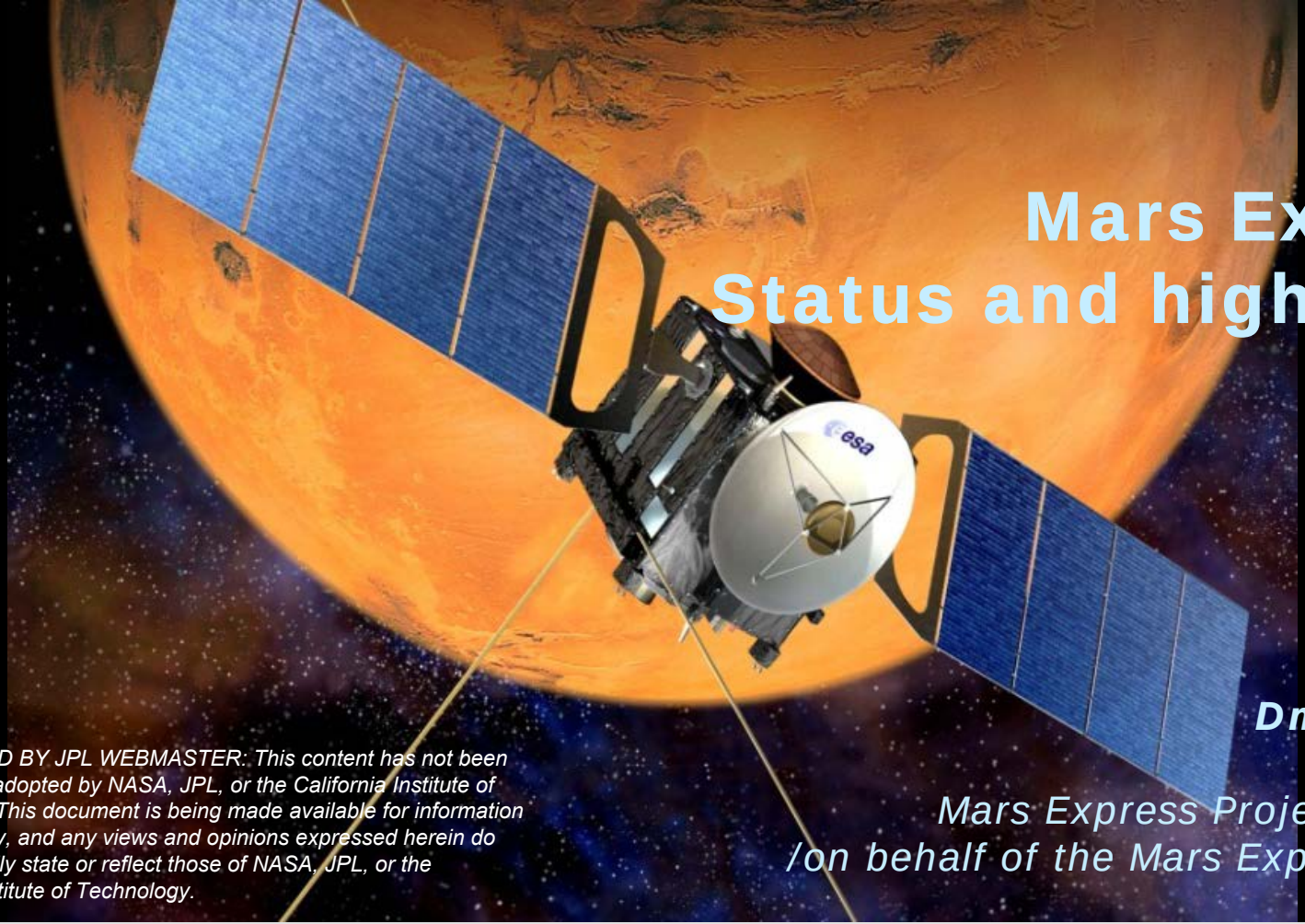


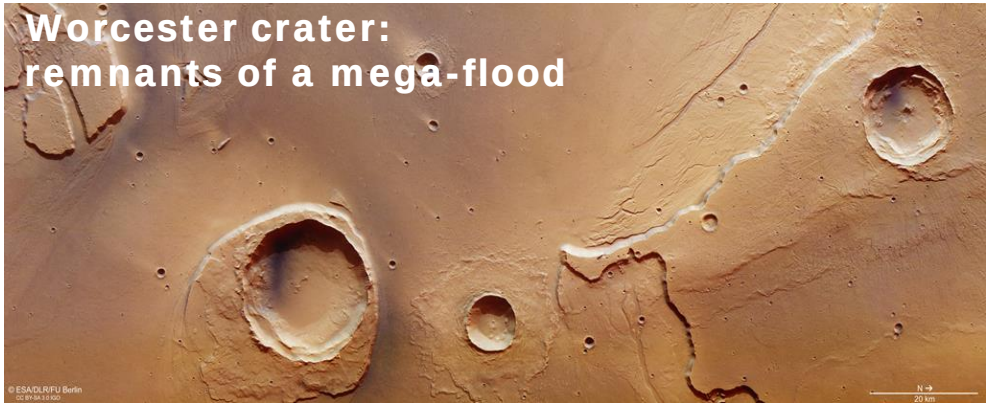
Mars Express
Status and highlights

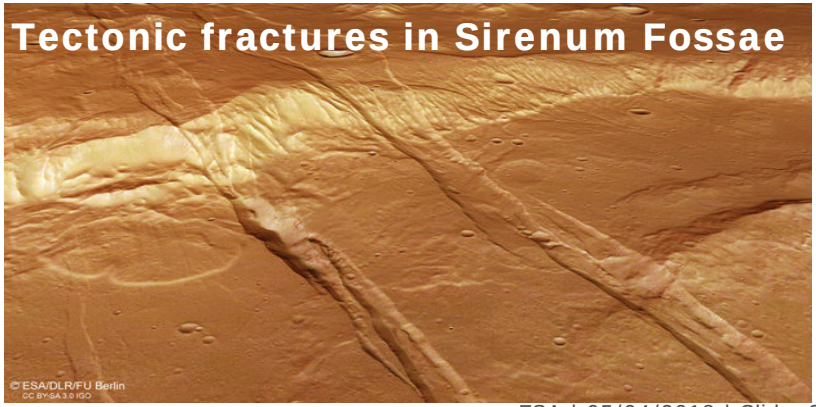
Dmitrij Titov

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

Science “nuggets”

