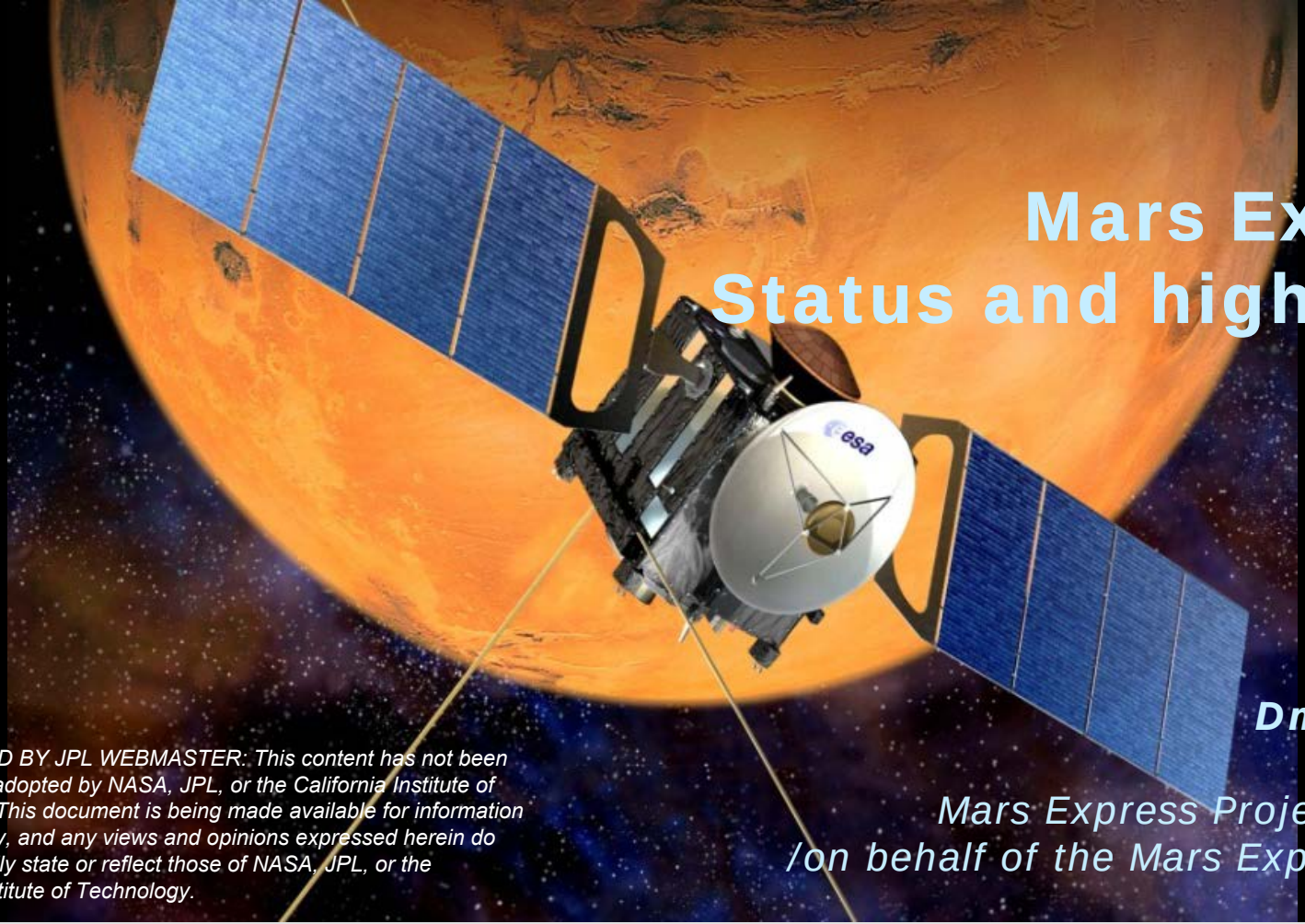


Mars Express
Status and highlights

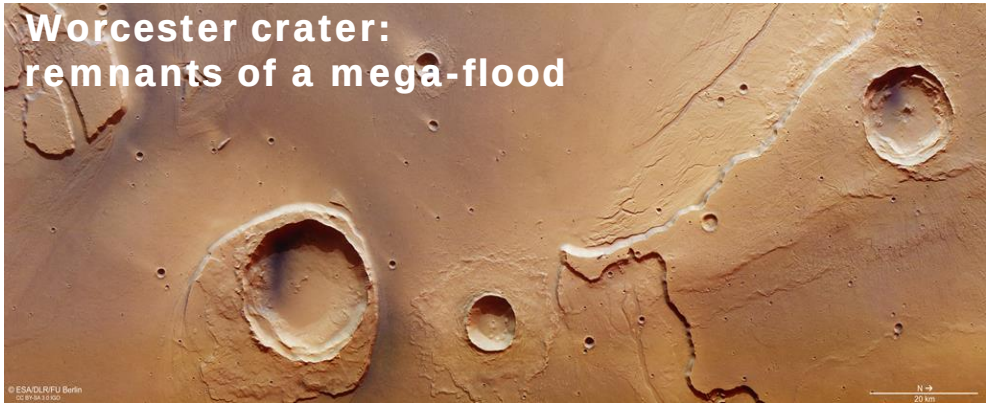
Dmitrij Titov

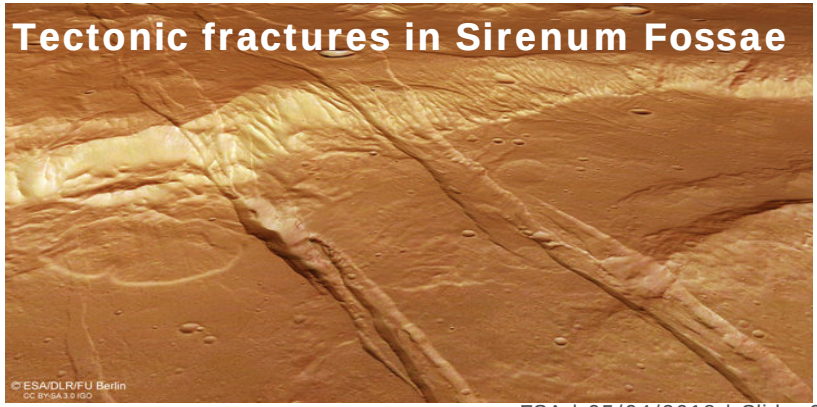
Mars Express Project Scientist
/on behalf of the Mars Express Team/

