PLATE RECONSTRUCTIONS ON THE ANTIJOVIAN HEMISPHERE OF EUROPA. Geoffrey C. Collins1, Louise M. Prockter2, G. Wesley Patterson3, Alyssa R. Rhoden4, Simon A. Kattenhorn5, Catherine M. Cooper6, Reid P. Perkins4, Craig A. Rezza6, Julia D. Walsh1, Olivia A. White1, Claire E. Albright1, Oluwadamilola S. Olubusi1, Samantha R. Oldrid3, Francis D. Wood1, 1Wheaton College, Norton MA, gcollins@wheatoncollege.edu; 2Lunar and Planetary Institute, Houston TX; 3Johns Hopkins University Applied Physics Laboratory, Laurel MD; 4Arizona State University, Tempe AZ; 5University of Alaska, Anchorage AK; 6Washington State University, Pullman WA.

Introduction: It is common to observe offsets of relatively old features on Europa by newer tectonic features such as ridges and bands. Through careful mapping and sequential reconstruction of older features, plate tectonic-like motions were hypothesized in Northern Falga Regio [1] (Figure 1A). To test the hypothesis of plate tectonics on Europa, we have been expanding the study area into adjacent regions imaged by Galileo at ~200 m/px (Figure 1) and performing multi-stage reconstructions in a spherical surface geometry [2].

Method: Reconstructions are performed within GPlates software [3], which is designed for terrestrial plate motion visualization and analysis. Our reconstructions begin by defining potential plate boundaries based on offset features, and then using cross-cutting relationships to develop a time sequence of boundary offsets. We define plates composed of terrain that is internally continuous, but with discontinuities at all the edges. Piercing points are manually aligned in the sequence defined by the relative ages of activity at the plate boundaries, and in some areas (1B, 1C) this has been checked against statistical methods for finding plate rotation poles. The resulting plate motions are then checked to be sure that no two pieces of terrain occupy the same location at the same time.

Study areas: Northern Falga (Fig. 1A) exhibits minor spreading early in the sequence, strike-slip motion throughout the reconstruction, and convergence late in the sequence. Our results are similar to earlier results [1] but the amount of convergence is smaller. The area near Castalia Macula (Fig. 1B) is dominated by early spreading, similar to previous results [4], but the later style of tectonic motion is dominated by strike-slip motions and small amounts of convergence. The area around Libya Linea (Fig. 1C) exhibits early strike-slip motions followed by later spreading. The area around Minos Linea (Fig. 1D) exhibits very few offsets, deformation is diffuse, and it does not appear to be organized into a system of plates. Plate-like behavior is observed again in the area around Belus Linea (Fig. 1E) but the complex history here including spreading, strike-slip, and convergence [e.g. 5], is still being examined at this time. The “wedges” region (Fig. 1F) is dominated by spreading [6] with some associated strike-slip motions but poor viewing geometry is hampering a proper assessment of the time sequence of plate motions in this region.


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