Tectonic phases in Galileo Regio, Ganymede’s dark terrain.

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The surface of Ganymede, which is the biggest satellite of Jupiter, shows strong tectonic deformation affecting both its geologic units, i.e., the younger light terrain and the older dark terrain. The dark terrain is characterized by low albedo, high crater density and furrows, which are morphotectonic structures formed by brittle deformation. Furrows are straight to curved fragments of troughs, with high albedo rims that bound a low albedo floor. Two systems have been recognized at the regional scale, which are the Lakhmu Fossae, whose furrow setting follows a concentric pattern resulting from a multi-ring impact basin, and the Zu Fossae, which follows a radial setting. In addition, local scale structures have been identified superimposed on the regional scale systems, leading to the reworking of the pristine structures. In this contribution, we investigate the tectonic evolution of the furrows in Galileo Regio (approximately from 180°-120° W to 0°-60° N), at both regional and local scale, with the identification of the tectonic events responsible for the deformation of this dark terrain. We performed a structural mapping and geostatistical analyses of the attributes of the mapped structures, such as the length, sinuosity, azimuth, spacing within the adjacent structures. Their quantification allows us to recognize a total of four structural systems within the area and to unravel the paleo-stress fields that have originated them. We prepared an evolutionary tectonic model of the furrow systems of Galileo Regio that shows the dynamics and the induced kinematics. We suggest that Galileo Regio underwent a sequence of tectonic phases associated with extensional and strike-slip regimes, these latter consistent with the kinematics that affected the light terrain of the adjacent Uruk Sulcus. This work advances the assumption that the dark terrain has been later affected by the same tectonics that deformed the light terrain and confirms the rejuvenation of the dark terrain towards a possible future transformation into light ones. The obtained results will be used for the scientific preparation of dedicated high-resolution observations that will be taken with the JANUS instrument onboard JUICE mission.

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