QUANTITATIVE COMPARISON OF TERRESTRIAL AND MARTIAN POLYGONAL NETWORKS. M. Lousada[1,2], L. Bandeira[1], P. Pina[1], G. Vieira[3], N. Benavente[1], J. Saraiva[1,2] [1]CERENA/IST, Lisboa, Portugal (maura.lousada@ist.utl.pt), [2]UNIS, Svalbard, Norway, [3]CEG/IGOT, Lisboa, Portugal.

In the last couple of years we have studied the ice-wedge polygonal networks of the Adventdalen area in Svalbard, in the frame of project ANAPOLIS [1,2]. Our aim is to compare the characteristics – namely geometry and topology - of these networks, whose origin raises no doubts, with the characteristics that can be extracted from orbital images of polygonal networks on Mars [3,4].

To this effect, we have analyzed remotely acquired (aerial) images of the numerous networks, varying in dimension and number of polygons, that occur along the valley. This, in a way, mimics the situation regarding the analysis of martian networks. However, working on the Earth has the advantage of permitting field work, which in turn allows for an *in situ* verification of the results obtained through the analysis of remotely sensed images.

A comparison of the network delineated from the manual analysis of the images with the map established in the field, by following the true boundaries of the polygons (see Figure 1), led us to confirm the expected drawbacks – not being able to identify less clear boundaries on the images – but also to conclude that the results of the analysis of remotely sensed images are not that different and thus can still be used with a degree of confidence, namely when it comes to comparions of topology and geometry.

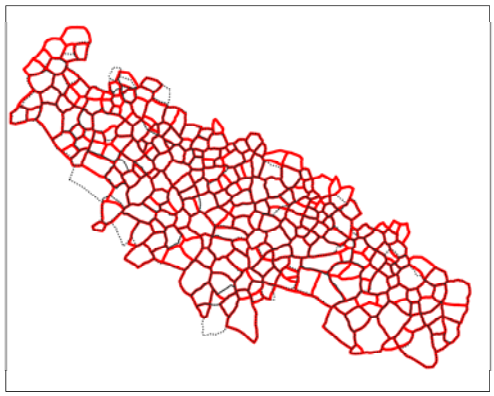

Figure 1 – Superposition of network maps obtained from analysis of remote images(dotted) and field work (red).

From the analysis of the remotely sensed images of the Adventdalen, a total of 120 polygonal networks containing at least 10 polygons were identified. The topology characterization procedure requires that all polygons in the network have neighbours whose neighbours can be counted; respecting this constraint led to the full analysis of 17 networks, all of which contain at least 20 polygons (Figure 2).

On Mars, we have conducted the same procedure for geometric and topological characterization on more than 30 networks, with different visual aspects and from varied areas of the planet [3]. Their origin is in many instances a subject for debate, but at least some seem to be clearly related to the presence of ice in the martian soil (for instance, those occurring in the area where the Phoenix probe landed, in 2008, at 68º N).

In this work, we make a comparison of some of the quantitative characteristics extracted from the networks of both groups, terrestrial and martian. The presence of any kind of clusters or trends could point to important clues to explore when conducting a more complete and detailed analysis, which will include other parameters, namely those related to the shape of polygons.

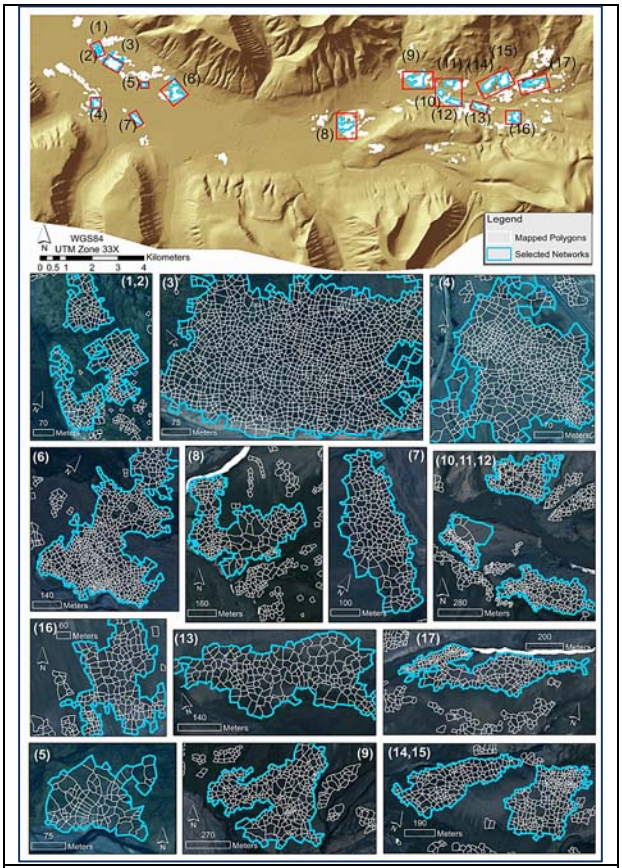

Figure 2 – Location and maps of the 17 terrestrial networks studied.

References: [1] Pina P. et al. (2011) *LPS XLII*, Abstract #1387. [2] Pina P. et al. (2012) *LPS XLIII*, Abstract #2353. [3] Pina, P. et al. (2008) *PSS*, *56*, 1919-1924. [4] Bandeira L. et al. (2011) *LPS XLII*, Abstract #1998.

Acknowledgments: This work was supported by FCT (Portugal) through project ANAPOLIS (PTDC/CTE-SPA/99041/2008).