PALEOENVIROMENTAL EVOLUTION OF THE HOLDEN-UZBOI AREA. L. Marinangeli[1], A.P. Rossi[1], M. Pondrelli[1], A. Baliva[1], S. Di Lorenzo[1], G.G. Ori[1], E. Hauber[2], G. Neukum[3] and the HRSC team, [1]International Research School of Planetary Sciences, Univ. d'Annunzio, viale Pindaro 42, 65127 Pescara, Italy luciam@irsps.unich.it, [2] Institute of Planetary Research, German Aerospace Center (DLR), Berlin, Germany, [3] Institut fuer Geologische Wissenschaften, Freie Universitaet Berlin, Malteserstr. 74100, Bldg. D, 12249 Berlin, Germany.

Introduction: The Uzboi Vallis is part of a large network of outflow channels of the Margaritifer Sinus Region, located on the easternmost side of Valles Marineris. The Noachian Holden crater appears to have modified a preexisting fluvial system, likely no very active at the impact time. A variety of younger fluvio-lacustrine environments and glacial morphologies have been recognized in the Holden crater [1], suggesting variations of the water cycle trough time. The aim of this work is to define the context on which the Holden lacustrine system was active. The work is focused on the two basins surrounding Holden crater (Figure 1): the "Holden NE" crater (as named by [2]) where fan-shaped deposits confirm the presence of water [2,3] and the northern Uzboi Vallis, the channel debouching into the Holden crater which was probably acting as lacustrine basin [1]. We have performed a geological survey of the two sites based on HRSC [4] images and stereo-derived topography and MOC images for close view of the deposits. We also compared the observed stratigraphic sequences with the one reconstructed in the Holden crater [1] to understand the overall evolution of the water-related environments.

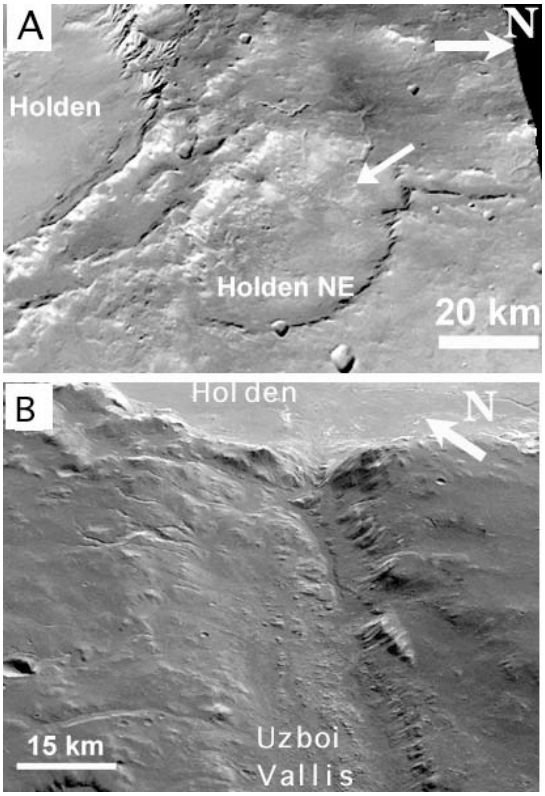

Figure 1. 3D views of the study area from HRSC images and DTMs (orbits 511, 533). **A.** The "Holden NE" crater. Arrow indicates the fan-shaped feature described by [2,3]. **B.** Northern Uzboi Vallis debouching into Holden crater.

Holden NE basin: The "Holden NE" basin (Figure 1A) consists of a highly degraded, elliptical impact crater about 67 by 42 km wide. The basin is mostly filled by the ejecta of the Noachian Holden crater. The large fan-shaped feature visible on the western side of this basin has already been described using MOC and THEMIS images [2,3]. Due to the high degradation level, its origin, alluvial [2] or deltaic [3], is still controversial. Our mapping and the accuracy of HRSC DTM (Figure 2) is consistent with a complex deltaic system debouching in a lacustrine system, being later dissected by fluvial erosion. However, we cannot rule out a transition from a fan-delta to alluvial fan as seen for the Holden crater fan due to variation of the climatic settings and water volume [1]. Layered units (Figure 3A) associated to this fan-delta are rather similar to those found in the Holden crater and interpreted as cyclic deltaic deposits [1]. This cyclicity has been interpreted as due to autogenic processes, more likely controlled by

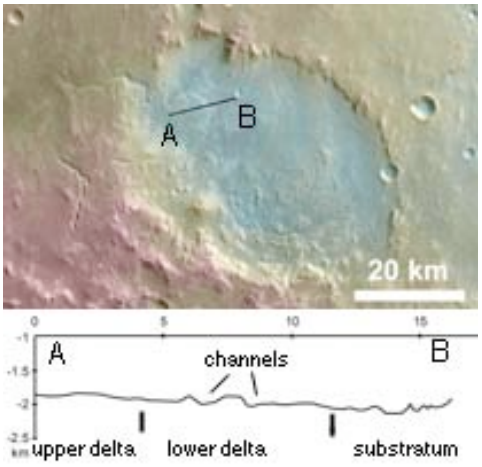

Figure 2: HRSC topography of the "Holden NE" delta (orbit 511). North is up.

avulsions of the distributary channels. Glacial morphologies have been identified mainly in southern portion of Holden NE (Figure 4A). Similar morphologies have been also observed in Holden crater [1].

