The Phyllosian era:

The two (very) different cases of Mawrth Vallis and Tyrrhena Terra

Damien Loizeau

Nicolas Mangold

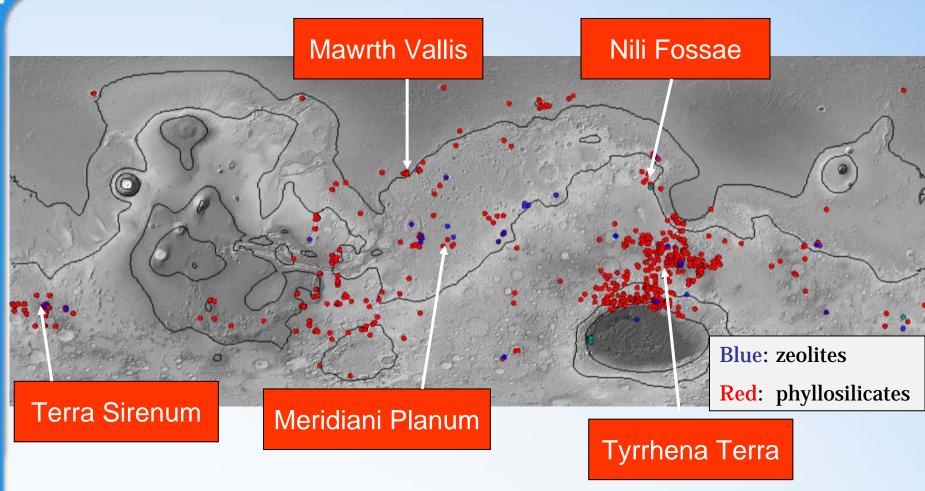
John Carter, François Poulet, Jean-Pierre Bibring ESA-ESTEC, Noordwijk, Nederland