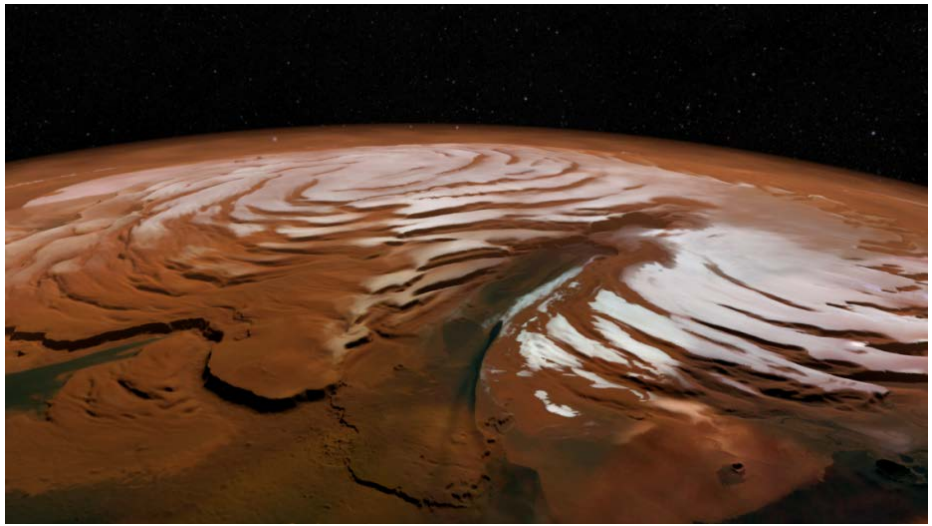
Regional geology and chronology

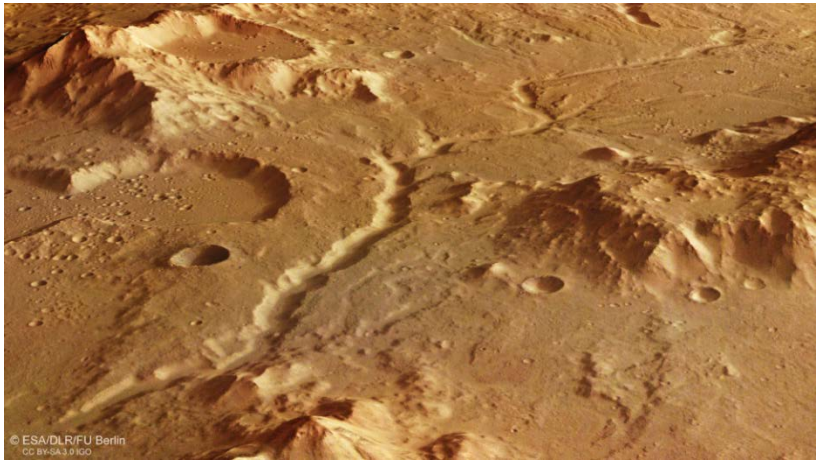


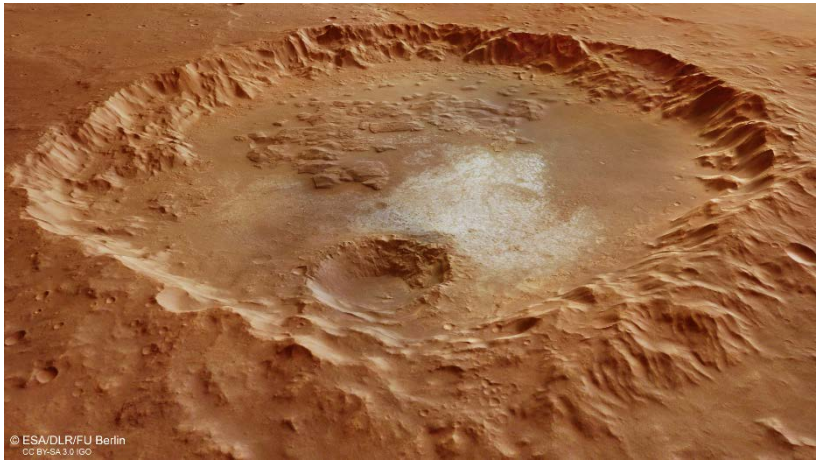


Recent highlights

