Development of Fluvial Activity at Dao Vallis, Niger Vallis, and Hadriaca Patera as derived from HRSC Image Data

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Introduction: The north-eastern Hellas Basin rim has been modified by volcanic activity at Hesperia Planum, in particular from the volcanoes Tyrrhena and Hadriaca Paterae. The southern and eastern boundaries of Hadriaca Patera are cut by the Dao and Niger Valles outflow channel system. The formation of the outflow channels has been attributed to the catastrophic discharge of meltwater caused by the melting of ground ice through volcanic intrusions. This discharge occurred on the surface or in the subsurface, producing subsided plains. On the basis of newly available data from the High Resolution Stereo Camera (HRSC) on the ESA Mars Express spacecraft, ages of the flanks of Hadriaca Patera (see abstract by Williams et al., same volume) and the outflow channels have been determined, providing constraints on the evolution of volcanism and fluvial activity in the eastern Hellas region. The plains into which the valleys have been incised have a model age of 3.3 to 3.8 Ga; a debris fan unit covering a large part of the floor of Dao Vallis has a model age of 0.3 to 0.5 Ga. Further measurements are being conducted to provide better constraints on the age and evolution of the outflow channel system.

Current Work: The evolution of the outflow channels and the volcanic features cannot be viewed independently. In order to examine the relationships of fluvial and volcanic activity, the different geologic units have been mapped. Images of the HRSC provide excellent coverage of the entire area at resolutions of 44m/pixel as well as stereo data. This image data is supplemented by higher-resolution THEMIS and MOC NA image data.