scale impact undoubtedly left an additional mark on the surface: a system of fault scarps, stair-step faults, and post-impact surface transformation by mass movements around the crater wall and the peak. Smaller craters left various scars on the surface, including asymmetric craters, whose morphology and allocation may be used to reconstruct regional topographic changes on the surface of Mimas. Besides the impact-related features, which dominated the surface of the icy satellite, groups of weak, quasi-parallel running linear features, such as undifferentiated lineaments, grooves/troughs, and ridges, were also observed. The appearance and pattern of those lineaments overlap with the allocation of various modeled global nonlinear tidal dissipation, supporting the existence of the theoretical subsurface stealth oceans.

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