EXOMARS 2018 LANDING SITE PROPOSAL: COOGOON VALLES. F. Gomez, (1)*, A. Molina, (1), I. Lopez (2), O. Prieto-Ballesteros, (1), A. Sansano, (3), J.A. Rodriguez-Manfredi, (1), M. A. de Pablo (4), D. Fernandez-Remolar (1), F. Rull (3), V. Parro (1), F. Tornos (1), S. Navarro (1), and J. Gomez-Elvira (1). (1) Centro de Astrobiología (INTA-CSIC, Spain), (2) Universidad Rey Juan Carlos, Spain (3) Unidad Asociada Valladolid Centro de Astrobiología (UVA-CAB, Spain, (4) Universidad de Alcalá de Henares, Spain. *corresponding author (gomezgf@cab.inta-csic.es, a.molina@csic.es, ivan.lopez@urjc.es, prietobo@cab.inta-csic.es, sansanoca@cab.inta-csic.es, manfredi@cab.inta-csic.es, miguelangel.depablo@uah.es, fernandezrd@cab.inta-csic.es, rullpf@cab.inta-csic.es, parrogv@cab.inta-csic.es, ftornos@cab.inta-csic.es, navarrols@cab.inta-csic.es, gomezej@cab.inta-csic.es)

Introduction: Coogoon Valles is a Mars region with clear indications of past water activity, including flow channels, layered sedimentary deposits, craters with fluidized ejecta and high albedo materials of special interest because their associate origin with aqueous solutions. The proposed landing site ellipse is centered at 16º 29´N 23º 28´W (Fig. 1). Coogoon is a new region to explore; practically it is not studied yet, with a low references regarding this place. However there are recent data from last (actual-ongoing) missions which show their potential as an interesting landing site. Images of particular interest used for the preparation of this proposal were HIRISE PSP_005740_1970, ESP_012214_1970, ESP_011937_1970 and CRISM 0000A3DE, 00008438, 00011725 and 00010FE9. Starting with deeper studies during the preparation phase of the mission in order to get the necessary information for mission's development is mandatory, as for example, the geological mapping needs to be refined during the preparation phase.

The main identified features of interest are the presence of water flow channels over the landing ellipse with special interest in short water flow features within rover distance traverse from the center of the ellipse (Fig. 2). Other remarkable features within 1 km distance range from the center of the ellipse are sedimentary deposits and high albedo materials congruent with the presence of phyllosilicates and polyhydrated sulfates.

Proposed site is ancient (older than 3.6 Ga)—Noachian (Phyllosian) following the main requirement of ExoMars mission landing site selection process. Materials of ancient age are clearly identified over the landing ellipse as it is reflected in the appropriate map.

Site shows abundant morphological and mineralogical evidence for long-duration, or frequently reoccurring, aqueous activity, but also sedimentary rock outcrops in different locations of the ellipse were identified. Regular distribution of interesting features over de landing ellipse, as it is summarized on the table below, were located as well. Further studies are needed in order to measure real distance to those different features for final identification of the most proximal easy to reach from the ellipse center. The site has in general little to nothing dust coverage.

In order to unveil the composition of the light toned material that is broadly distributed from the center to the northeast of the ellipse, MRO CRISM hyperspectral images at the northeast were processed [1]. Here we show the summary products designed to identify hydroxylated silicates, mafic mineralogy and oxidized iron minerals (as described in [2]) for the FRT00008438 cube (NE of the ellipse). CTX images indicate that the geological units and features are easily correlated to those at the center of the ellipse. Those indicate a wide extension of outcropping phyllosilicate bearing material overlapping the light toned deposits. These smectite bearing deposit show a Fe-rich like signature – as in nontronite - with band centers near 1.43 mm and 2.29 mm (Figure 3, profile 3). Those are distributed in the pink colored areas (Figure 3), meanwhile other Al-rich smectites that typically display absorptions at 1.41 mm and 2.21 mm also are identifiable (green patches and Profiles 1 and 2 in Figure 3) [3] [4] [5]. The iron phyllolisicates distribution is also evident in through OLINDEX ([2]; red in Figure 4, left) and the 0.53 mm band depth (also red in Figure 4, right). Polyhydrated sulfates are probably present in the area as well, as is shown in blue color (Fig. 3).