LPGN, Nantes, France

IAS, Orsay, France

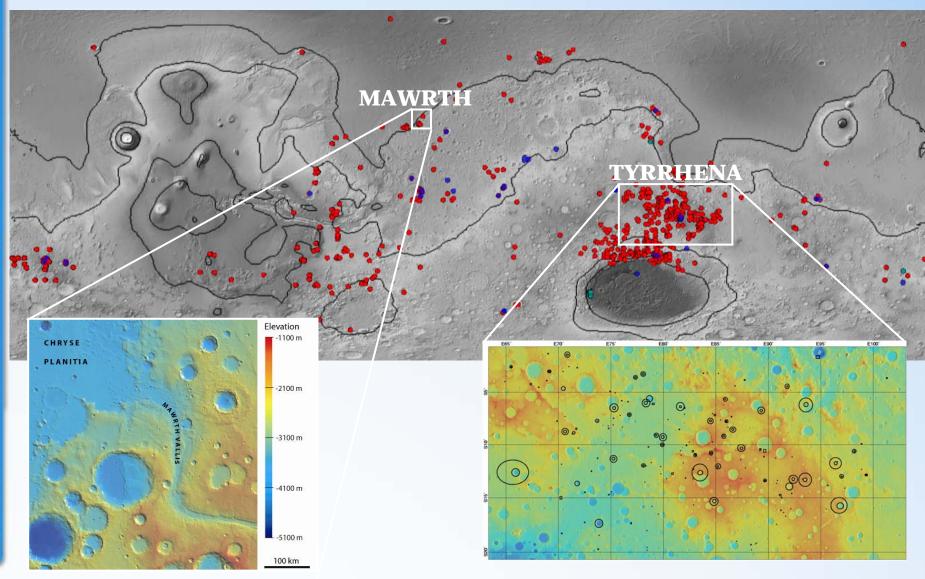


THE PHYLLOSIAN ERA



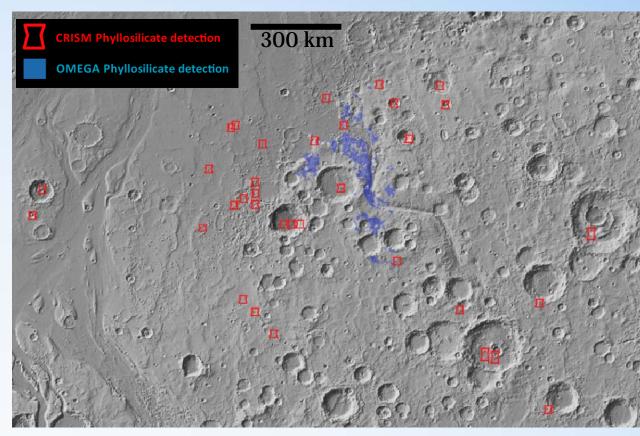
- Phyllosilicates : southern hemisphere, Noachian terrains
- ⇒ aqueous alteration: early Mars, PHYLLOSIAN

THE PHYLLOSIAN ERA

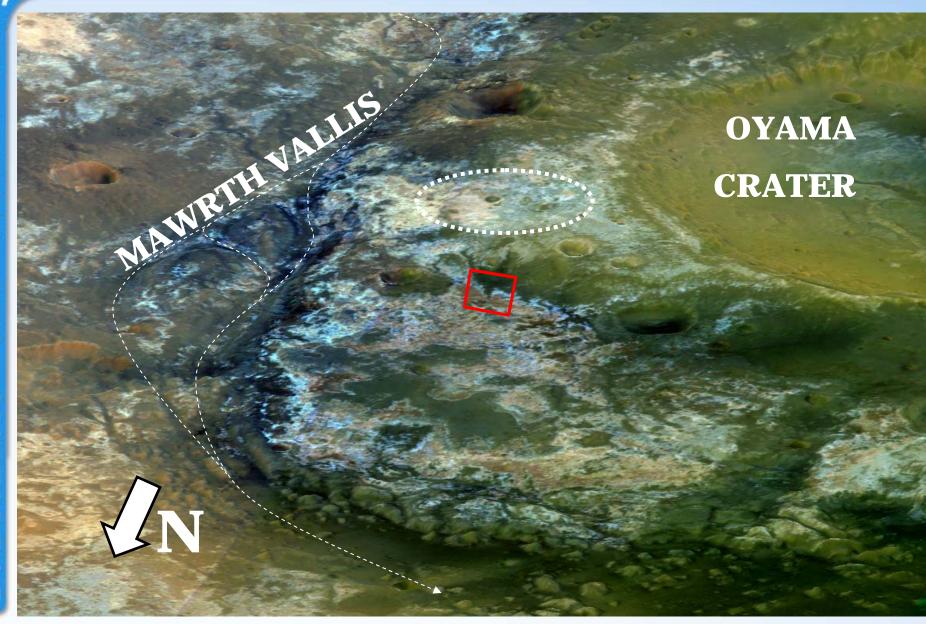




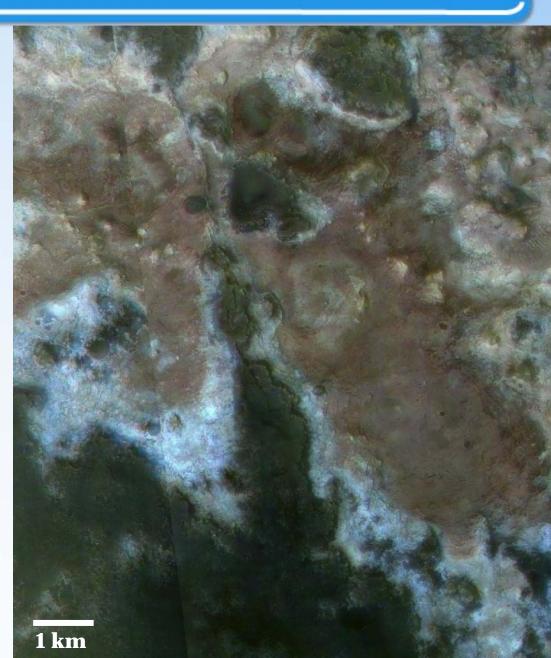
- Extended unit with similar clay mineralogy



