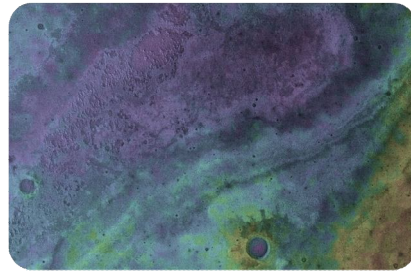# Survey of Martian sites of astrobiological interest for lander and sample-return missions

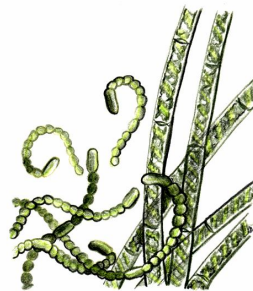E. P. Monaghan, D.E. Wills and B. H. Foing

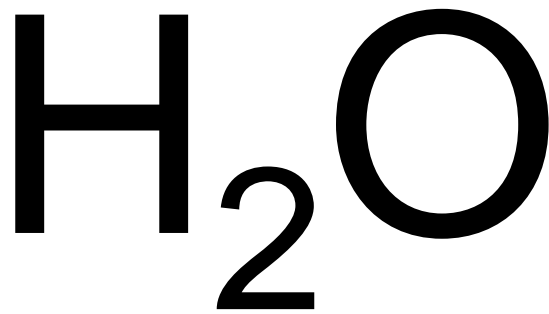esa   *Cranfield* UNIVERSITY   University of BRISTOL

Astrobiology?

- The search for life, past or present, elsewhere in the universe
- A very multidisciplinary field including aspects of biology, geology, astronomy, chemistry...

Why Mars?

H_2O

Why Mars?

- Water is necessary for life as we know it
- We know (for sure) that Mars has water
- Mars lost its surface volatiles around 3.8-3.5Gyr ago
- The search for prokaryotes/pre-biotic chemistry
- Biosignatures
- Accessing the subsurface

Science objectives

- Morphological evidence of hydrological activity
- Mineralogical evidence of hydrological activity
- Noachian terrain
- Preservation of biosignatures
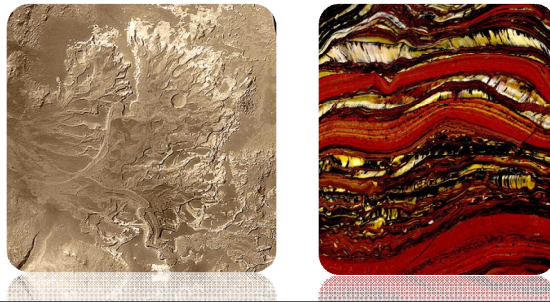
Engineering constraints

- Using ExoMars as a baseline
- The "big three" constraints:
  - Latitude: -5 to 45°
  - Altitude: ≤0 km relative to the MOLA geoid
  - Dust cover: thermal inertia > 100 tiu, albedo < 0.25
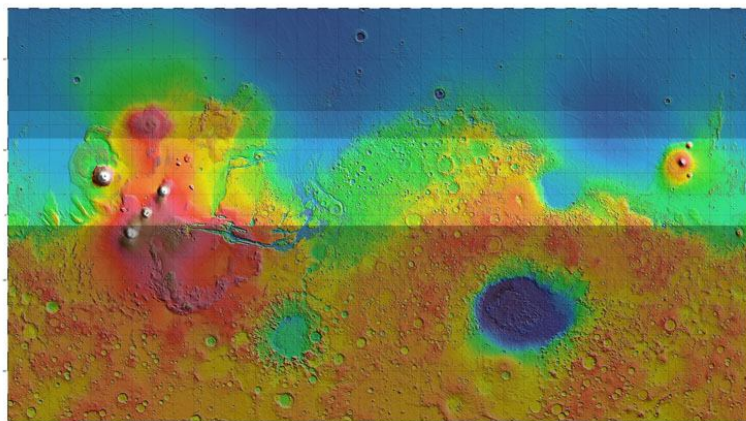 - But also: wind, radar altimeter reflectivity, slopes, rock distribution and size, landing ellipse radius, and so on...
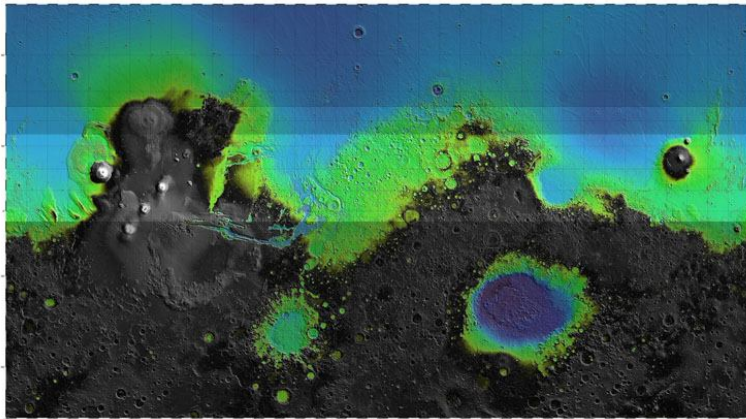
So, Mars...