Northern Uzboi Vallis basin: Uzboi Vallis flowed in the Holden area prior to formation of the Holden crater. The Holden crater rim should have been for a while an obstacle that was impossible to breach, even if there had been sufficient fracturing to allow water infiltration and favor erosion. Though these processes allowed water to flow freely inside the Holden crater, we found evidence for the formation of an ephemeral lake on the northern Uzboi Vallis (Figure 1B), just outside the crater border. This scenario is consistent with the presence of layered deposits in this area also associated to alluvial fan feature (Figure 3B). Terraces are also well developed (Figure 1B). Glacial scourings, stoss and lee morphologies (Figure 4C), grooved and streamlined features, associated with blocky units (moraine-like deposits), have been also observed.

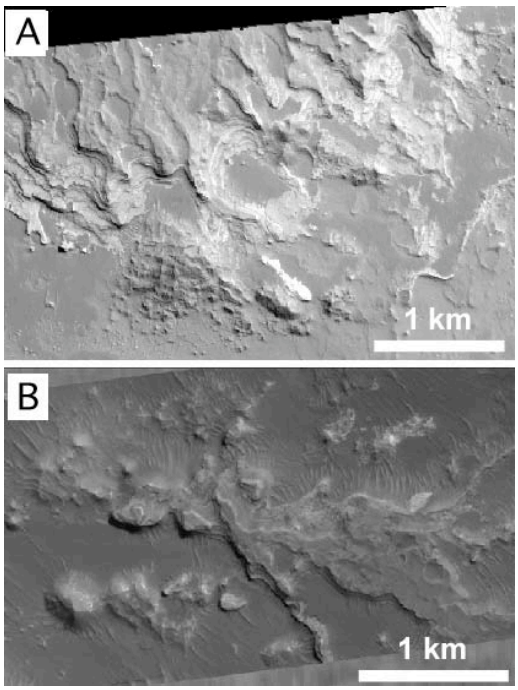

Figure 3. Layered sedimentary deposits. **A.** Layered bright and dark deltaic sediments in the Holden NE basin (MOC e2300003). **B.** Outcrop of layered alluvial deposits observed in the Uzboi Vallis basin (MOC r0200033). They may be part of a highly eroded alluvial fan in the formed on the western flank of the valley

Summary: The Holden, "Holden NE" and northern Uzboi Vallis basins, although not directly connected each other, show similar paleoclimatic evolution being characterized by fluvio-lacustrine activity and younger localized glacial activity. The presence of a ice-covered lake cannot be ruled out so far. The lacustrine activity in the Holden crater appears to be younger than the Holden NE and partially coeval with the northern Uzboi. Aeolian erosion and mantling is widespread and represents the youngest geological activity in the area. Other studies on new deltaic systems identified from HRSC images [5], will help in better constrain the Martian fluvio-lacustrine activity.

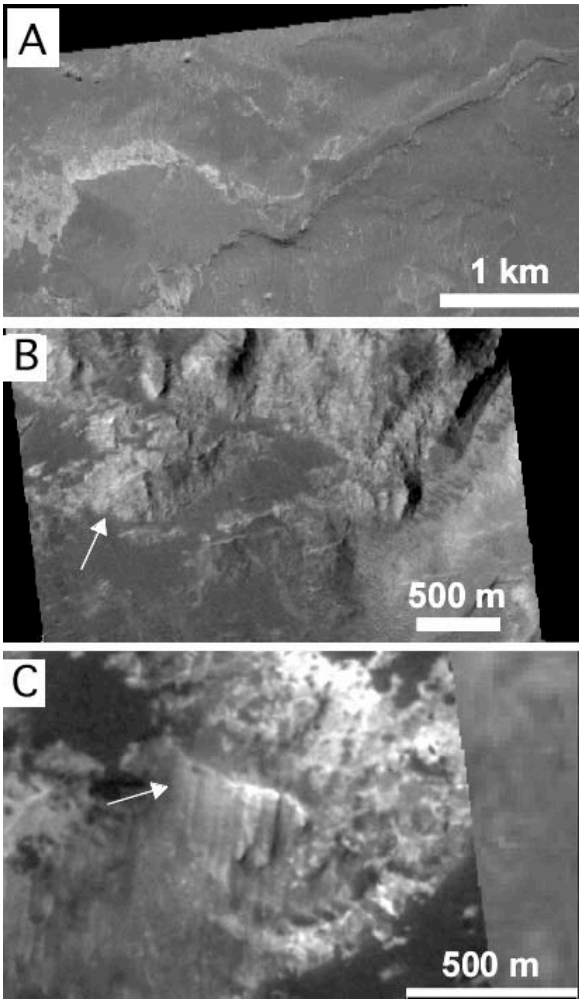

Figure 4. Glacial morphologies and deposits. **A.** Possible esker in Holden NE basin (MOC r0701352). **B.** Stoss and lee morphologies in Holden NE basin (MOC r0600324). **C.** Stoss and lee morphologies in Uzboi Vallis floor (m1100709).

References: [1] Pondrelli M. et al. (2005) *JGR*, in press. [2] Malin and Edgett *Science*, 2004 [3] Moore et al. (2004) *GRL*, [4] Neukum G. et al. (2004) ESA Spec. Publ. 1240, 17-35. [5] Hauber E. et al. (2005) *LPS XXXVI*, Abstract #1661.