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Contributions to Crustal Mechanics on Europa from Subterranean Ocean Vibrations.[1] ROBERT HAYES, North Carolina State University — The recent discovery of subduction zones on Europa demonstrated a significant step forward in understanding the moon's surface mechanics. This work promotes the additional consideration that the surface mechanics have contributions from small relative pressure differentials in the subsurface ocean that create cracks in the surface which are then filled, sealed and healed. Crack formation can be small, as interior pressure can relatively easily breach the surface crust, generating cracks followed by common fracture formation backfilled with frozen liquid. This process will slowly increase the overall surface area of the moon with each sealed crack and fracture increasing the total surface area. This creeping growth of surface area monotonically decreases subsurface pressure which can eventually catastrophically subduct large areas of surface and so is consistent with current knowledge of observational topology on Europa. This tendency is attributed to a relatively lower energy threshold to crack the surface from interior overpressures, but a higher energy threshold to crush the spherical surface due to subsurface underpressures. Proposed mechanisms for pressure differentials include tidal forces whose Fourier components build up the resonant oscillatory modes of the subsurface ocean creating periodic under and overpressure events below the crust. This mechanism provides a means to continually reform the surface of the moon over short geological time scales.

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