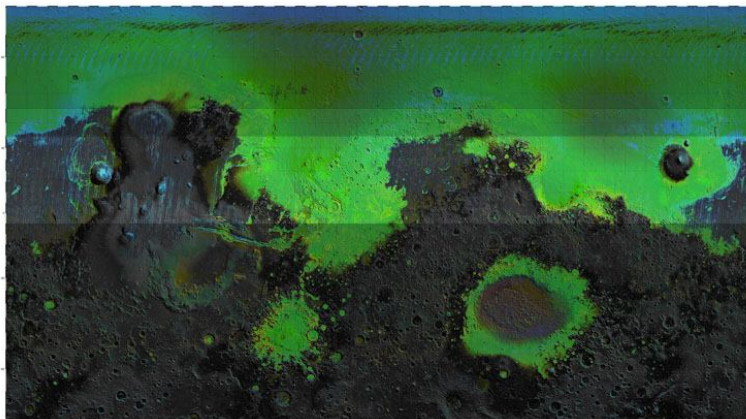THE TOPOGRAPHY OF MARS BY THE MARS ORBITER LASER ALTIMETER (MOLA)
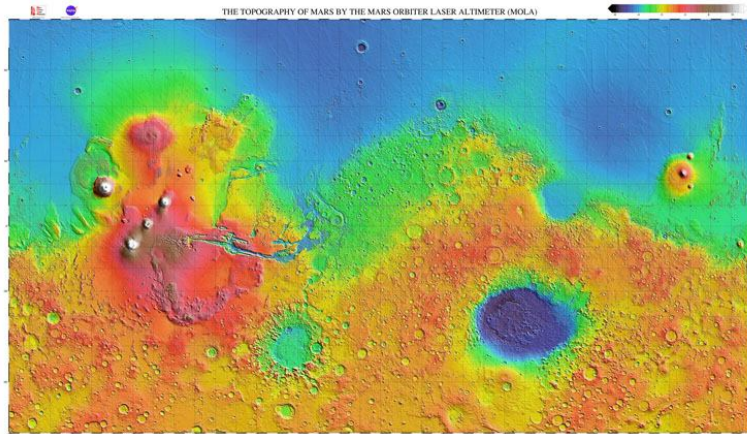
...with latitude constraints overlaid...

