

DEVELOPMENT OF FLUVIAL ACTIVITY AT DAO VALLIS, NIGER VALLIS, AND HADRIACA PATERA, MARS. W. Zuschneid¹, G. Neukum¹, S.C. Werner¹, R. Greeley², D. Williams², and the HRSC Co-I Team, ¹Freie Universitaet Berlin, Institute for Geosciences, Germany (ewill@zedat.fu-berlin.de), ²Arizona State University, Department of Geological Sciences

Introduction: The north- eastern Hellas Basin rim has been modified by volcanic activity at Hesperia Planum, and in particular from the volcanoes Tyrrhena and Hadriaca Patera[1-2]. 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 melting of ground ice by volcanic intrusions and the catastrophic discharge of meltwater[3]. This discharge occurred on the surface or subsurface, producing subsided plains. On the basis of the newly available data from the High Resolution Stereo Camera (HRSC) on the ESA Mars Express, ages of the flanks of Hadriaca Patera and the outflow channels will be determined to provide constraints on the evolution of volcanism and fluvial activity in the eastern Hellas region.

Geologic Setting: The geologic evolution of the eastern Hellas Basin is dominated by large-scale volcanic activity. This activity has led to the formation of the volcanic plains of Hesperia Planum, but it is also associated with central- vent volcanism at the Tyrrhena and Hadriaca Paterae. Hadriaca Patera, located at the northeastern rim of Hellas, is a large, low relief volcanic construct with a radial drainage pattern. Dao and Niger Vallis form a system of outflow channels located directly at the southern margin of Hadriaca Patera. The outflow system was created by a combination of surface and subsurface discharge[3-4]. The latter has led to the formation of subsided plains due to the loss of material under a rigid surface layer.

Dao Vallis source depression: Dao Vallis originates from an extensive horseshoe- shaped source depression, 120km in length, up to 40km wide and up to 2700m deep. It shows partly smooth, partly chaotic floor material. Downstream, a second, smaller depression with similar morphology follows [4].

Niger Vallis: Niger Vallis has a far more complex morphology than Dao. It consists of a variety of depressions and connecting channels. Several channels were formed by surface flow, while others were created by removal of material underneath a brittle surface which subsequently fractured and filled the void [3]. These subsurface flow features connect Niger with Dao Vallis and the outflow system to Ausonia and Peraea Cavus in the east of Hadriaca. The larger depressions of Niger Vallis have different depths, their floors are smooth and show few chaotic areas.

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 12.5 to 25m/pixel and stereo data. On the basis these images, crater retention ages [6-8]] will be measured. These age measurements provide a basis for establishing a chronology of events for the Dao Vallis and Niger Vallis region.

References: [1] Crown, D.A. and Greeley, R. (1993) JGR 98, 3431-3451; [2] Tanaka, K.L. et al. (2002) GeRL 29 ; [3] Squyres, S.W. et al. (1987) Icarus 70, 385-408; [4] Mest, S.C. and Crown, D.A.(2001) Icarus 153, 89-110; [5] Crown, D.A. et al (1992) Icarus 100, 1-25; [6] Hartmann, W.K. and Neukum, G.(2000) Space Sci. Rev. 96, 185-194; [7] Neukum, G. (1983) Habilitation Dissertation, LMU Muenich; [8] Ivanov, B.A. (2001) Space Sci. Rev. 96, 87-104

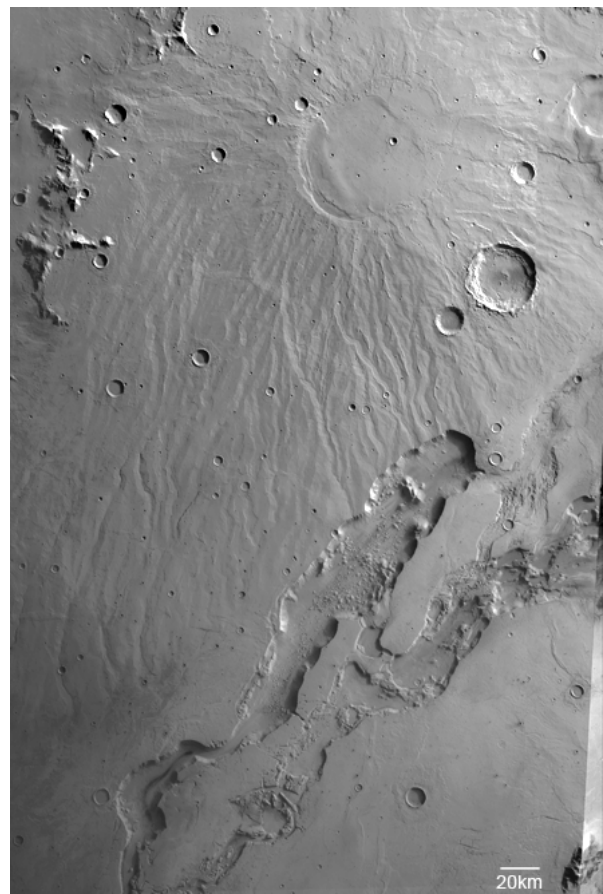


Figure 1: Overview of Dao and Niger Valles and Hadriaca Patera. Images of this mosaic were acquired by HRSC during orbit 528 and 550