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



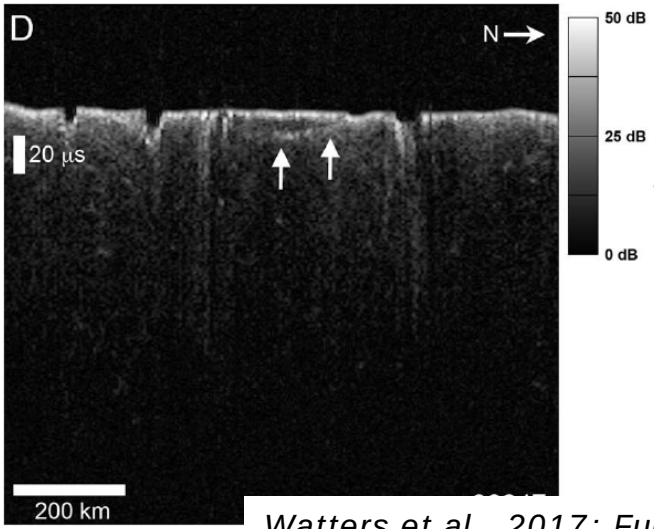


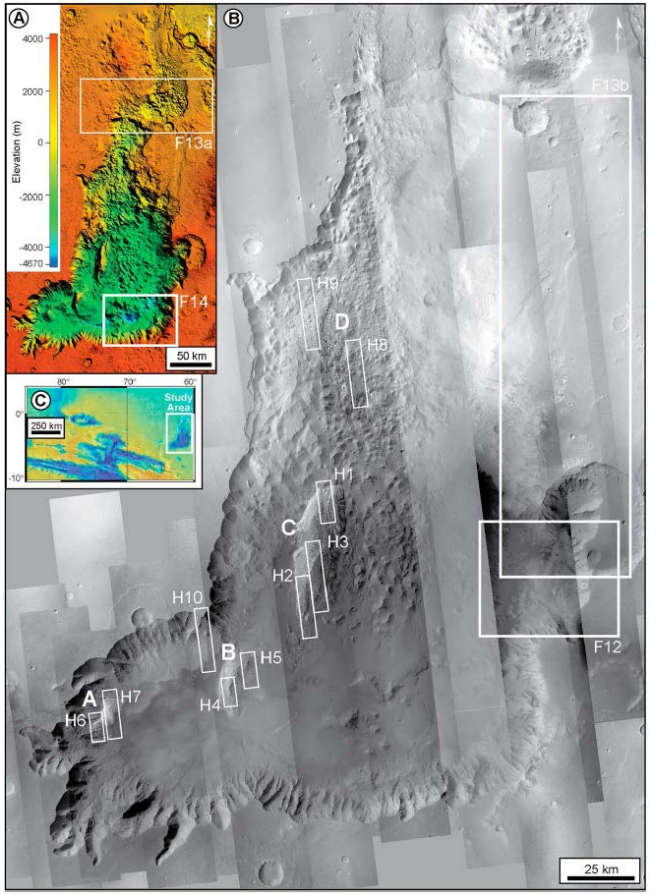


Geology, interior and history

- **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