...and altitude constraints...
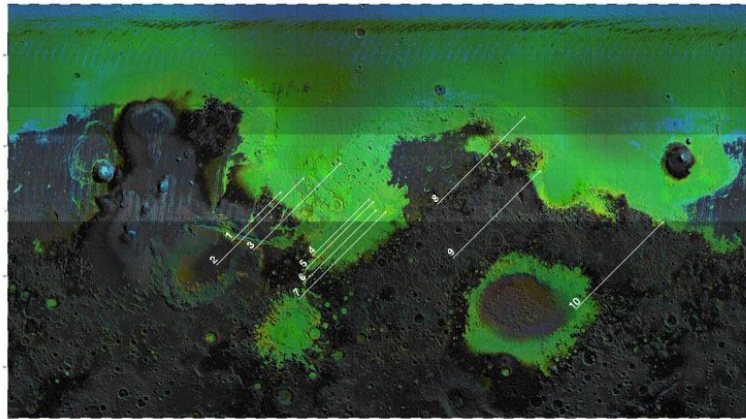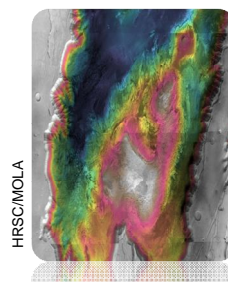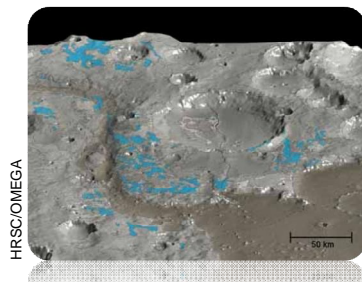
...and thermal inertia constraints.
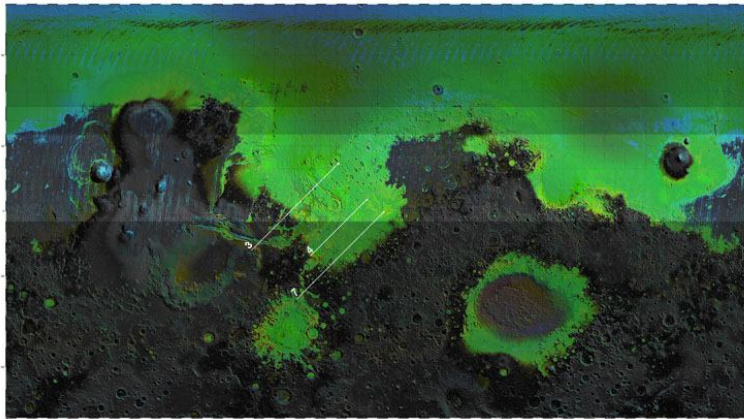
The short-list

Further characterisation

Using HRSC as a bridge to other datasets, e.g.:
- Mineralogy from OMEGA
- Higher-resolution data from HiRISE
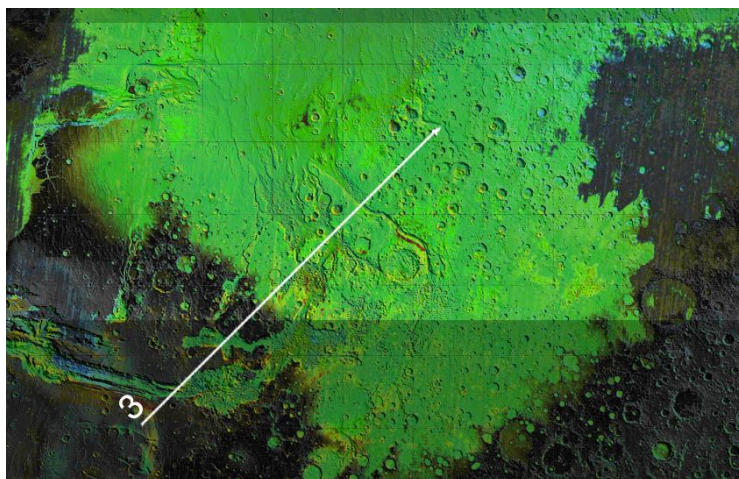- Lower-resolution data from MOLA