NOTE ADDED BY JPL WEBMASTER: This content has not been approved or adopted by NASA, JPL, or the California Institute of Technology. This document is being made available for information purposes only, and any views and opinions expressed herein do not necessarily state or reflect those of NASA, JPL, or the California Institute of Technology.

Science “nuggets”

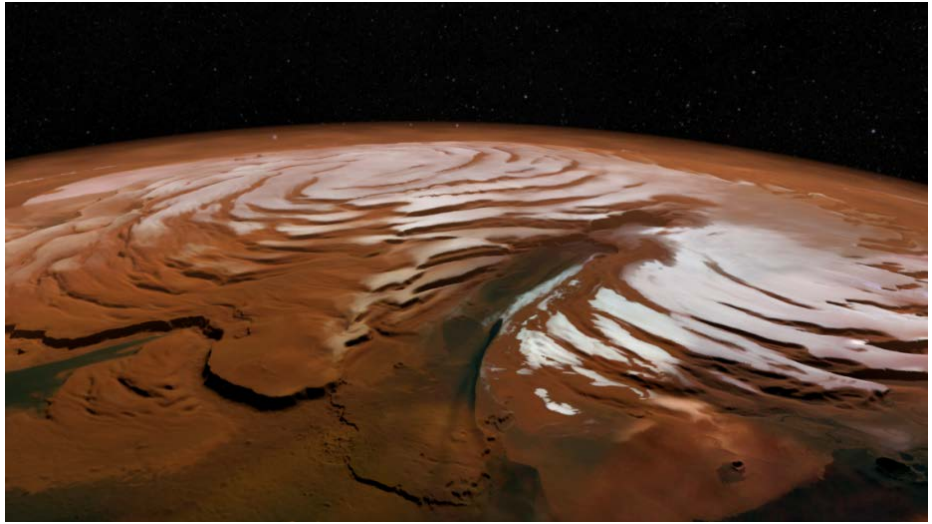
Regional geology and chronology

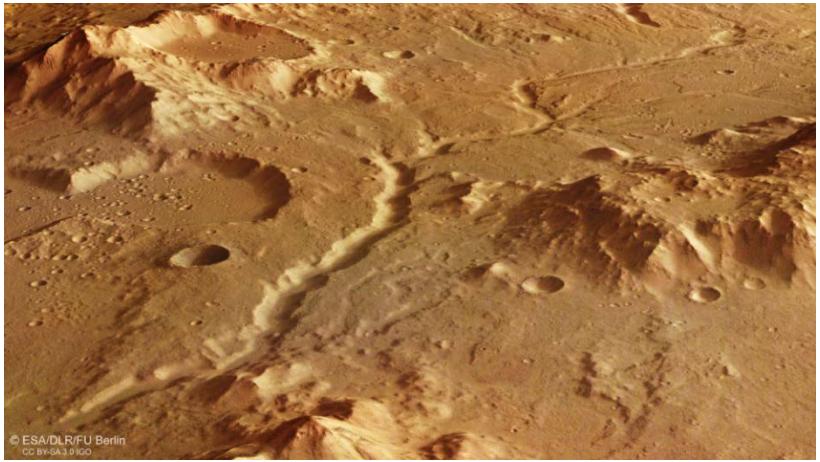


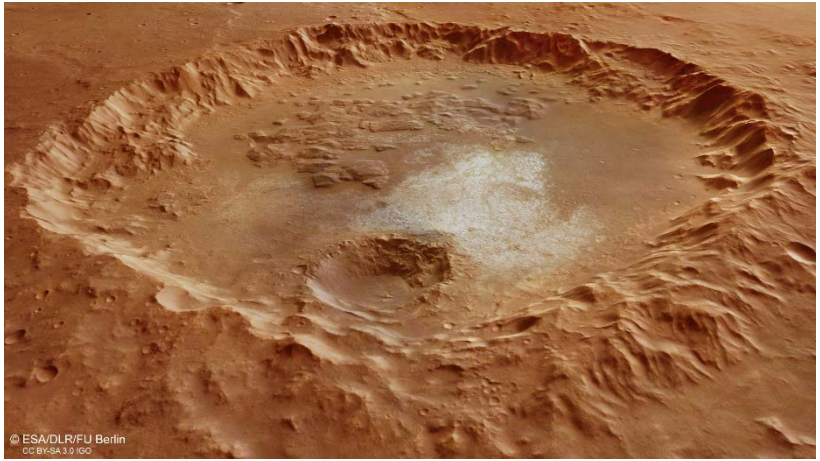


Recent highlights

- Important role of fluvial erosion and middle-low latitude glaciation
- Evolution of sedimentary deposits
- Polar caps morphology