**

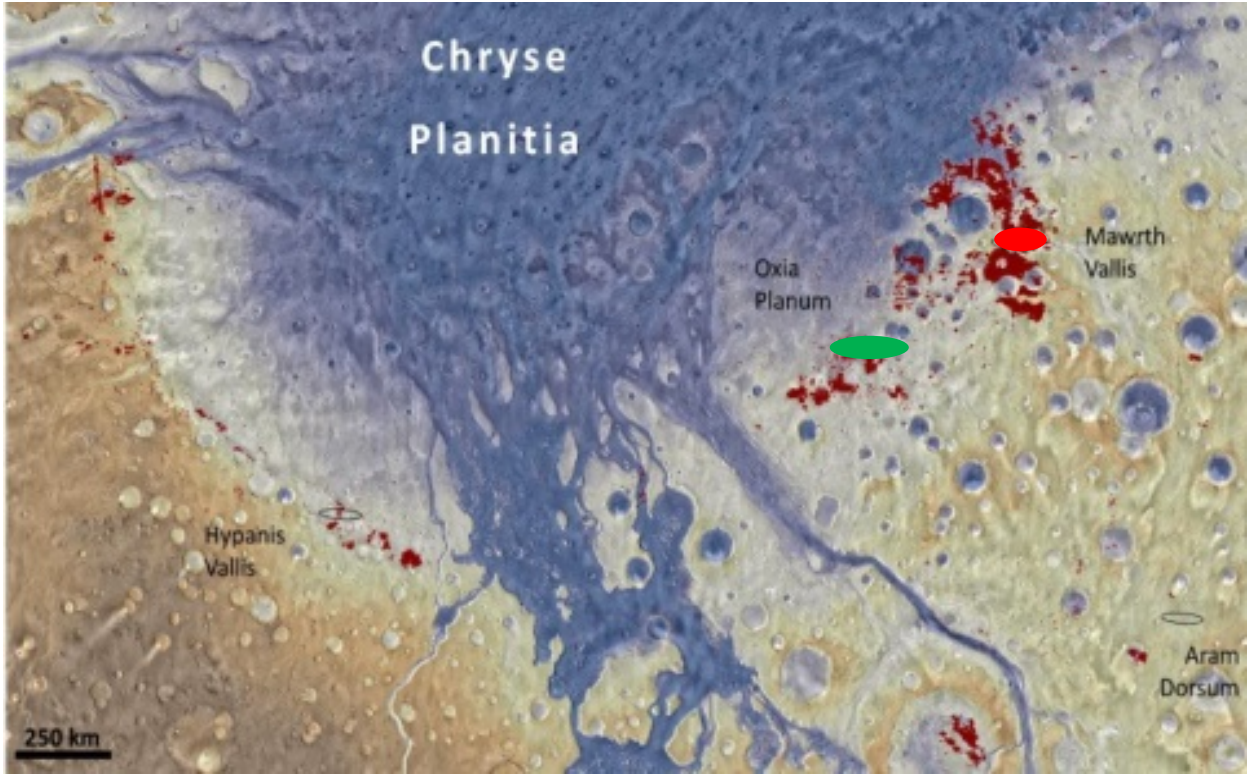
- **Ice-free compact sand deposits in Meridiani Planum**
- Inhomogeneities of dielectric properties of Lucus Planum





