MAWRTH VALLIS: STRATIGRAPHY OF THE PHYLLOSILICATE-RICH UNIT AT THE MSL LANDING SITE. D. Loizeau[1], N. Mangold[2], J. Michalski[1], V. Ansan [2], F. Poulet[1], J. Carter[1], J-P. Bibring[1], [1] Institut Astrophysique Spatiale, Université Paris-Sud/CNRS, UMR 8617, 91405 Orsay Cedex, France (damien.loizeau@ias.u-psud.fr), [2] Laboratoire de Planétologie et Géodynamique de Nantes, Université de Nantes/CNRS UMR6112, 2 rue de la Houssinière, BP 92208, 44322 Nantes, France.

Introduction: The Mawrth Vallis region has been shown to display the largest clay-rich outcrops on the surface of Mars with data from Mars Express/ OMEGA and CRISM/Mars Reconnaissance Orbiter (MRO). These outcrops correspond to the eroded parts of a thick and large thinely layered unit (e.g. [1], [2], [3]) dated from the Noachian. Hence, this unit records a past environment where water was available for abundant alteration in the context of a sedimentary unit.

The next NASA rover to Mars, Mars Science Laboratory (MSL), has been designed to determine a planet's past or present habitability. In the context of this mission, one potential landing ellipse has been selected in the Mawrth Vallis region, directly on a large outcrop of the clay-unit (~35 km x ~20 km).

We discuss the stratigraphy of this landing ellipse and its close surroundings as known from the remote sensing data available today, both in terms of mineralogy and morphology.

Characteristics of the landing ellipse from orbital data:

Mineralogy. We have been using infrared hyperspectral datasets (OMEGA and CRISM) to detect and map phyllosilicates on the surface of the region. The ellipse shows the presence of two principal groups: Al-phyllosilicates are located principally on the western part of the landing ellipse, while Fe/Mg-phyllosilicates are mainly on the eastern part.

Cross-section. The stereoscopic HRSC/Mars Express data provided a Digital Terrain Model (DTM) of the region at ~50 m/pix and we used it to locate exactly the different phyllosilicates. In the landing ellipse, the eastern, Al-phyllosilicate-rich, part is higher in altitude. More locally all small Al-phyllosilicate-rich outcrops are also higher than Fe/Mg-phyllosilicate-rich ones, showing a constant stratigraphy with Al-phyllosilicates above Fe/Mg-phyllosilicates.

Mineralogical units mapped with near infrared CRISM and OMEGA data correspond to different color units in the HRSC and HiRISE/MRO color datasets. This allows an even higher mapping of the clay-unit at local scale.

Using the high-resolution mapping and the HRSC DTM, it was possible to build a constrained cross-section of the clay-unit on the landing ellipse (where HiRISE images cover the whole area), to understand the geometry of this unit. A similar work based only on HRSC color data has been made in [4].

This cross-section confirms the stratigraphy: Al-phyllosilicates on top of Fe/Mg-phyllosilicates, but also shows the presence of different sub-units in the Fe/Mg-phyllosilicate-rich layers.

It gives an estimation of the stratigraphic depth that MSL could reach (more than 100 m, for tens of layers). Furthermore, the presence of hydrated ejecta material, ~20 km south of the center of the ellipse, exhumed from a crater, 15 km in diameter, could give access to deeper rocks.

The presence of new HiRISE images on the neighboring Mawrth Vallis channel flank could also provide more information about the stratigraphy, but the capping unit partly covering the region hides large parts of the clay-unit.

Conclusion: The relation between alteration and deposition of the unit is not a simple one. The Fe/Mg-phyllosilicates are always in meter-scale layered rocks, whereas the upper Al-phyllosilicate sub-unit seems in several places to lie unconformably on the rest of the unit ([4], [5]), and the layering is almost undetectable on its outcrops, indicating a possible strong leaching of the upper strata, altering to Al-phyllosilicates, and erasing layers boundaries. This upper Al-phyllosilicate unit is observed very widely around the region ([6]) and could indicate a spatially extended last stage of alteration.

The action of liquid water has been extensive and long in the Mawrth Vallis region, making it one of the most important region where past-habitability is to be studied on Mars.

References: [1] Poulet F. et al. (2005), *Nature, 438*, 623-627. [2] Loizeau D. et al. (2007), *JGR, 112*, E08S04. [3] Poulet F. et al. (2008), *A&A, 487*, L41-L44. [4] Loizeau D. et al. (2010), *Icarus, 205*, 396-418. [5] Wray et al. (2008), *GRL, 35*, L12202. [6] Eldar et al., *JGR, in press*.