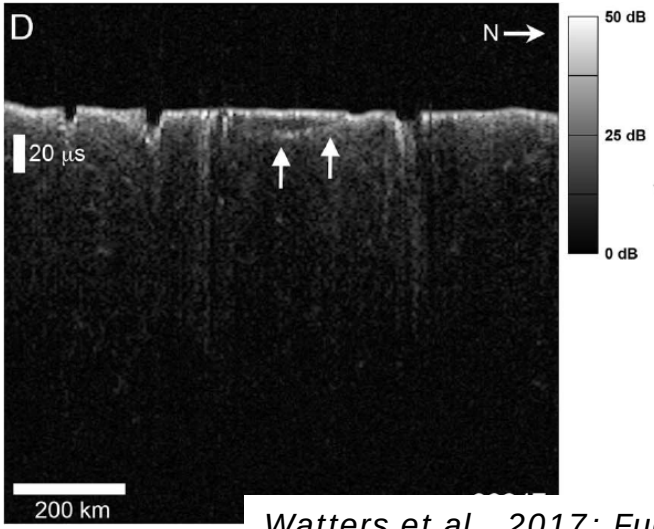


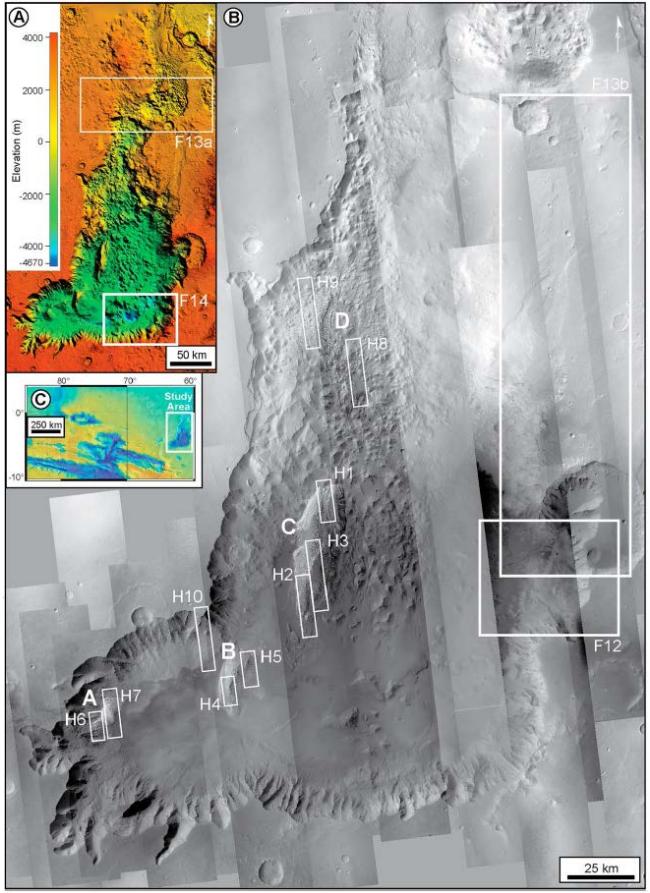


Geology, interior and history

- **Evolution of Juventae Chasma:** sedimentation in paleolacustrine environment followed by progressive collapse
- **Fluvial activity in Jezero crater** (NASA Mars-2020 landing site candidate)
- **Sedimentary deposits in Xanthe Terra and Chryse Planitia**

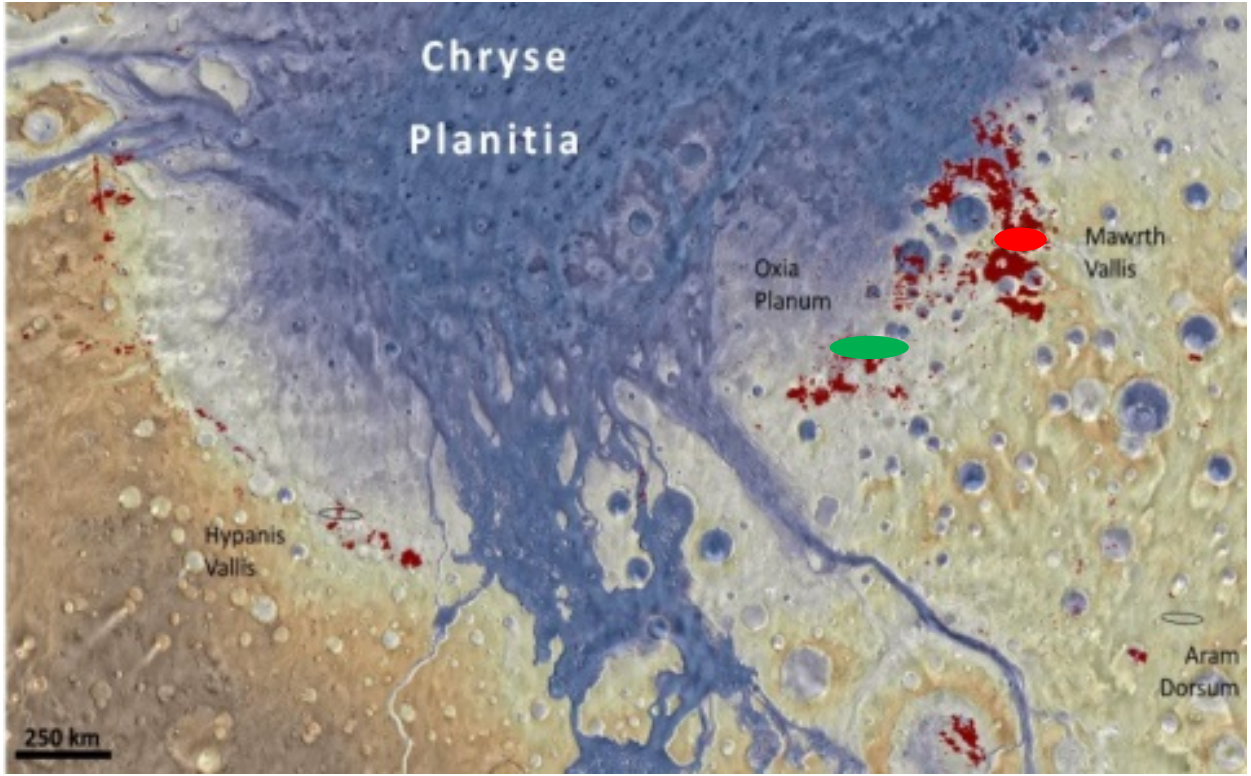
- **Ice-free compact sand deposits in Meridiani Planum**
- Inhomogeneities of dielectric properties of Lucus Planum