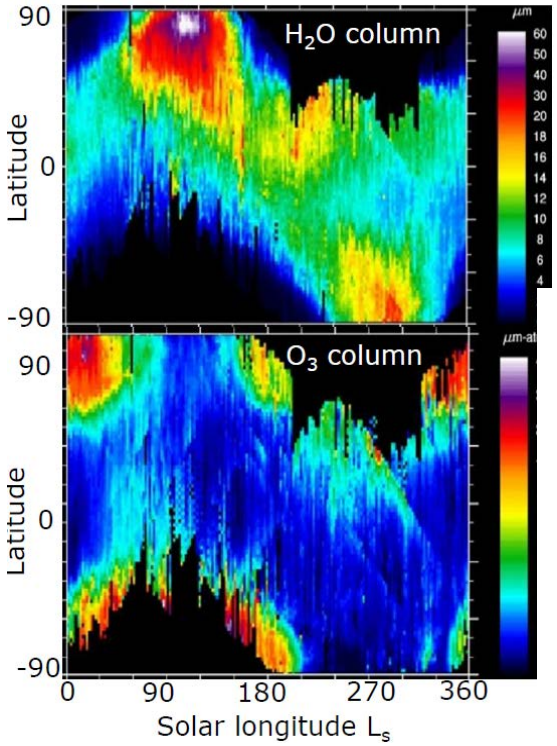
Watters et al., 2017; Fueten et al., 2017; Al-Samir et al., 2017.