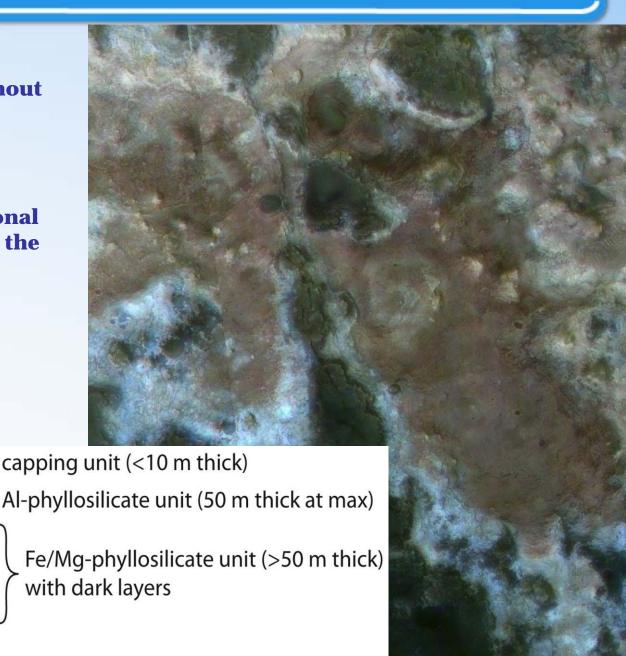
after Noe Dobrea et al. (2010)



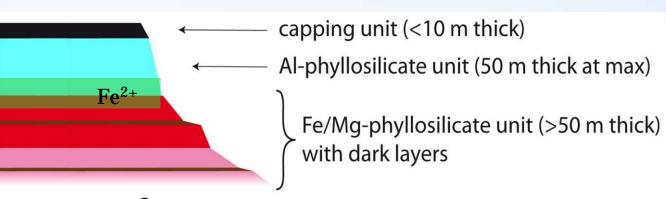
- Ancient valleys through the region, inverted by strong erosion



- Ancient valleys throughout the region, inverted by strong erosion
- Similar clay compositional stratigraphy throughout the region



- Ancient valleys throughout the region, inverted by strong erosion
- Similar clay compositional stratigraphy throughout the region
- Clays associated to a layered, thick unit (> 200 m)