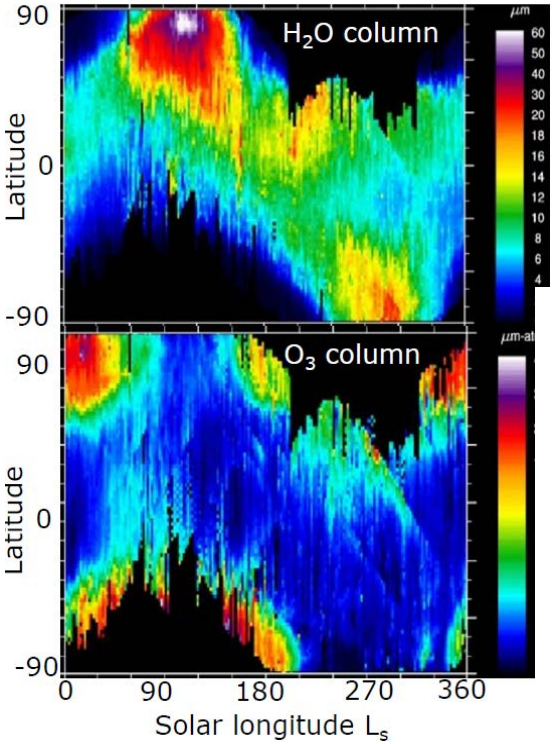
Watters et al., 2017; Fueten et al., 2017; Al-Samir et al., 2017.

Characterization and selection of ExoMars-2020 landing sites

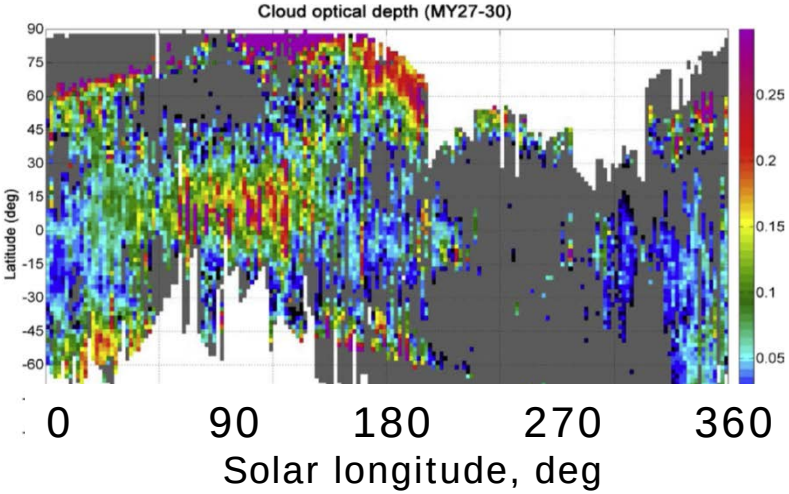


Meteorology and climate

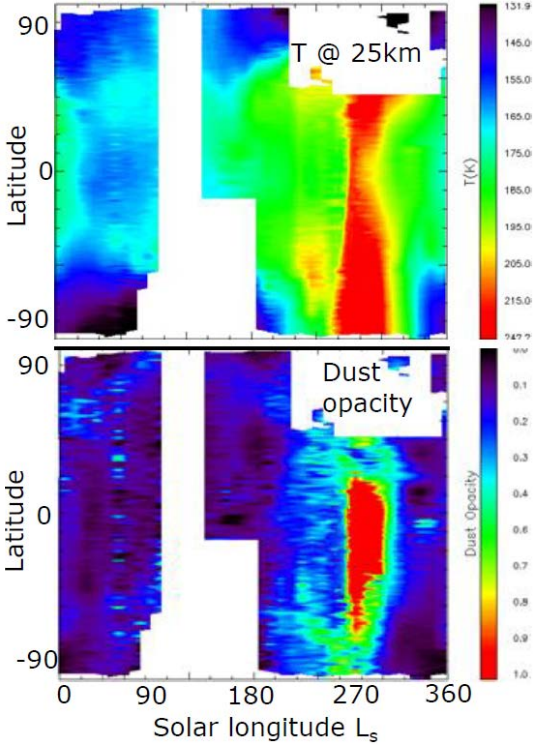
H_2O, O_3 and cloud cycles



- **More than a decade long record of key climatological parameters**
- **Mars Climate Database (MCD 5.3) was released in 2017**
- **Collaboration within MEX team and with MAVEN and TGO**



