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The Study of a Melting Hammering Drill Head in the exploration of subsurface planetary ice layers

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The recently discovered water vapor plumes on Saturn's moon Enceladus, the polar caps of planet Mars and the possible ice volcanism on the Jovian satellites call for adapted techniques to explore deep ice layers of Solar System's bodies. This paper presents a novel approach to deliver scientific probes into deeper layers of planetary ice. Within the frame of a Sino European cooperation, the idea was evaluated preliminarily with different melting head forms in ice. The performance models of such locomotion types were compared to classical drilling/hammering performances. This work led to the concept of a melting mechanism and a drilling/hammering mechanism combined to increase penetration speed and system redundancy. The paper will conclude with the outlook and future development plan for the Melting Hammering Drill Head.