Geophysical Research Abstracts
Vol. 21, EGU2019-7208, 2019
EGU General Assembly 2019

Ray Craters as Stratigraphic Markers in Ganymede's Geologic History

Roland J. Wagner (1), Nico Schmedemann (2), Stephanie C. Werner (3), James W. Head (4), Katrin Stephan (1), Katrin Krohn (1), Thomas Roatsch (1), Harald Hoffmann (1), Ralf Jaumann (1), and Pasquale Palumbo (5)

(1) German Aerospace Center (DLR), Institute of Planetary Research, Berlin, Germany (roland.wagner@dlr.de), (2) Max Planck Institute for Solar System Research, Göttingen, Germany, (3) CEED, University of Oslo, Norway, (4) Dept. Earth, Environmental and Planetary Sciences, Brown University, Providence, R.I., USA, (5) Universita degli Studi di Napoli Parthenope, Naples, Italy

Ganymede, Jupiter's planet-sized largest icy moon, is characterized by two major geologic units: old, dark materials covering about 1/3 of its surface, and light, tectonically resurfaced materials implying intense tectonism in its past [1]. In addition, Ganymede, as its neighbor satellite Callisto, features the largest range of crater morphologies compared to all other planetary bodies in the solar system [2]. In this study, we focus on the role of impact features such as bright ray craters or palimpsests as time-stratigraphic markers in Ganymede's geologic history and use the size-frequency distributions of craters superimposed on these major impact features to constrain their ages in context with dark and bright materials. Image data base is a global mosaic put together with images from the Voyager and Galileo mission at a map scale of 700 m/pxl. Main reference for global geology is the geologic map by [3]. We modified these units and their boundaries where necessary to account for the requirements of measuring crater frequencies. Absolute Model Ages (AMAs) of geologic units are derived from the two currently existing impact chronology models for the Jovian system: one based on a lunar-like time dependence (termed LDM) [4] and one based on preferential impacts of Jupiter family comets (termed JCM) [5]. We concentrate on the anti-Jovian hemisphere since it was imaged with the highest-resolution obtained by Voyager on Ganymede, and because several geologic key units could be targeted by the Galileo SSI camera at regional spatial resolution (100 – 300 m/pxl) in this region. The dark, densely cratered plains units date back to the earliest history, with AMAs of 4.1-4.3 Ga [4][5]. Depending which cratering chronology is applied, the bright, tectonically resurfaced units can be as old as 2 Ga (JCM [5]) or 3.8 Ga (LDM [4]). Bright, large craters with ray systems extending radially over hundreds of kilometers represent comparably young geologic features but their AMAs can only be estimated with a high degree of uncertainty in the current image data base. For Osiris, a 107 km large bright ray crater we could constrain a maximum AMA of 750 Ma (LDM [4]) or 84 Ma (JCM [5]). The current image data base of Ganymede will be greatly extended by the images of the JANUS camera [6] aboard ESA's JUICE mission to Jupiter and Ganymede. JUICE is planned to be launched in 2022 and will orbit Jupiter and Ganymede in 2030 – 2033. REFERENCES: [1] Pappalardo et al., 2004. In: F. Bagenal, T. E. Dowling, Q. B. McKinnon (Eds.), Jupiter. Cambridge Univ. Press, p. 363-396. [2] Schenk P. M. et al., 2004. In: F. Bagenal, T. E. Dowling, Q. B. McKinnon (Eds.), Jupiter. Cambridge Univ. Press, p. 427-456. [3] Collins G. C. et al., 2013. USGS Sci. Inv. Map #3237. [4] Neukum G. et al., 1998. LPSC XXIX, abstr. No. 1742. [5] Zahnle K. et al., 2003. Icarus 163, 263-289. [6] Della Corte V. et al., 2014. Proc. SPIE 9143, doi:10.1117/2056353.