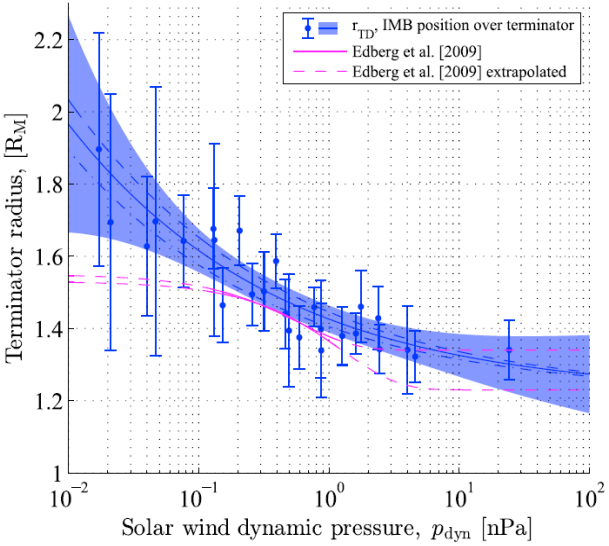
Temperature and dust

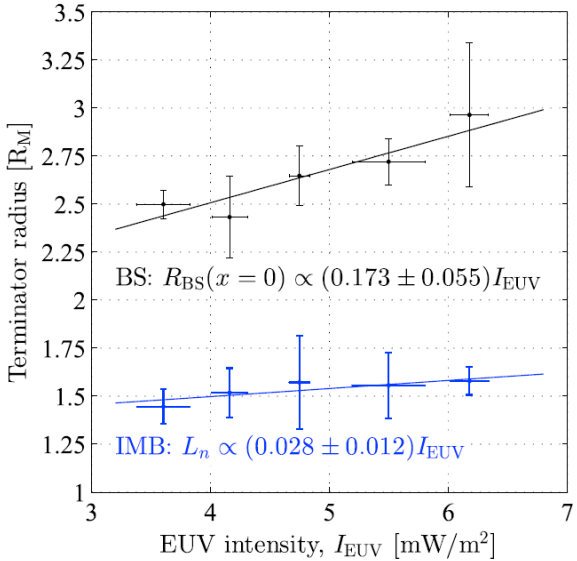


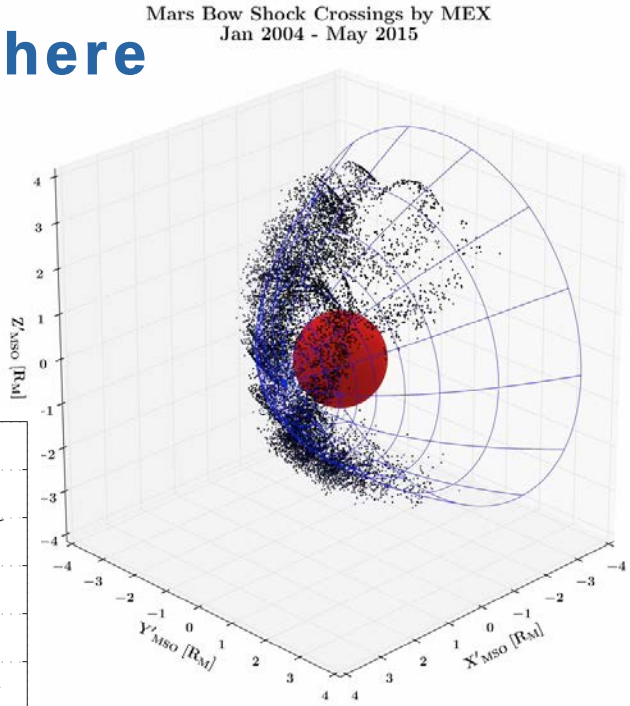
Montmessin et al. 2017; Willame et al., 2017; Wolkenberg et al., 2017; Oliva et al., 2017.

Plasma environment and ionosphere

- Statistical description of plasma boundaries
- Size of the plasmosphere decreases with solar wind pressure and increases with EUV
- Study of vertical and lateral electron distribution and their variations