Characterization and selection of ExoMars-2020 landing sites

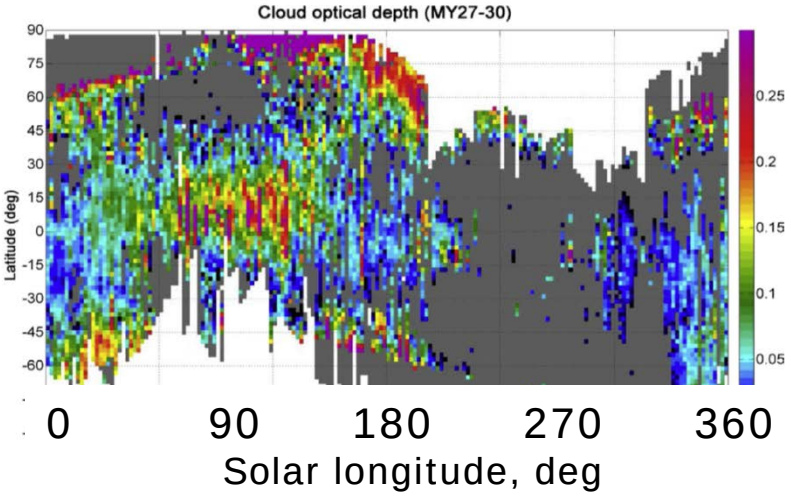


Meteorology and climate

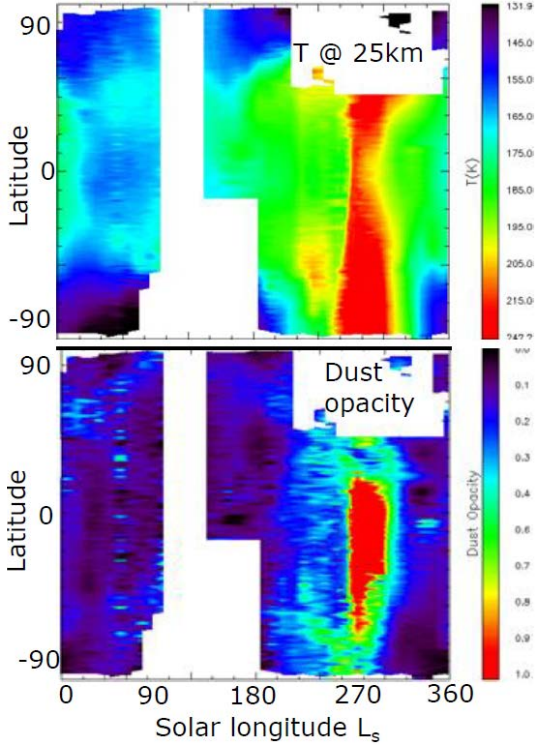
H_2O, O_3 and cloud cycles



- **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**