HRSC/OMEGA

HRSC/MOLA
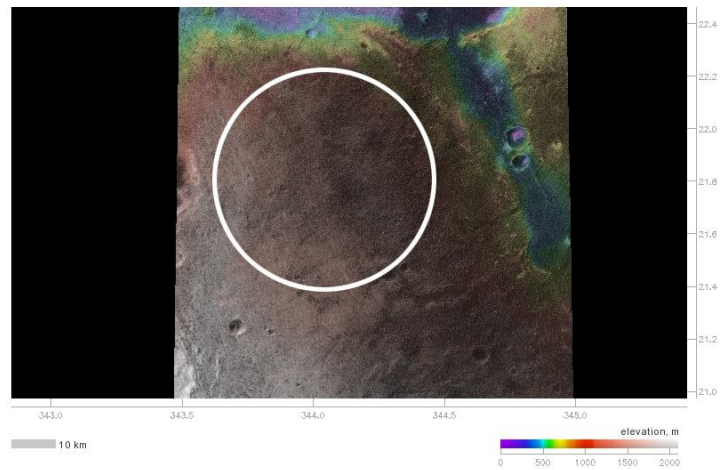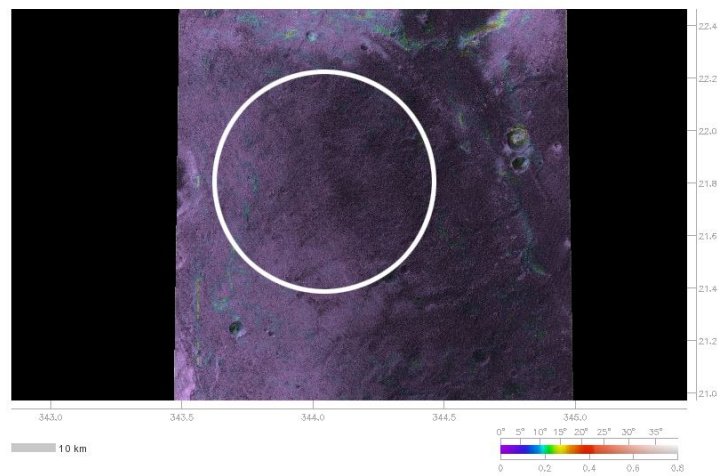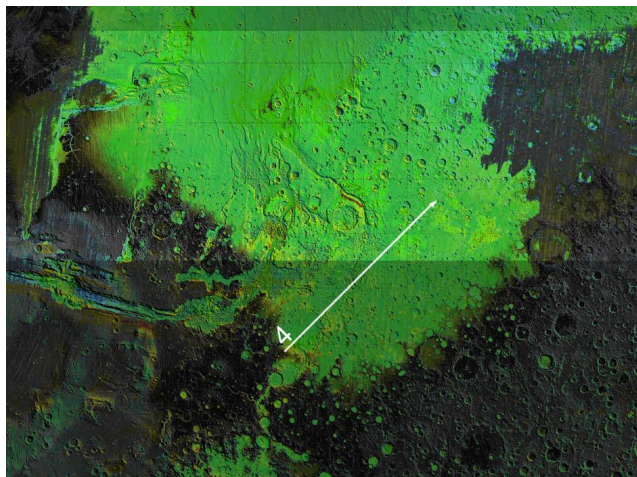
Priority sites

Mawrth Vallis

Mawrth Vallis

Mawrth Vallis
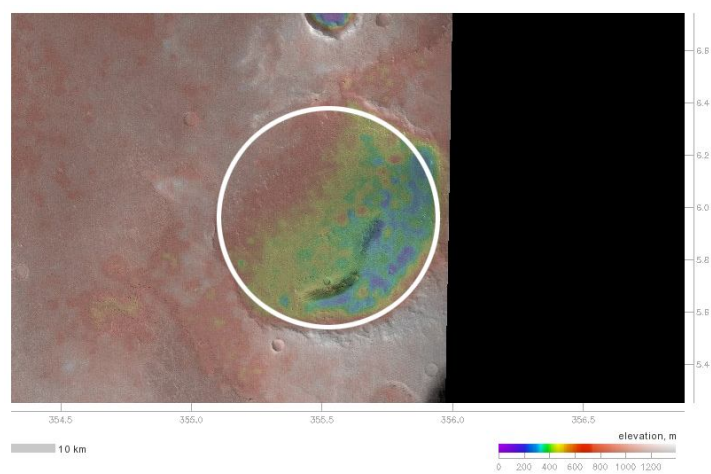
Vernal Crater

Vernal Crater
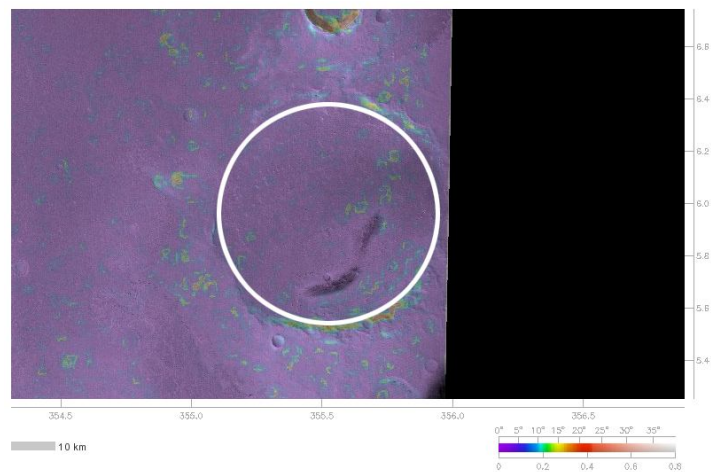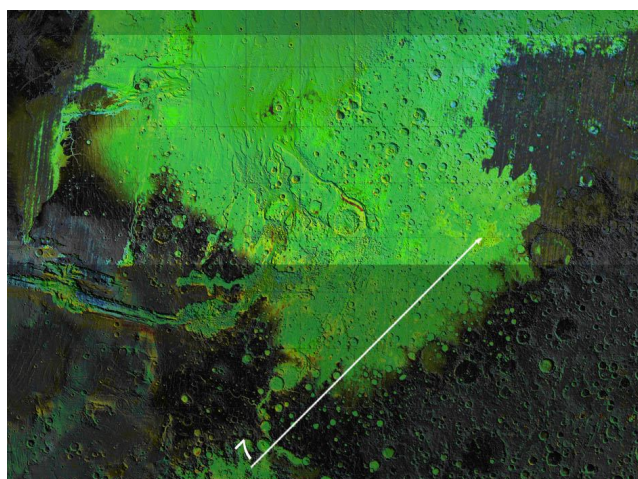
Vernal Crater