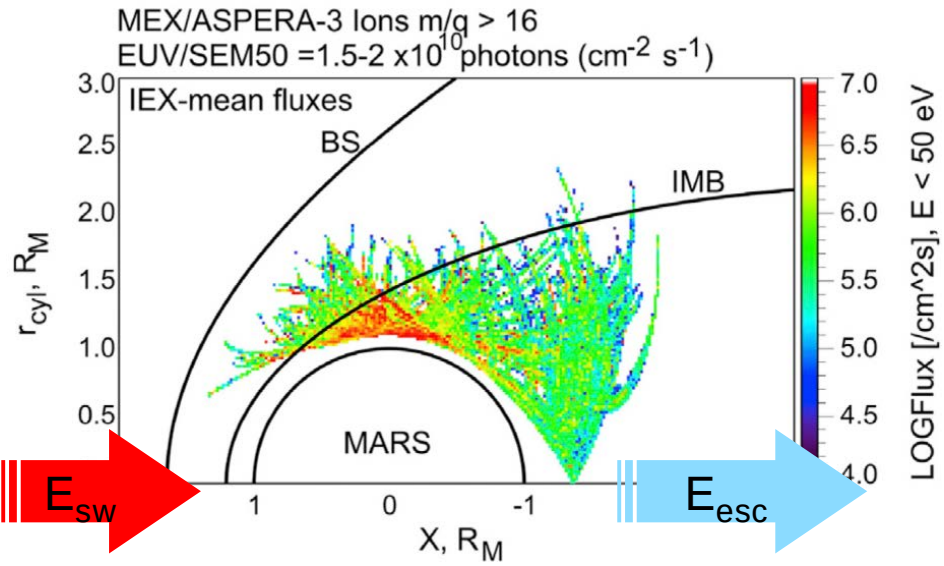


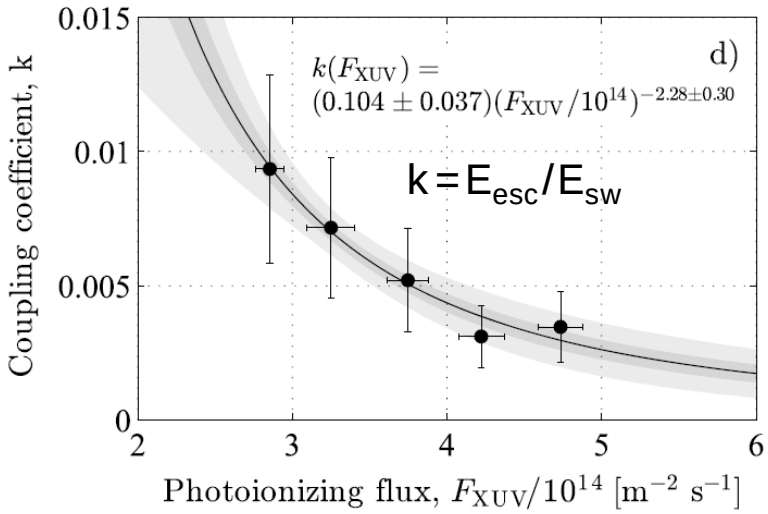




Hall et al., 2016; Ramstad et al., 2017

Atmospheric escape vs solar wind conditions and EUV flux



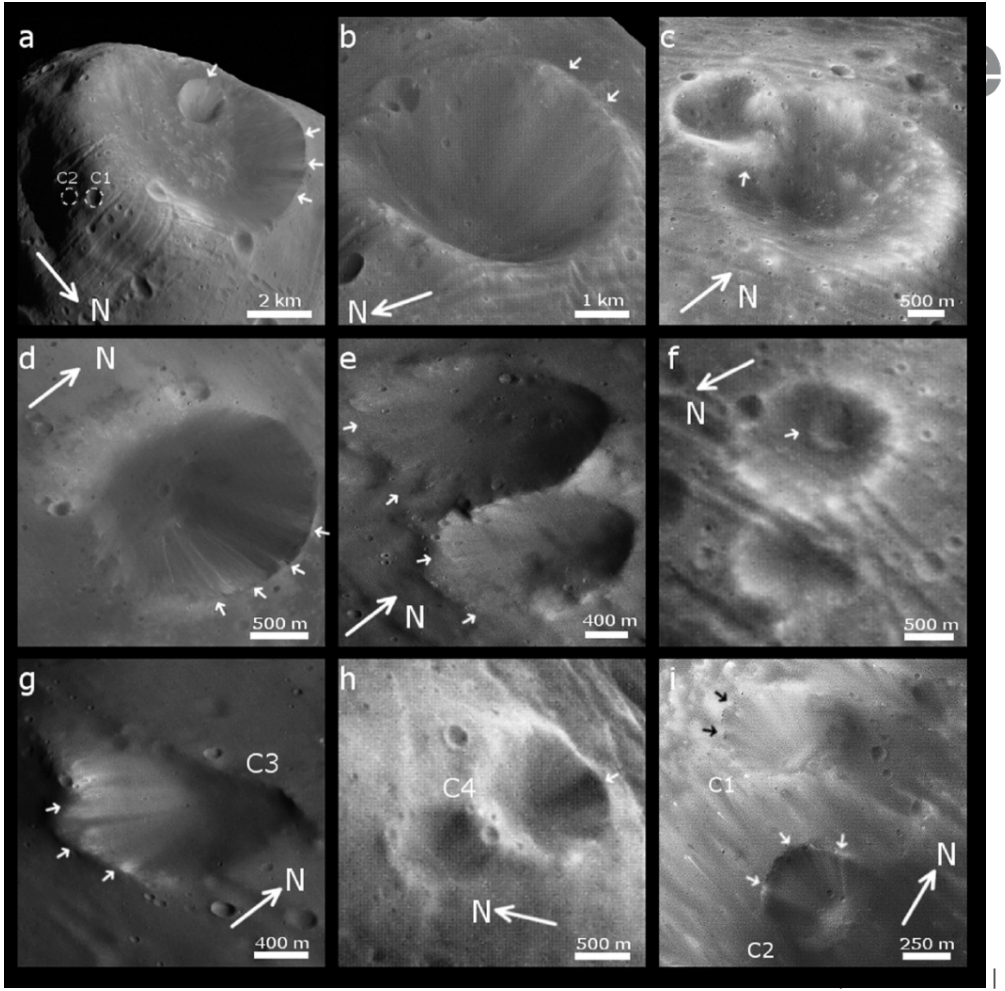


- **Ion escape at Mars is production rather than energy limited**
- **Heavy Venus vs light Mars ?**

Dubinin et al., 2017; Ramstad et al., 2017

Phobos studies

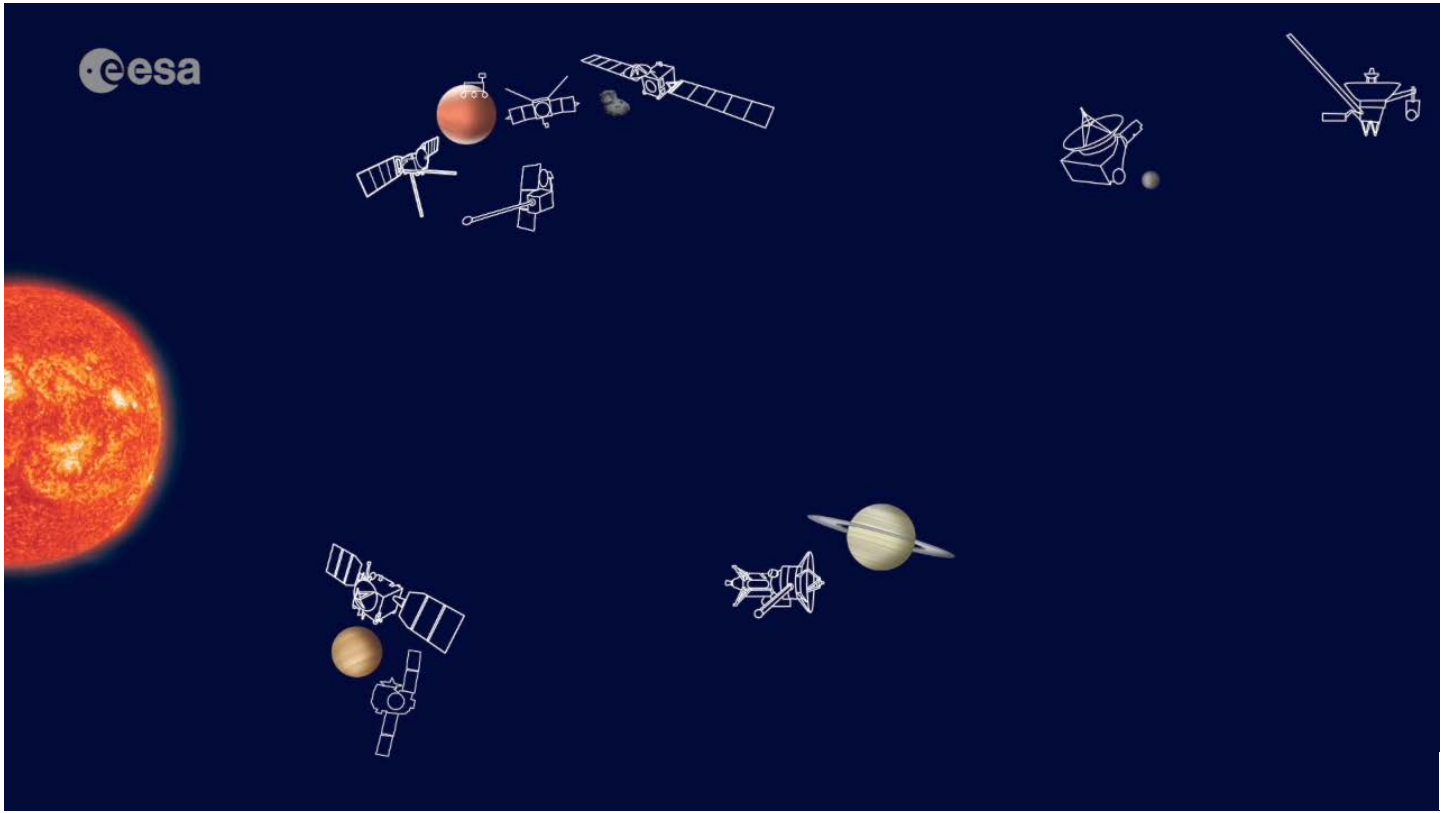
- mass wasting features in craters on Phobos
- locations of the observed landslides correlate with slope increase by tidal effects



