CARTOGRAPHIC PROCESSING OF THE GALILEO SSI DATA: AN UPDATE ON THE PRODUCTION OF GLOBAL MOSAICS OF THE GALILEAN SATELLITES. T.L. Becker, T. Rosanova, L. Gaddis (U.S. Geological Survey, Astrogeology Team, 2255 N. Gemini Drive,Flagstaff, AZ), A.S. McEwen, C. B. Phillips (Lunar and Planetary Lab, University of Arizona, Tucson, AZ), M.E. Davies, T.R. Colvin (Rand Corporation, 1700 Main Street, Santa Monica, CA); tbecker@flagmail.wr.usgs.gov.

Introduction: The Astrogeology Team of the U.S. Geological Survey has been providing cartographic support for the Galileo Mission, primarily in the form of global mosaics of the available medium-resolution digital images of the Galilean satellites Io, Europa, Ganymede, and Callisto. Geometric control for these mosaics has been provided by Mert Davies and Tim Colvin of the Rand Corporation [1]. The primary image bases have been comprised of Voyager I and II data, and, with the return of new data during the recent Galileo Nominal Mission by the Solid State Imager instrument, the global mosaics are now being supplemented with SSI data. These new mosaics have refined geometric control, improved geometric stability, and higher resolution coverage in many areas. This processing effort of all four satellites is in cooperation with University of Arizona. Our purpose here is to provide an update on our progress and to announce the availability of our products to the general community.

Voyager Base Mosaics: Our role in the Galileo mission has been the generation of global mosaics of the four Galilean satellites, using the best available Voyager data supplemented by the most recent geometric control solution available as supplied by Rand. The geometric control data for the Galilean satellites based on Voyager data alone have been through an iterative refinement process in recent years. The quality and amount of equatorial coverage of the image data largely determine the quality of the possible geodetic solution.

Refinement of geometric control and production of a quality digital mosaic is valuable for many purposes: mission observation and sequence planning, production of geometrically controlled mosaics of other data sets which include high resolution coverage, and in support of scientific analysis and geologic mapping. Our base mosaics for the Galilean satellites Io, Europa, Ganymede, and Callisto were processed at a moderate resolution of ~4 kilometers/pixel, and they contained image data from both the Voyager I and II Missions. Clear- and blue-filter images at a variety of resolutions were selected for global coverage. The images were processed using the ISIS software developed and maintained at U.S. Geological Survey [2,3,4]. Image processing included calibration, photometric correction with the Lunar-Lambert function, removal of blemishes and anomalies, map reprojection, and mosaicking. The final Voyager-only global image mosaics are available via digital ftp transfer through our local USGS Galileo Web site (at http://pele.wr.usgs.gov/Galileo) [5].

Combined Voyager and Galileo SSI Base Mosaics: Because the recent return of data from the Galileo Nominal Mission for the Galilean satellites represent a virtually complete dataset, we focus on completing the controlled global mosaics. For U.S.G.S., Ganymede has been the starting point. We returned to the individual Voyager I and II images that were included in the earlier Ganymede global mosaic and have selected match points between all images, ensuring crossover coverage between data from Voyager I and II. The points shared between each pair of images is a total of three (3) points. The control between these two data sets have been weak as a result of minimal overlap and low spatial resolution. To improve coverage and control, we have selected medium-resolution Galileo SSI image data from the G1, G2, E6, G7, G8, and G9 encounters and have selected match points between pairs of overlapping images, in addition to selecting match points across common coverage with the Voyager data. This match point network database was then sent to Rand for geodetic calculations to derive triaxial solutions and updated satellite radii. Rand requires full-frame Galileo SSI images only for their calculations, limiting the number of useful images. Full-frame resolution quality is superior to the summation compressed frames, which result in only 1/2 of the original resolution. During this processing, Rand's geometric control solution, their updated radii and our own limb measurements are integrated onto the image labels. The images are then calibrated, photometrically normalized, corrected for anomalies and blemishes, projected to a Sinsoidal Equal-Area projection at a moderate map scale (0.5 to 4 km/pixel) and mosaicked. The mosaic is then reviewed in detail by hand to corroborate the positional accuracy of features, and is compared to the previous mosaic.

A new global mosaic of Io has been produced entirely from SSI images. We utilized the clear-filter topographic mapping images [6] designed to maximize resolution and illumination angle for a global inventory of large-scale landforms. The resolution varies from 2.5 to 10 km/pixel. Discussion of the topography seen in these images is given by [7]. These images are superior to those from Voyager for the region from about longitude 30-210 degrees.

Europa was quite poorly imaged by Voyager, and the Voyager-era base map included global low-resolution mosaics with a high-resolution mosaic covering approximately 20% of the surface. A new merged Galileo-Voyager base map has been produced using Galileo low and medium resolution images and Voyager medium resolution images. The mosaic includes images from G1 at 1.6 km/pixel, G2 at 6.9 km/pixel, E4 at 1.2 km/pixel, E6 at 1.6 km/pixel, G7 at 3.2

km/pixel, and C9 at 12 km/pixel, as well as Voyager images at 1.9 km/pixel [8, 9]. Because of the Voyager low resolution coverage of Europa, the Voyager-era coordinate system was not accurate enough for the control of the new higher-resolution Galileo images. Therefore, a preliminary Galileo-only coordinate system was used for intermediate mosaics, based on limb fits to Galileo images. This was then updated to a consistent control network by Rand. A goal of the Galileo Europa Mission (GEM) is to produce global images of Europa at 1-2 km/pixel resolution in a variety of filters. These images should improve the current base maps considerably.

Callisto is the next effort and the approach will be similar to Ganymede in selecting images and match points, and geodetic calculations with Rand. Figures will be included in the displayed poster to show resolution coverages between Voyager and Galileo SSI and visual products will be presented that will demonstrate the geodetic control results.

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