CRATER CONTROLS ON THE FRACTURING AND INITIAL TECTONIC DEFORMATION ON GANYMEDE

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Galileo images show evidence for progressive tectonic disruption in the formation of grooved swaths at the expense of ancient, dark terrain. Because tectonic resurfacing destroys evidence of previous stages of deformation, we suggest that the structures generated during the initial stages may yield important information on crustal properties and internal structure. We documented that impact craters focus tectonic deformation on Ganymede. Fracture propagation paths can be deflected through the center of impact structures, even connecting several craters. Extension through craters generally reactivates radial and concentric fractures that probably formed upon impact. Large craters, therefore, may have played a significant role in determining the areas where tectonic deformation would concentrate, especially in ancient times when the lithosphere may have been thinner. We have studied deflected fracture sets and arcuate fractures not related to any known topographic or structural features and found that a) the orientation of sets of arcuate fractures is consistent with extensional reactivation of pre-existing circular flaws, and b) the size-frequency distribution of these arcs correlates with a crater production curve for Ganymede. These results imply the existence of an otherwise invisible ancient crater population on this area of Ganymede and could have important implications for the crustal rheology and crater counts for the satellite.