**CLASSIFICATION AND TIME SEQUENCE SORTING OF A GANYMEDE GLOBAL GROOVED TERRAIN DATABASE.** G. C. Collins, Wheaton College, Norton MA 02766, gcollins@wheatonma.edu.

**Introduction:** Understanding the formation of grooved terrain on Ganymede is important for understanding the evolution of the satellite as a whole. Grooved terrain records an intense episode of extension and possibly volcanism, and thus may be linked to tidal or endogenic processes. Progress in understanding these processes will come from understanding the history of the grooved terrain itself. To that end, here I report progress in classifying and sorting a global database of grooved terrain features to extract the global history of grooved terrain formation.

The GIS grooved terrain database consists of two different parts. The first database contains all of the trough bottoms visible in Voyager and Galileo imaging of grooved terrain at the 1 km/pixel scale, and contains over 61,000 features [1]. Though this is a good database for automated collection of groove locations, orientations, and lengths, it is not ideal for morphological classification and time sequence sorting due to the sheer number of features. Since grooves on Ganymede tend to occur in “packets” with adjacent grooves of similar morphology and orientation, one can define the different packets of grooves and then classify and sort several hundred features instead of tens of thousands.

The second database contains the outlines of different packets of grooves in the bright terrain. This database was created for the global geologic map that is being assembled for Ganymede [2], and thus the initial classification of the database is based on the morphology of the terrain. We have split grooved terrain into four units: grooved, subdued, irregular, and undivided (see [2] for more detail).

**Classification:** One of the essential pieces of information to gather from the global database is the amount of strain represented by the grooved terrain. The morphological classification of grooved terrain used for the global map is already related to the amount of strain. The densely packed, high relief ridges and troughs of the grooved unit are typically observed to be complexes of tilt-block normal faults in high resolution images. Where such faults have cut craters, they exhibit many tens of percent extension [3]. Strain measurement using fault geometry has confirmed this view [4]. On the other end of the strain spectrum, areas in the subdued terrain appear to represent low levels of strain, perhaps only a few percent [3].

A similar classification scheme was used to estimate strain around three great circle transects on Ganymede [5]. Even though strains are locally high in grooved terrain, the integrated strain around these transects was only a few percent. With all of the groove packets classified by morphology, this global strain estimate can be improved. Instead of relying on narrow transects, the strain estimates can be applied to the areas covered by different types of grooved terrain, and an areal estimate of global surface strain can be obtained. Strain estimation based on fault geometry [4] can be performed in more high resolution target areas to increase our confidence that the strain estimates we are using for different groove morphologies are correct.

**Sorting:** The other important aspect of grooved terrain history is the time sequence of events that formed the grooves. Previous studies of groove formation sequence have been regional, due to the difficulty of manually sorting the relationships among many sets of grooves [e.g. 6]. Having a computer keep track of the relative age observations on the map, and then find the best sort, is highly desirable when working with large databases of terrain features. New methods for computer-assisted time sequence sorting [7] have been tested on a large and complex region of Ganymede grooved terrain [8], with positive results. The next stage of database classification is to code in the relative age relationships among different packets of grooved terrain, which will serve as the input for a computer-aided sort for the entire globe. This will allow comparison of time sequences that have been found in different areas of Ganymede.

**Current progress:** As of this writing, the classification of the global database is almost complete, and the collection of relative age information at a global scale is in its beginning stages. At the meeting, I will present the global database of groove packets, along with their morphological classifications, and show a preliminary global strain estimate based on this database. I will also present a new regional relative age sort, and show new tools that have been developed to simplify the collection of large amounts of relative age data.

**References:** [1] Collins et al., *LPSC XXXI*, #1034, 2000; [2] Patterson et al., *LPSC XXXVIII*, #1098, 2007; [3] Pappalardo and Collins, *J. Struct. Geol.* 27, 827-838, 2005; [4] Michaud and Collins, *LPSC XXXVIII*, #1500, 2007; [5] Collins, *LPSC XXXVII*, #2077, 2006; [6] McBee and Collins, *LPSC XXXIII*, #1449, 2002; [7] Crawford and Pappalardo, *Astrobiology* 4, 232-308, 2004; [8] Martin et al., *LPSC XXXVII*, #1204, 2006.