THE ANALYSIS OF THE EXOMARS 2016 LANDING SITE. G.G. Ori[1], A. Aboudan[1], S. Portigliotti[2], A. Marcer[2], L. Lorenzoni[3,] A. Pacifici[1], F. Cannarsa[1], [1]IRSPS Univ. d'Annunzio, Viale Pindaro 42, 65127 Pescara (ggori@irsps.unich.it), [2]Thales Alena Space Italia, Strada Vecchia di Collegno 253, Torino, 10146, Italy, (Stefano.Portigliotti@thalesaleniaspace.com) [3] ESA, ESTEC, Nordwijk, The Netherland (Leila.Lorenzoni@esa.int).

Introduction: The landing ellipse of ExoMars 2016 lander (EDM, recently named Schiaparelli) is located at Meridiani Planum. The ellipse is 110 km long and 25 km large and cover a flat area to the west of the Opportunity landing site.

The EDL operations require a large landing area due to the ballistic approach. The entry in the atmosphere will be at 120 km of altitude and the EDM decelerate due to a parachute and a propulsion system. In order to define the safety of the landing in the Meridiani landing site a careful analysis of the engineering constraints has been performed.

The entire data set has been included in a GIS platform and an online MapServer provides fast accessibility at data, maps and images.

Landing site: The area of the landing site cover a flat area dominated by the Burns formation and possible adjacent lava flows covered by Aeolian deposits or a thin veneer of deflated material. The constraints that have been taken into account are the relief and slope at different scales. Relief and slopes at kilometer-scale base lengths can be evaluated using MOLA data downsampled down to 1 km and 2 km per pixel of resolution using the Steepest Adjacent Neighbor algorithm. Relief and slopes at hectometer-scale base lengths can be evaluated using MOLA data and HRSC DEMs (with resolution down to 75-100 m/pixel, see example of Figure 1). However, the nominal resolution of MOLA data does not allow the direct investigation of the slope at hectometer scales ranging from 100 m to about 460 m. The characterization of the meter/tens of meter slope constraint can only be performed through high-resolution stereogrammetry at the meter length scale (e.g. with HiRISE, MOC, and CTX data). Photoclinometry has been performed on MOC images when stereo data were lacking and, basically, for comparison (see example of Figure 2). Finally, In order to verify the slopes constraints at those scales not covered from the available data, it has been assumed that the LS surface obeys self-affine behaviour. MOLA tracks, HRSC DEMs and MOC PC2D DEMs have been considered in this analysis (Figure 3).

TES and Themis data have been used to analyse several parameters including thermal inertia, albedo, bolometric temperature (see example of Figure 4).

The derivation of the rock abundance and spatial distribution can be performed in three ways: IRTM assessment and estimation, Extrapolation from models, Visual inspection. IRTM has been widely used in the rock property assessment, but estimates are at a spatial resolution of 1degree bins (60 km). Visual inspection of images is a key method and the automatic identification of rocks on HiRISE images can be extremely useful. To this aim a rock detection software has been developed by IRSPS [1].

Special care has been paid to evaluate whether surface material present at the landing site is radar reflective and provide sufficient backscatter signal. The terrain reflectivity of Meridiani LS has been evaluated using both Hagfors and fractal backscattering models. The expected radar cross section has been computed assuming given the terrain dielectric properties and the terrain roughness. Other analysis and experiments are still underway.

Impact craters and other geological features have been mapped mapped and included in a geological-geomorphological map that has been prepared as base for the entire data set [2].

Landing site assessment: The analysis of the data has produced a multi-layered geographical data set. To asses the landing safety the landing hazard has been pigeonholed in a classification based on a quantification of the single parameters.

The various classes of hazard have been used to reconstruct a set of hazard maps and a general one that report and geographically summarize the landing risk (Figure 5).

The most probable landing area (70% landing probability) is classified as medium/low risk. The medium risk is mainly due to the lack of high-resolution data. On the other hand, where meter scale images are available the risk is low (with the exception of pristine craters).

References: [1] Aboudan A. et al. (2014) *this volume* [2] Pacifici A. et al. (2014) *this volume*.

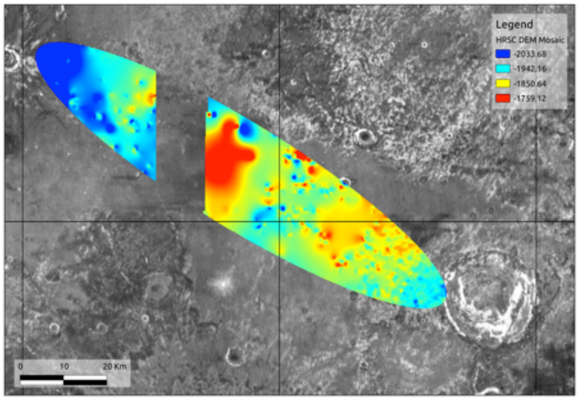

Figure 1: HRSC DEM mosaic at 75 m/px (W/left part) and 100 m/px (E/right part).