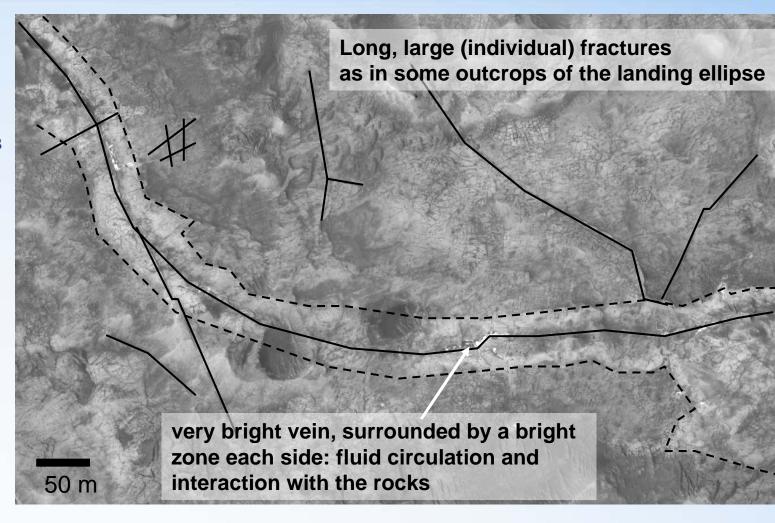




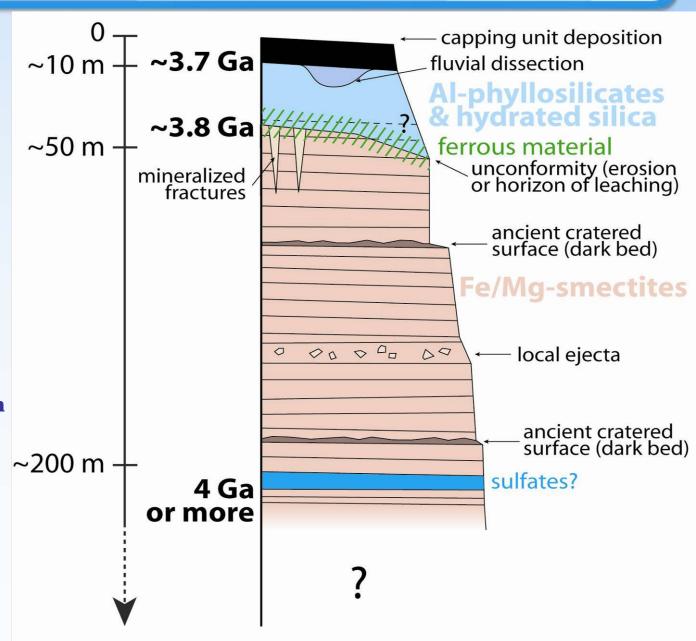


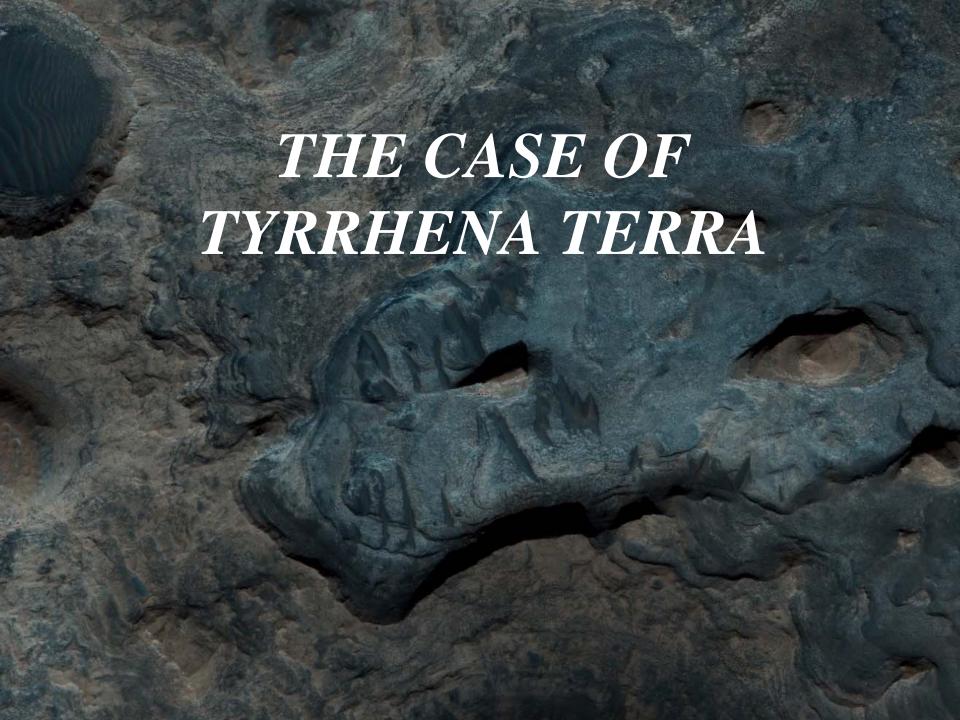


- Fluid circulation in the layered clay unit after its deposition

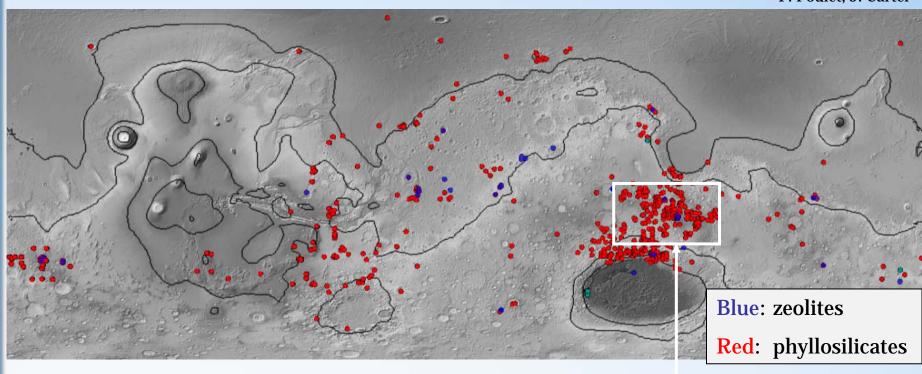


- complex waterrock interaction history, at different times, at different scales, over long periods: access to different environments
- alteration at low temperature & pressure, no deep burial
- recent exposures due to wind erosion