References:

[1] Murchie, S., Arvidson, R., Bedini, P., Beisser, K., Bibring, J.-P., Bishop, J., Boldt, J., Cavender, P., Choo, T., Clancy, R.T., Darlington, E.H., Des Marais, D., Espiritu, R., Fort, D., Green, R., Guinness, E., Hayes, J., Hash, C., Heffernan, K., Hemmler, J., Heyler, G., Humm, D., Hutcheson, J., Izenberg, N., Lee, R., Lees, J., Lohr, D., Malaret, E., Martin, T., McGovern, J.A., McGuire, P., Morris, R., Mustard, J., Pelkey, S., Rhodes, E., Robinson, M., Roush, T., Schaefer, E., Seagrave, G., Seelos, F., Silverglate, P., Slavney, S., Smith, M., Shyong, W.-J., Strohbehn, K., Taylor, H., Thompson, P., Tossman, B., Wirzburger, M., Wolff, M., 2007. Journal of Geophysical Research: Planets 112, E00D06.

[2] Pelkey, S.M., Mustard, J.F., Murchie, S., Clancy, R.T., Wolff, M., Smith, M., Milliken, R., Bibring, J.-P., Gendrin, A., Poulet, F., Langevin, Y., Gondet, B., 2007. J. Geophys. Res. Planets 112, n/a–n/a.

[3] Bishop, J., Madejová, J., Komadel, P., Fröschl, H., 2002. Clay Miner. 37, 607–616.

[4] Bishop, J.L., Lane, M.D., Dyar, M.D., Brown, A.J., 2008. Clay Miner. 43, 35–54.

[5] Clark, R.N., King, T.V.V., Klejwa, M., Swayze, G.A., Vergo, N., 1990. Res. Solid Earth 95, 12653–12680.

5) Figures

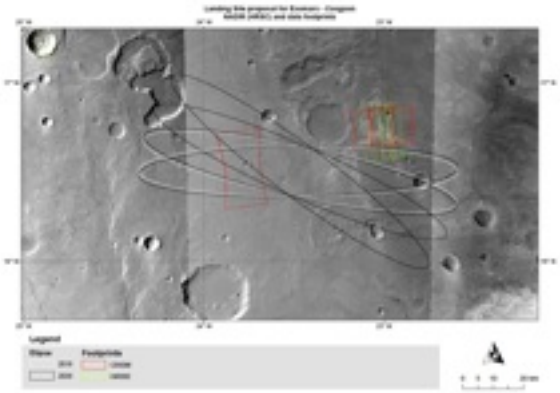

Fig. 1 Landing ellipse location

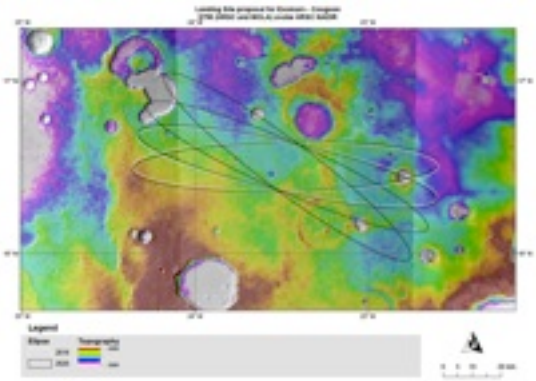

Fig.2: Topography map with proposed landing ellipse location.

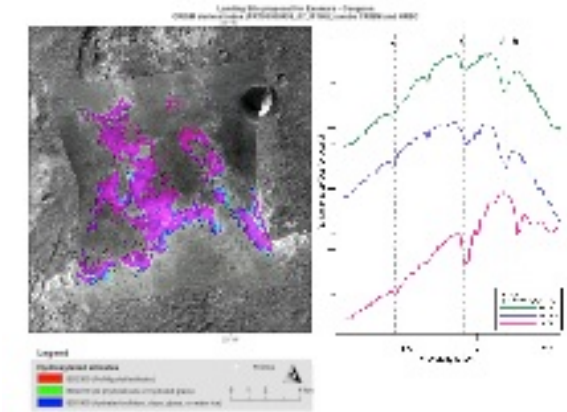

Figure 3: CRISM hyperspectral images. See text for details.

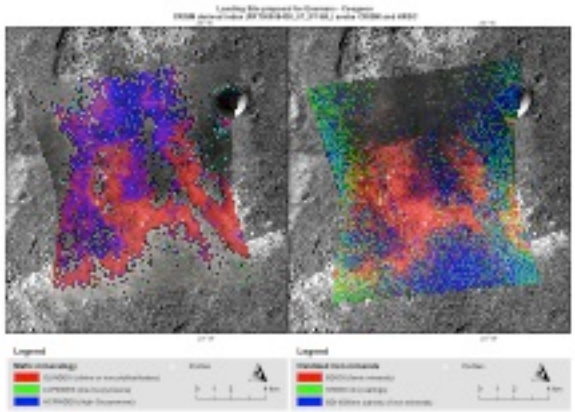

Figure 4: Iron phyllosilicates distribution in site of interest.