

**GEOMORPHOLOGICAL MAPPING OF WEST COOGOON VALLES AND SOUTHEAST OXIA PLANUM, MARS.** Á. García-Arnay<sup>1</sup>, O. Prieto-Ballesteros<sup>2</sup>, F. Gutiérrez<sup>1</sup>, A. Molina<sup>2</sup>, and I. López<sup>3</sup> <sup>1</sup>Dpto. de Ciencias de la Tierra, Universidad de Zaragoza, 50009 Zaragoza, Spain ([arnay@unizar.es](mailto:arnay@unizar.es)), <sup>2</sup>Centro de Astrobiología-CSIC-INTA, 28850 Torrejón de Ardoz, Spain, <sup>3</sup>Universidad Rey Juan Carlos, 28933 Móstoles, Spain

**Introduction:** Oxia Planum is located in west Arabia Terra. This area has been recently chosen as landing site for the ESA's ExoMars 2020 rover due to evidence of water in the past, including phyllosilicate-rich layered deposits widely reported in west Arabia Terra (e.g., [1][2][3][4][5]). This work presents a detailed geomorphological map of west Coogoon Valles and southeast Oxia Planum (centered in 17.30°N, 23.37°W).

**Geomorphological mapping:** Recently, a geologic map of the Coogoon Valles region was published by [6]. We have produced a geomorphological map of the western Coogoon Valles and southeast Oxia Planum to characterize their landscapes (Fig. 1). It was elaborated in a GIS environment using a HRSC-derived DEM, a CTX panchromatic image mosaic (75 and ~6 m/pixel, respectively), and THEMIS-derived thermal inertia images (100 m/pixel).

The study area is located astride two well-differentiated geomorphic domains: the highland and basin units. The highland unit, which corresponds to the Coogoon Valles region, is heavily cratered and dissected by valleys related to fluvial and/or sapping erosion. The NW-directed valley network that comprises Coogoon Valles is carved in this topographically higher unit. The basin unit corresponds to the region of Oxia Planum and presents less cratered and relatively flat terrains. The mouth of Coogoon Valles is located on the southeast edge of the basin. Here, sediment accumulation by unconfined flows from Coogoon Valles developed a fan with subdued distributary channels. To the south there is another fan with a similar size and apparently disconnected from the valley network. This fan was probably developed by the western branch of Coogoon Valles before its piracy, as suggests a sharp turn (elbow of capture) located close to the fanhead, or related to the Noachian outflow channel as proposed by [6]. The largest crater, located in the NE corner of the mapped area, displays fan-shaped and terrace-like deposits at the foot of its northern escarpment. The region shows numerous closed depressions that have been classified into impact craters and uncertain-origin depressions. All the impact craters larger than 0.5 km in diameter were mapped. A significant number of craters are surrounded by deposits of fluidized ejecta that may indicate the presence of groundwater during the impact. The other enclosed depressions display the following features: (1) elongated shapes that may be the

result of the coalescence of adjoining depressions, (2) lack associated ejecta deposits, (3) contain residual reliefs such as flat-topped mesas that can be dissected by channels, and (4) the presence of shadow valleys surrounding their margins that may indicate later fluvial activity [6]. These lines of evidence suggest that the depressions may have formed by sapping processes affecting to previously filled coalescent craters, and/or by thermokarst or volcanic activity as indicated by [6]. In fact, in the southeast part of the region, an escarpment shows theater-headed valleys possibly related to headward erosion by localized sapping processes. Eolian deposits mainly occur in low-lying areas such as impact craters, valleys and other depressions. These are dune fields mostly with parallel ridges. A dominant SE wind direction can be inferred from the bright streaks that occur in the leeward edges of some crater rims. This indicates that dunes are dominantly of the transverse type since their crests are perpendicular to the wind direction. The region also shows wrinkle ridges with a dominant NW-SE direction. These linear landforms may correspond to tectonic structures.

We paid special attention to geometrical relationships (e.g., cross-cutting, inset, superposition) in order to obtain information on the relative chronology of the mapped landforms and to establish a chronosequence. The eolian deposits, which overlie the rest of the landforms, are the most recent landforms. The relative age of some impact craters can be also determined by onlapping relationships of their ejecta deposits. Fluidized and multilayered ejecta deposits released from the central impact crater of ~16 km in diameter have partially buried the fluvial valleys along tens of kilometers.

The study area displays two CRISM observations (~18 m/pixel and ~10 km across), FRTs 8438 and 9A16, which correspond, respectively, to gently sloping terrains below a cliff-forming caprock, and the outlet area of Coogoon Valles characterized by valleys and fan-shaped deposits. The analysis of both CRISM scenes indicates the presence of phyllosilicate-bearing outcrops, which occur in gentle and topographically low slopes probably related to fluvial and/or sapping erosion in the mapped highland unit.

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**Fig. 1:** Geomorphological map of W Coogoon Valles and SE Oxia Planum, superimposed on a subset of CTX image mosaic. CRISM observations FRTs 9A16 (A) and 8438 (B) are recognizable by the hourglass-shaped footprint.