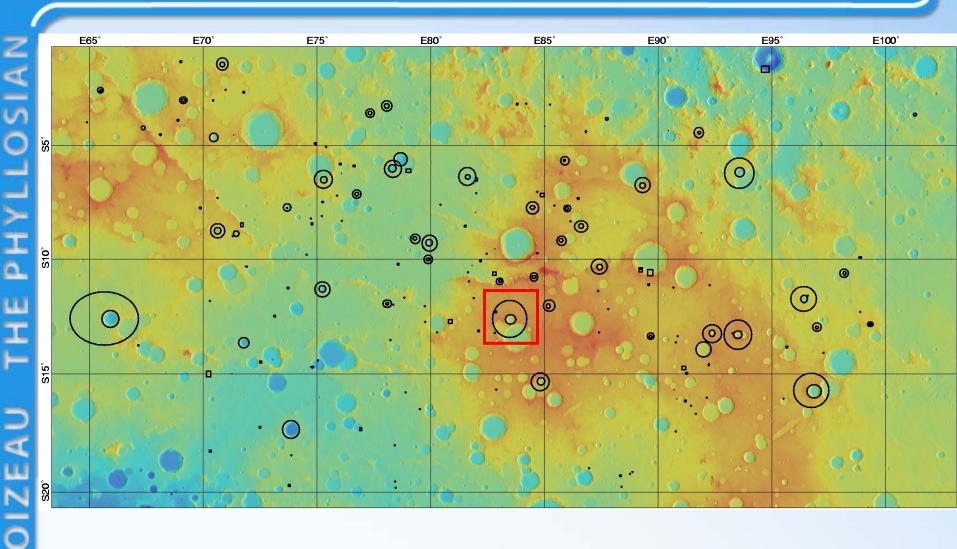


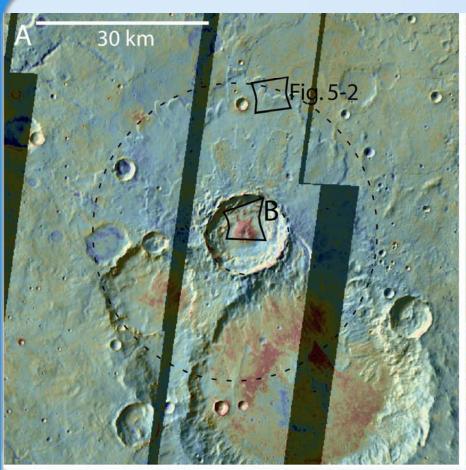


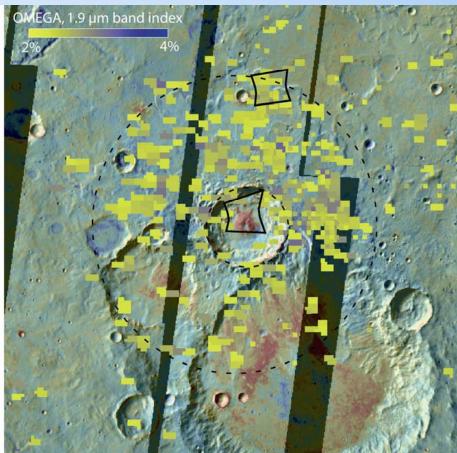
F. Poulet, J. Carter

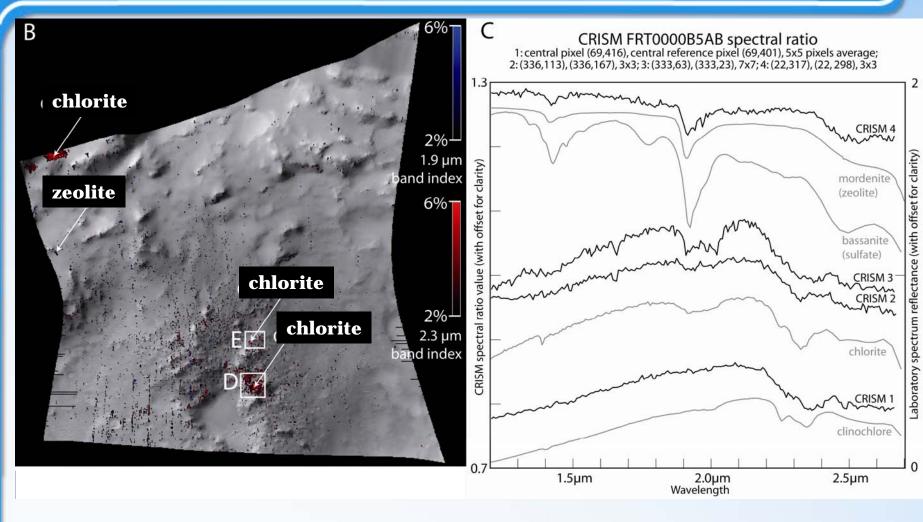


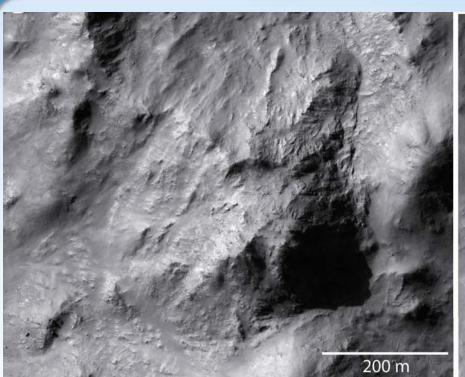
Tyrrhena Terra

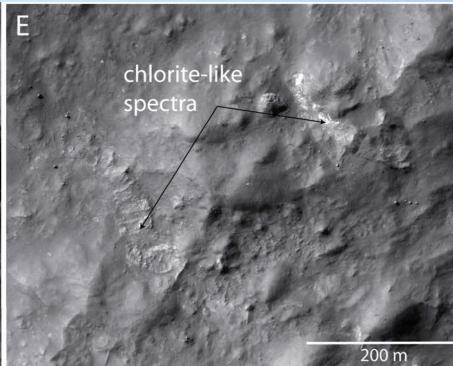


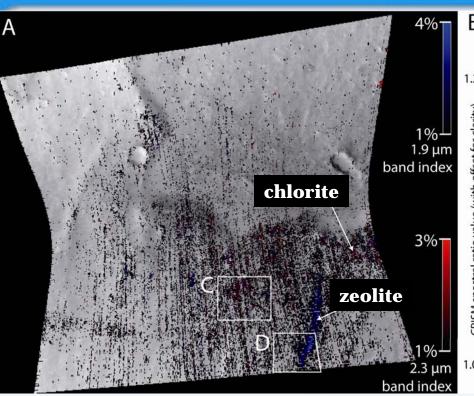


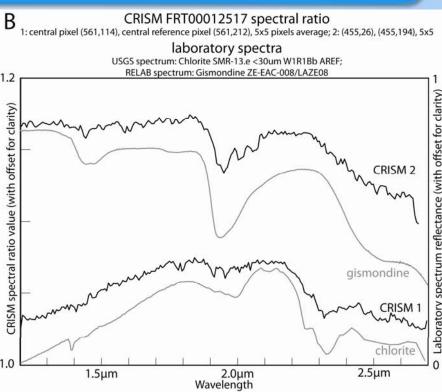


