

TERBY IMPACT CRATER: AN EVIDENCE FOR A NOACHIAN SEDIMENTARY FILLING BY SUBAQUEOUS FAN DELTAS. V. Ansan¹, D. Loizeau², N. Mangold¹, S. Le Mouélic¹, J. Carter², F. Poulet², G. Dromart³, A. Lucas¹, J-P. Bibring², A. Gendrin², B. Gondet², Y. Langevin², Ph. Masson⁴, S. Murchie⁵, J. Mustard⁶, G. Neukum⁷, ¹ Laboratoire de Planétologie et Géodynamique de Nantes, Université de Nantes/CNRS UMR6112, 2 rue de la Houssinière, BP 92208, 44322 Nantes, France (veronique.ansan@univ-nantes.fr), ² Institut Astrophysique Spatiale, Université Paris-Sud/CNRS, UMR 8617, 91405 Orsay, France, ³ Laboratoire de Sciences de la Terre, ENS Lyon/CNRS/Université Lyon 1, UMR 5570, 69622 Villeurbanne, France, ⁴ Lab. IDES, CNRS UMR 8148, Université Paris-Sud/CNRS, 91420 Orsay cedex, France, ⁵ Johns Hopkins Univ, Appl. Phys. Lab., Johns Hopkins Rd, Laurel, MD 20723 USA, ⁶ Brown Univ, Dept Geol Sci, Providence, RI 02912 USA, ⁷ FU, Berlin, Germany

Introduction: The 174 km diameter Terby impact crater (28.0°S - 74.1°E) located on the northern rim of the Hellas basin displays anomalous inner morphology [e.g. 1,2], including a flat floor and light-toned layered deposits [3, 4, 5]. An analysis of these deposits was performed using multiple datasets with visible images for interpretation, infrared data for mineralogic mapping, and topography for geometry. The geometry obtained was consistent with that of clastic sediments that settled mainly in a sub-aqueous environment during the Noachian period [6].

To the north, the thickest sediments displayed sequences for fan deltas, as identified by 100 m to 1 km long clinoforms, as defined by horizontal beds passing to foreset beds dipping by 6°-10° toward the center of the Terby crater [6]. The identification of distinct sub-aqueous fan sequences, separated by unconformities and local wedges, showed the accumulation of sediments from prograding/onlapping depositional sequences, due to lake level and sediment supply variations. The mineralogy for several layers with hydrated minerals, including Fe/Mg phyllosilicates, supports this type of sedimentary environment.

The volume of fan sediments was estimated as >5,000 km³ [6] (a large amount considering classical Martian fan deltas such as Eberswalde (6 km³) [7]) and requires sustained liquid water activity. Such a large sedimentary deposition is characteristic of the Noachian/Phyllosian era where the environment favored the formation of phyllosilicates, the latter detected by spectral data in layered deposits in three distinct sequences.

During the Hesperian period, the sediments experienced strong erosion, possibly enhanced by more acidic conditions (in the Theiikian), forming the current morphology with three mesas and closed-depressions. Small fluvial valleys and alluvial fans formed subsequently, attesting to late fluvial processes dated as late Early to early Late Hesperian. After this late fluvial episode, the Terby impact crater was sub-

mitted to aeolian processes and permanently cold conditions as confirmed by viscous flow features.

Therefore, the Terby crater displays, in a single location, geologic features that characterize the three main eras on Mars, with the presence of one of the thickest sub-aqueous fan deposits reported on Mars.

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