

Grooved bands on Enceladus: morphology and implications

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Abstract

Enceladus has undergone substantial resurfacing during its evolution. Among other features indicative of resurfacing there are 10-15 km wide grooved bands, as Cassini images show (Fig. 1a). Here, we report on pinch and swell topography across one of the bands (Fig. 1b) and similarities to the morphology of grooved bands on Ganymede. Grooved bands on Ganymede were suggested to have formed by an extensional necking instability [1], and we suggest that it has also been involved in the formation of grooved bands on Enceladus. Extensional necking on Enceladus implies high surface thermal gradients [2] and would be consistent with high heat flows previously derived in this area [3]. From the wavelength of topography (~ 5 km) the theory predicts brittle layer thicknesses of ~ 1.4 km, which matches the lithospheric thickness derived from flexure studies nearby the band [3].

References

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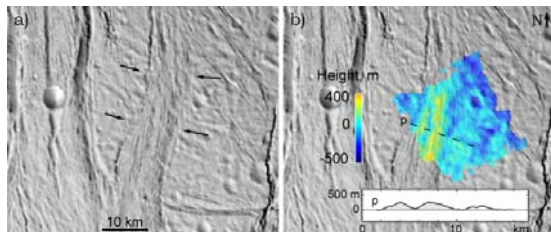


Figure 1: Cassini frame N1489048222 (150 m/pxl) showing an extensional band (arrows) formed at 10°S, 138°E (a). A stereo-derived elevation model (horizontal/vertical resolution $\sim 800/50$ m) reveals high-standing pinch and swell topography across the band (b).