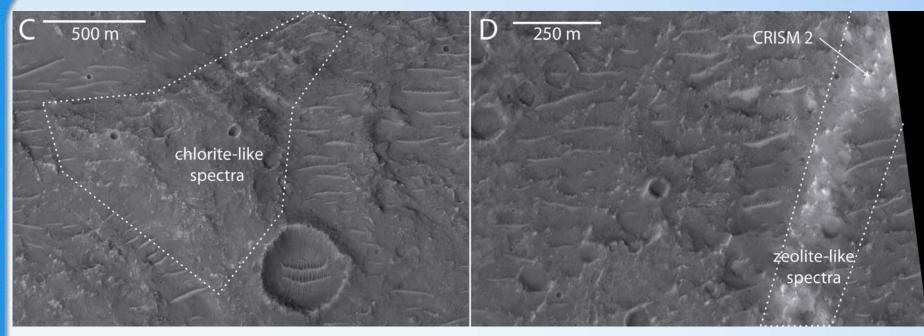


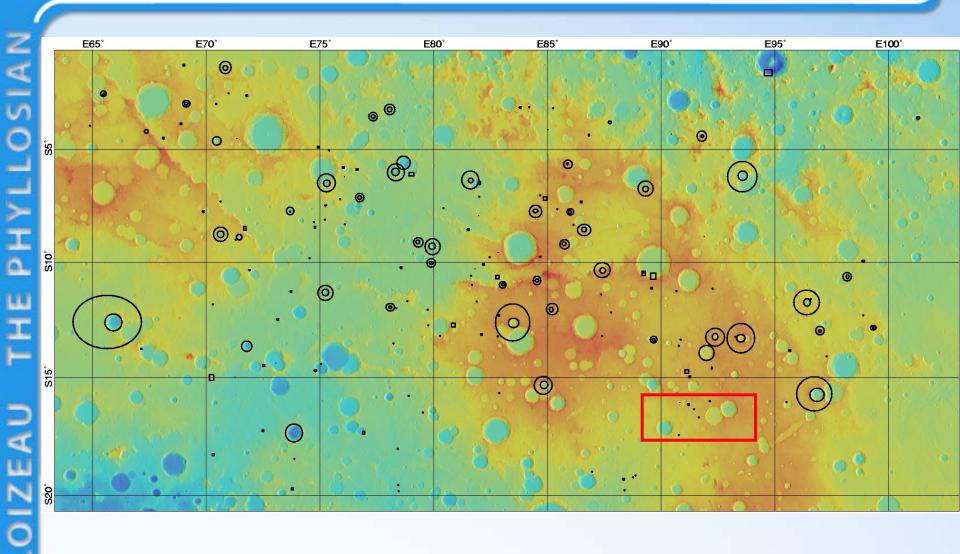


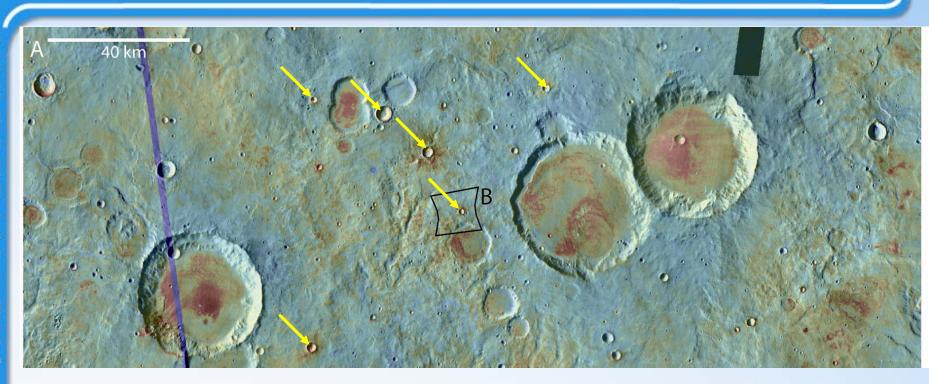


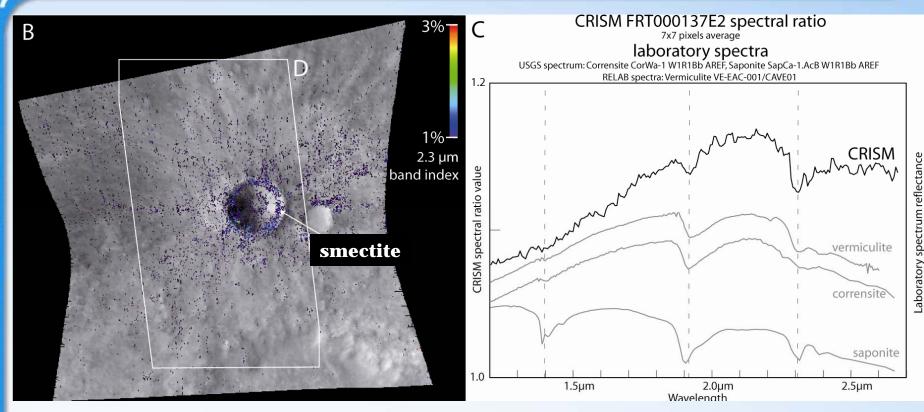


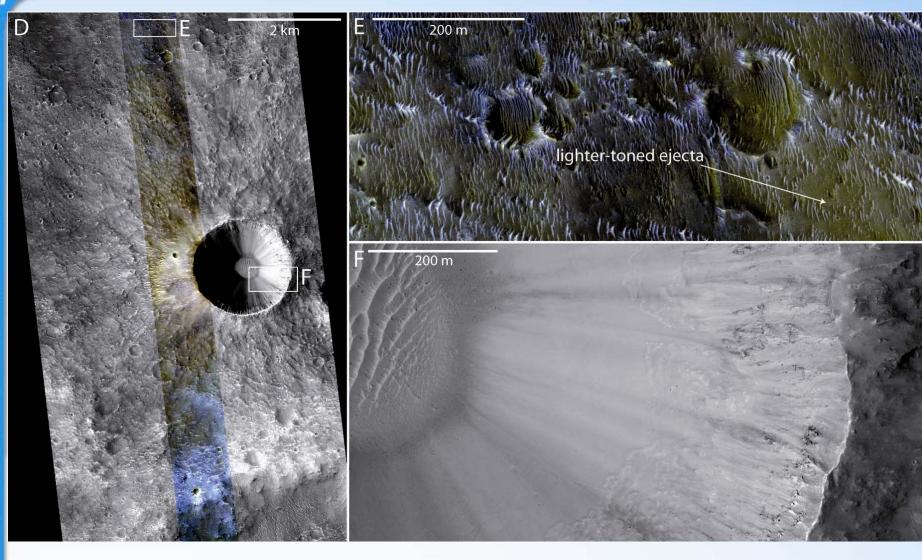






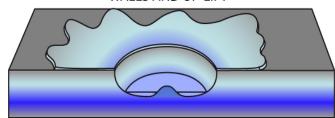






PRE-IMPACT SURFACE AND CRUST

POST-IMPACT HYDRATED EJECTA, WALLS AND UP-LIFT



Excavation of a buried phyllosilicate-bearing unit

- hydrated silicates
- altered crust, in depth (down to 1 km at least)
- high temperature minerals indicate alteration due to hydrothermal system(s) or low-grade metamorphism
- buried hydrates silicates exhumed by « recent » impacts

TYRRHENA vs. MAWRTH

	MAWRTH VALLIS	TYRRHENA TERRA
alteration	strong, surface alteration	weaker, surface to depth alteration
stratigraphy	thin layers	massive crust
thickness	hundreds of meters	hundreds of meters, km
extension	at least 300 km x 400 km	at least 1000 km x 2000 km
altitude	-1 km to -4 km	4 km to 0 km
exhumation	wind erosion	impacts
mixing	limited mixing (some redeposition and few impacts) => protection? outcrop nature?	significant mixing by successive impacts
typical altered crust?	concentration of altered rocks, ancient bassin?	typical altered highlands