Shi et al., 2017

Interplanetary media

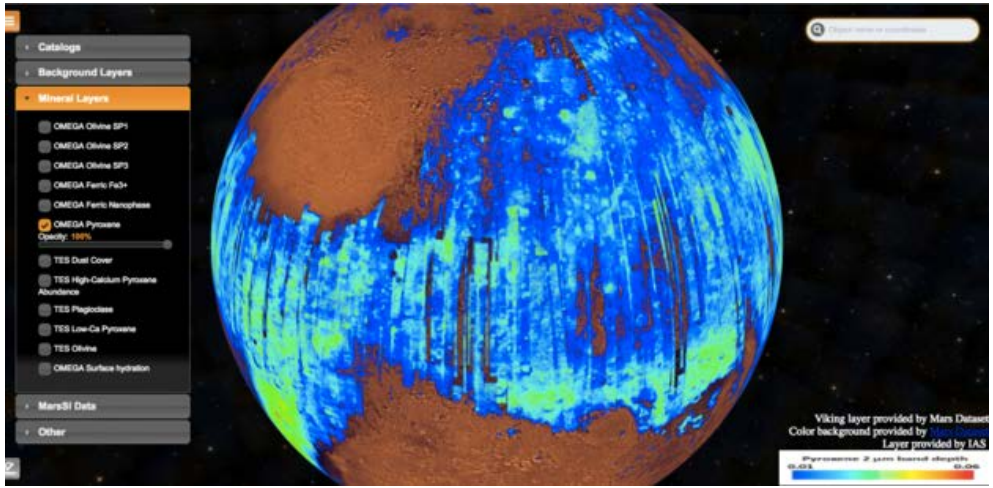
- **Propagation of Coronal Mass Ejection (CME) through the Solar System**



Witasse et al., 2017

New tools for exploring the surface of Mars

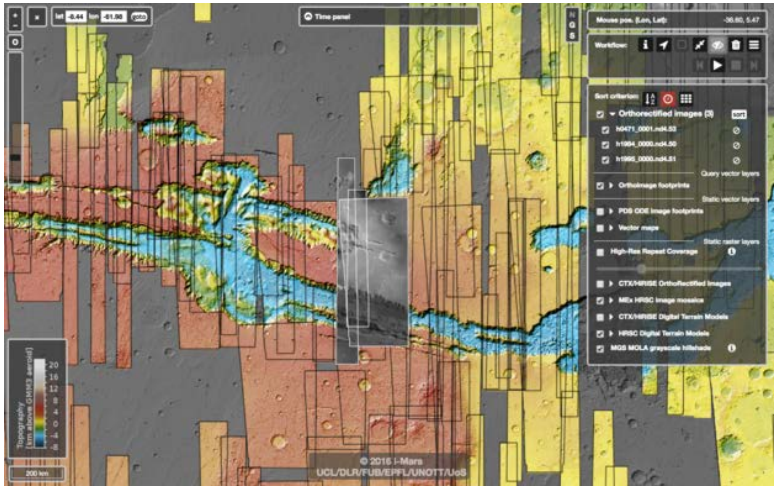
Planetary Surface Portal (PSUP)
(Observatories of Paris-Sud & Lyon)



- **Visualisation of the surface properties**

Poulet et al., 2017

iMars Surface
(UCL/FUB/EPFL/UNOTT/UoS)



- **Web-based geographic information system**
- **Identifying surface changes**

Mars Express status

Mars Express status

- **Spacecraft, operations and archiving are nominal**
  - *15 years of MEX operations in orbit*
  - *2018: implementation of “gyroless” AOCS mode*
- **Mission extension**
  - *extension till the end of 2020 is approved*
  - *2018: technical evaluation and science case for the mission extension 2021-2022*
- **Archiving of high level science products**
  - *MEX legacy archive (led by IDSs)*
  - *project supported activities*
- **Publications:** 1074 papers and 143 PhD theses