Eastern Meridiani
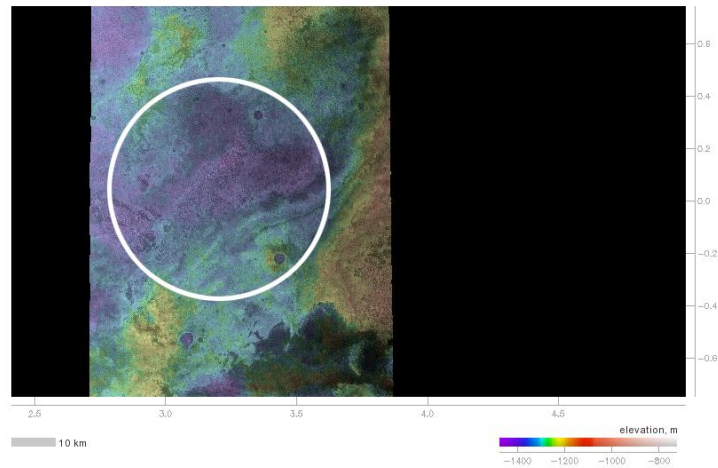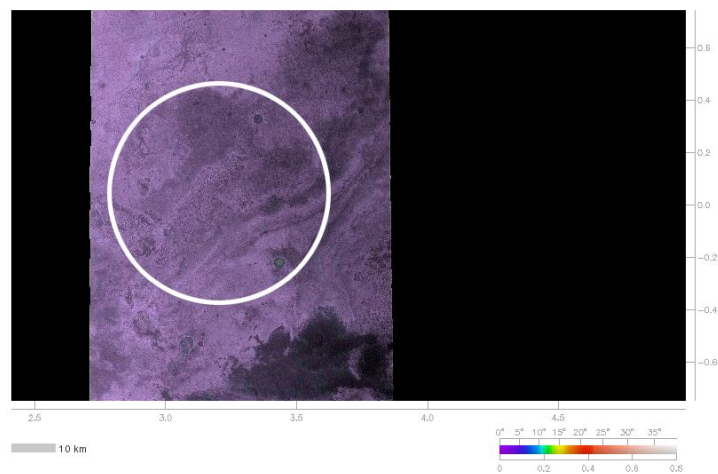
Eastern Meridiani

Eastern Meridiani
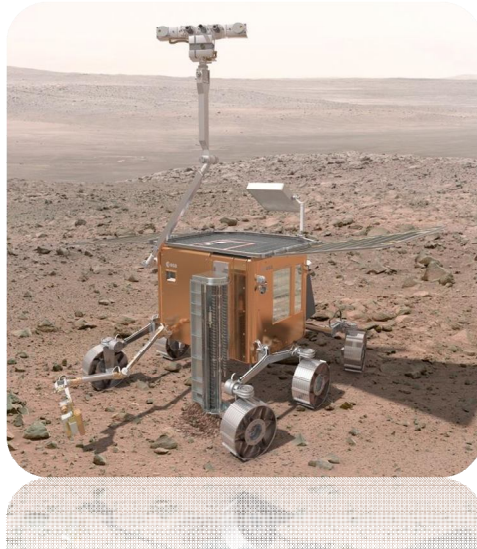
On to Mars?

euan.monaghan@rssd.esa.int | danielle.wills@esa.int