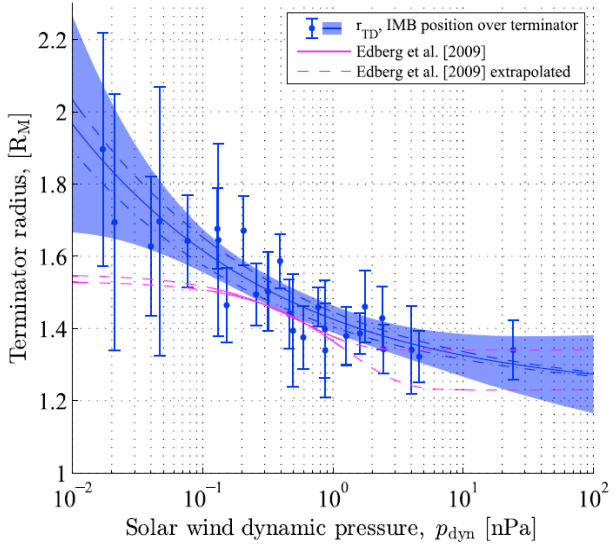
Temperature and dust

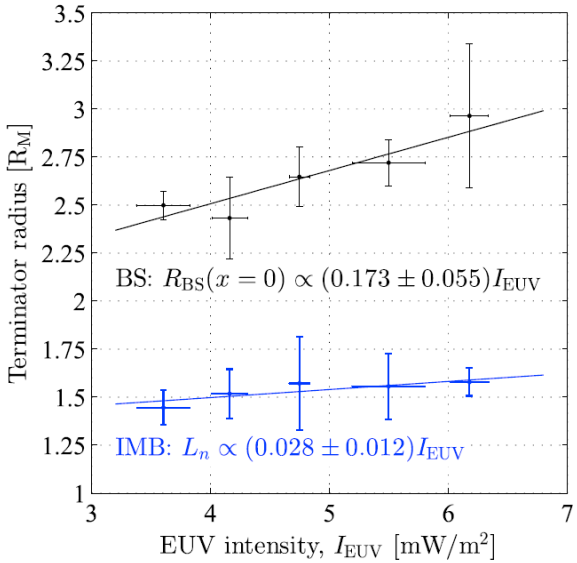


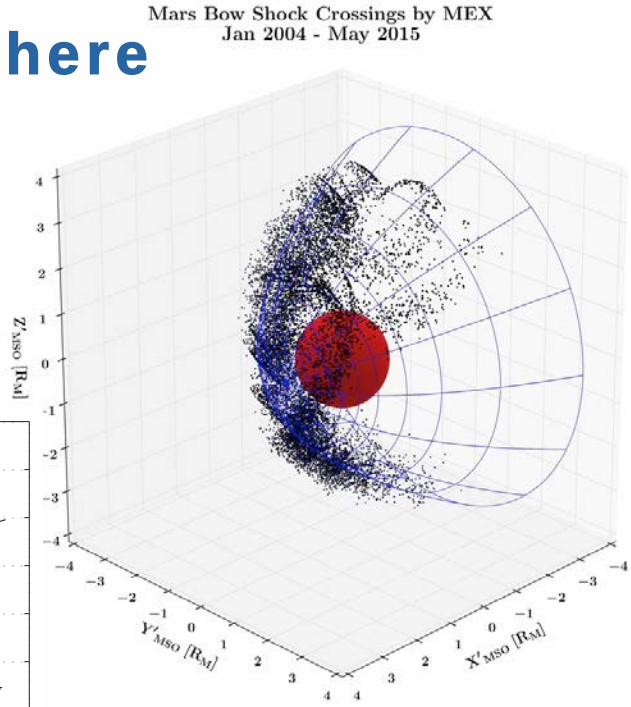
Montmessin et al. 2017; Willame et al., 2017; Wolkenberg et al., 2017; Oliva et al., 2017.