Goals for 2019-2020 extension

Geology, interior and history

- *High-res stereo coverage to 84%*
- *Multi-orbit DEMs (50m/pixel)*
- *High-res subsurface sounding of the polar layered deposits*
- *Detailed investigation of potential landing sites*

Meteorology & climate

- *Impact of dust on the atmospheric state*
- *Couplings between the lower and middle atmosphere*
- *Transient phenomena on the surface and in the atmosphere (cyclones, waves, “plumes”)*

Aeronomy and plasma environment

- *Continue monitoring ionosphere and plasma environment*
- *Aeronomy, ionosphere and escape in the solar minimum #24 vs #23*
- *Coupling between the lower/middle and upper atmosphere*

Phobos

- *Completion of the surface coverage*
- *From global mapping to detailed investigation of selected sites*
- *MEX orbit adjustment*

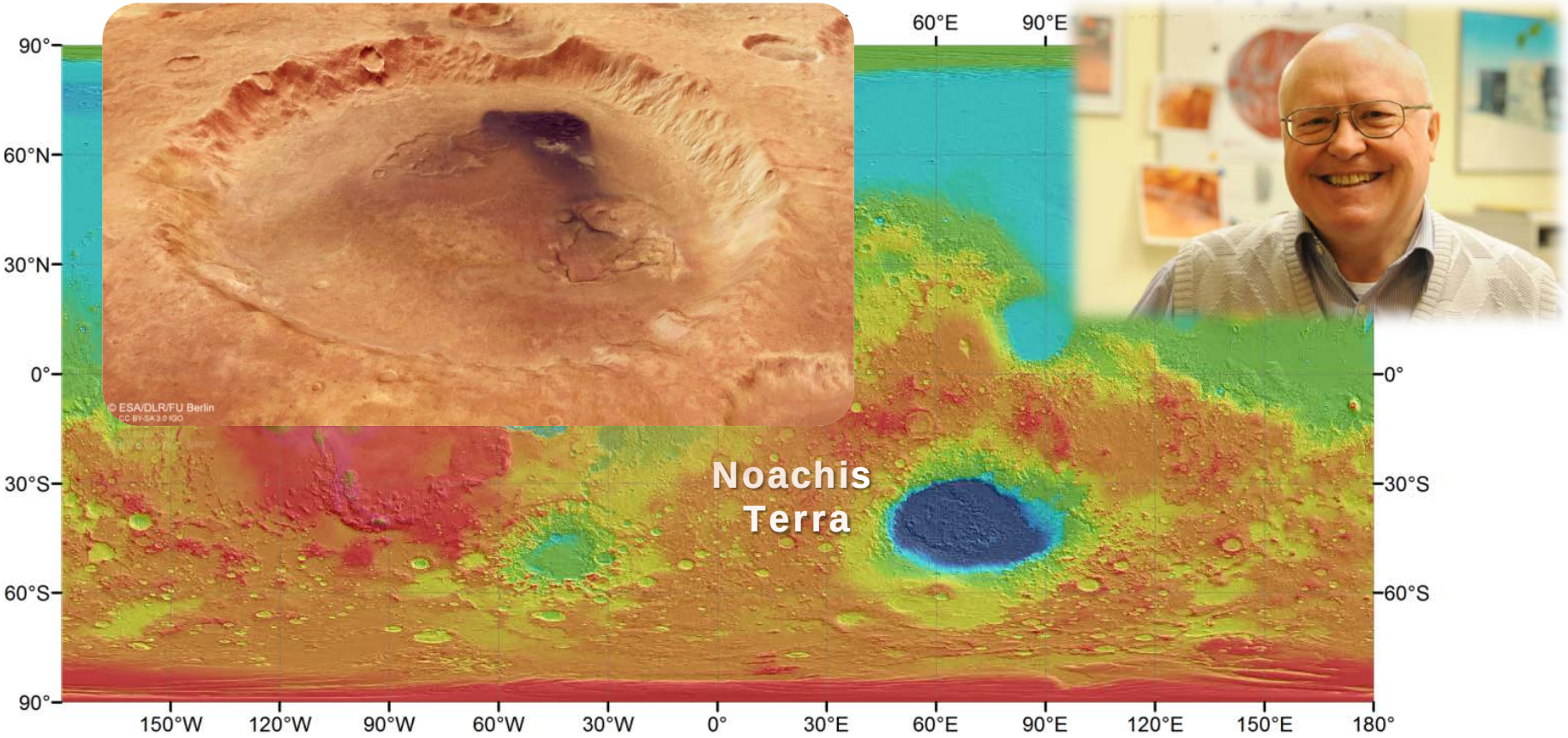
Collaborations

- **Trace Gas Orbiter (ESA-Roscosmos)**
  - *Discussions with the community*
  - *Analysis of the opportunities for joint observations (ESAC)*
  - *Aim – a long term collaboration plan*
- **MAVEN (NASA)**
  - *going well: joint observations and data analysis*
  - *JGR special issue followed Mars Aeronomy conference*
  - *ESLAB 52 Symposium on Comparative aeronomy and plasma environment of terrestrial planets*
- **China**
  - *ASPERA and MARSIS data workshops in China*
  - *support in selection of landing sites for HX-1 mission in 2020*
- **Japan**
  - *support for JAXA MMX mission (WG led by T. Duxbury, MEX IDS)*

Conferences and workshops

- Regular sessions at EGU, EPSC, COSPAR
- Mars atmosphere modelling and observations WS, Granada, 2017
- Mars Aeronomy conference, Boulder, USA, 15-19 May 2017
- From MEX to TGO, ESAC, 27 Feb–1 Mar, 2018
- ESLAB#52 Symposium on Comparative Aeronomy and plasma environment of terrestrial planets, ESTEC, 14-18 May, 2018
- “15 years of MEX” at EPSC Congress (Sept 2018, Berlin)

A crater is named after Prof. Gerhard Neukum



Thank you !