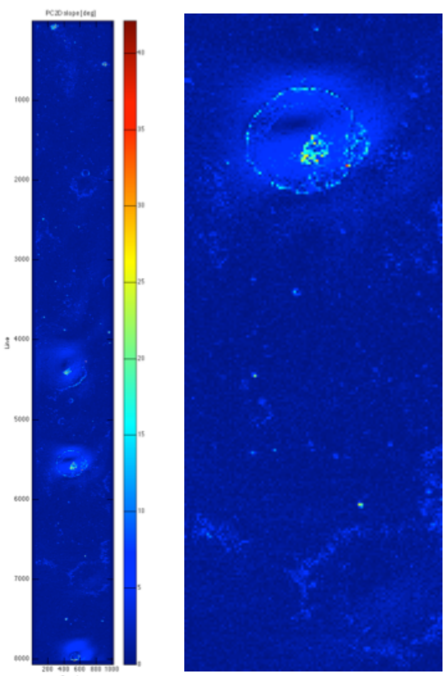

Figure 2: Slope map derived from MOC PC2D DEM and a close up.

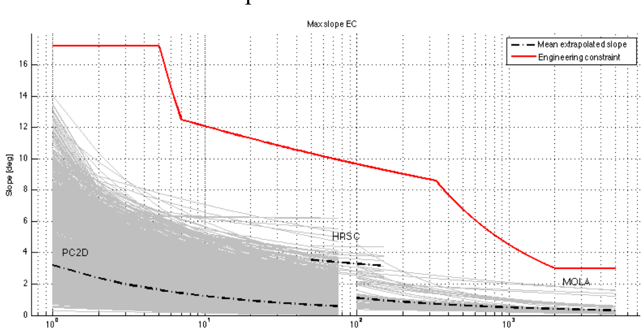

Figure 3: RMS slopes extrapolated on MOLA, HRSC and PC2D compared with the slope EC.

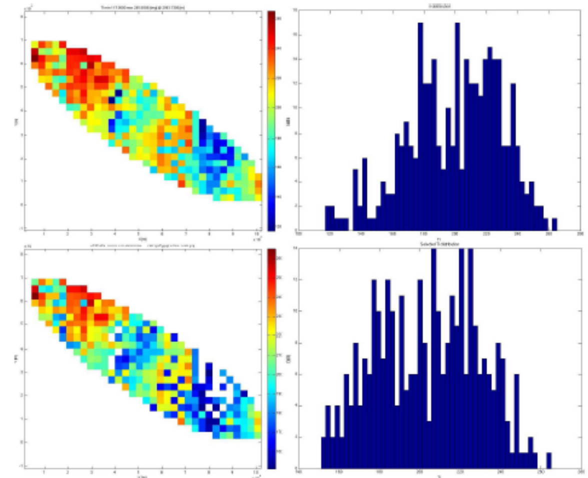

Figure 4: THEMIS-derived thermal inertia and histograms for the studied landing site.

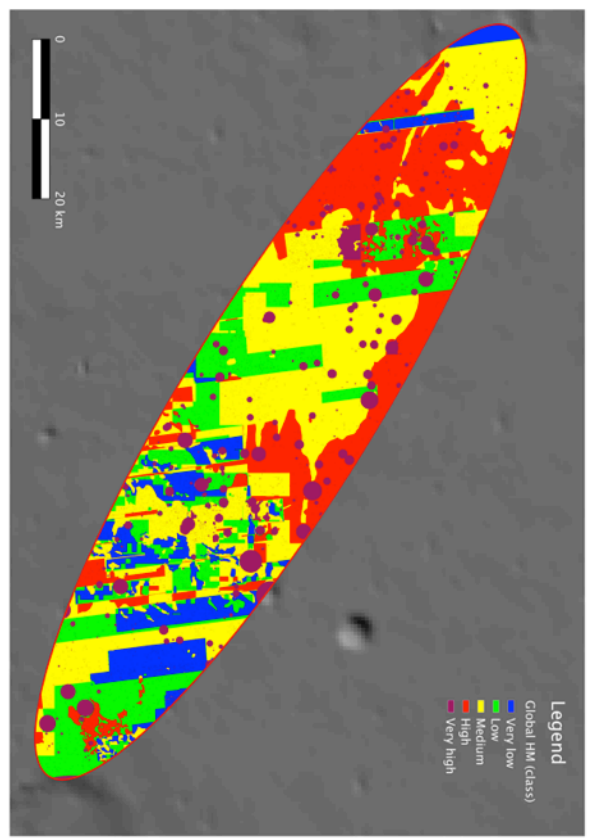

Figure 5: Meridiani landing site global hazard map. Landing risk is classified as Very-low, Low, Medium, High and Very-high.