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

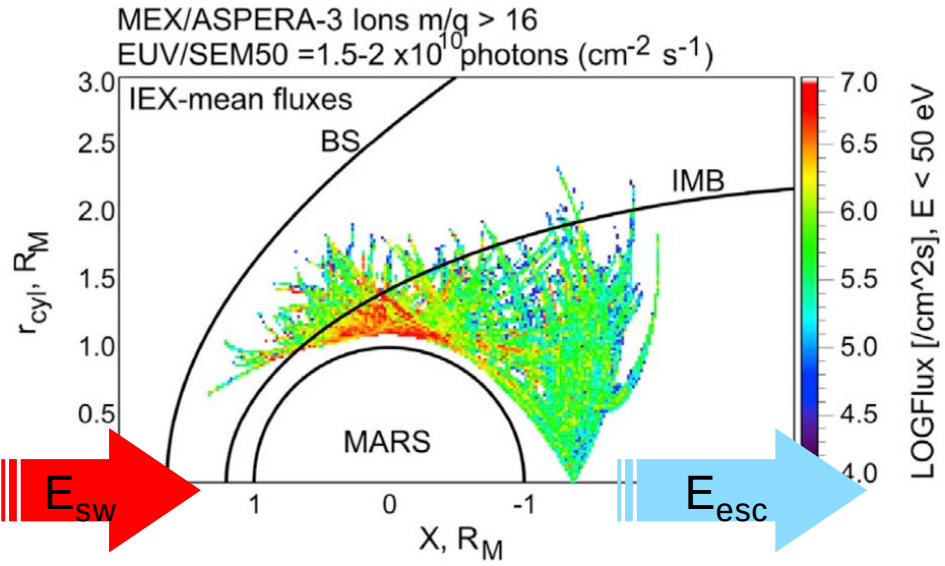


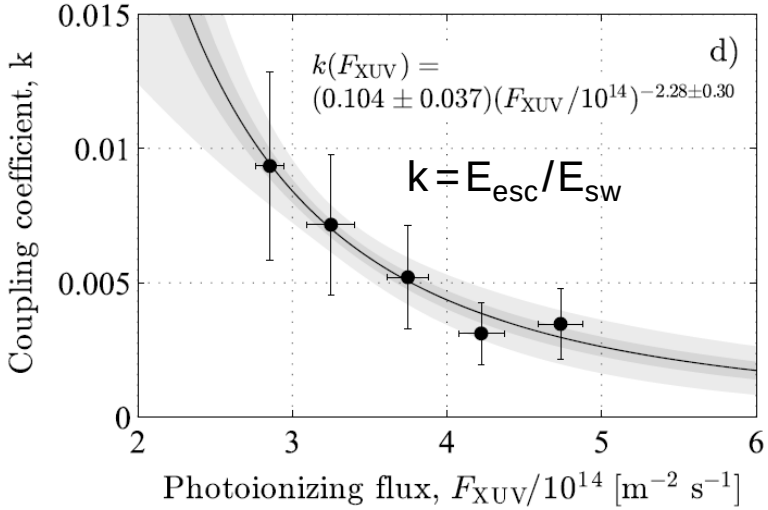




Hall et al., 2016; Ramstad et al., 2017

Atmospheric escape vs solar wind conditions and EUV flux



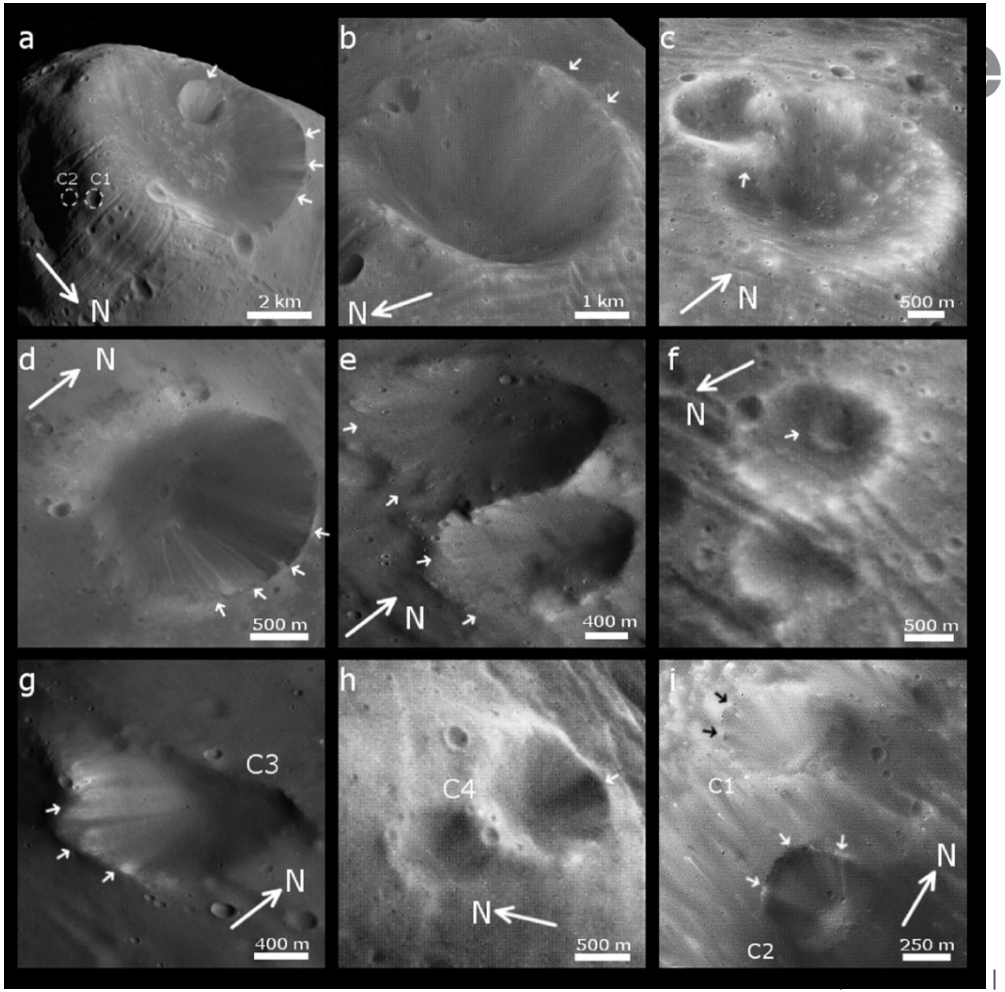


- **Ion escape at Mars is production rather than energy limited**
- **Heavy Venus vs light Mars ?**

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

Phobos studies

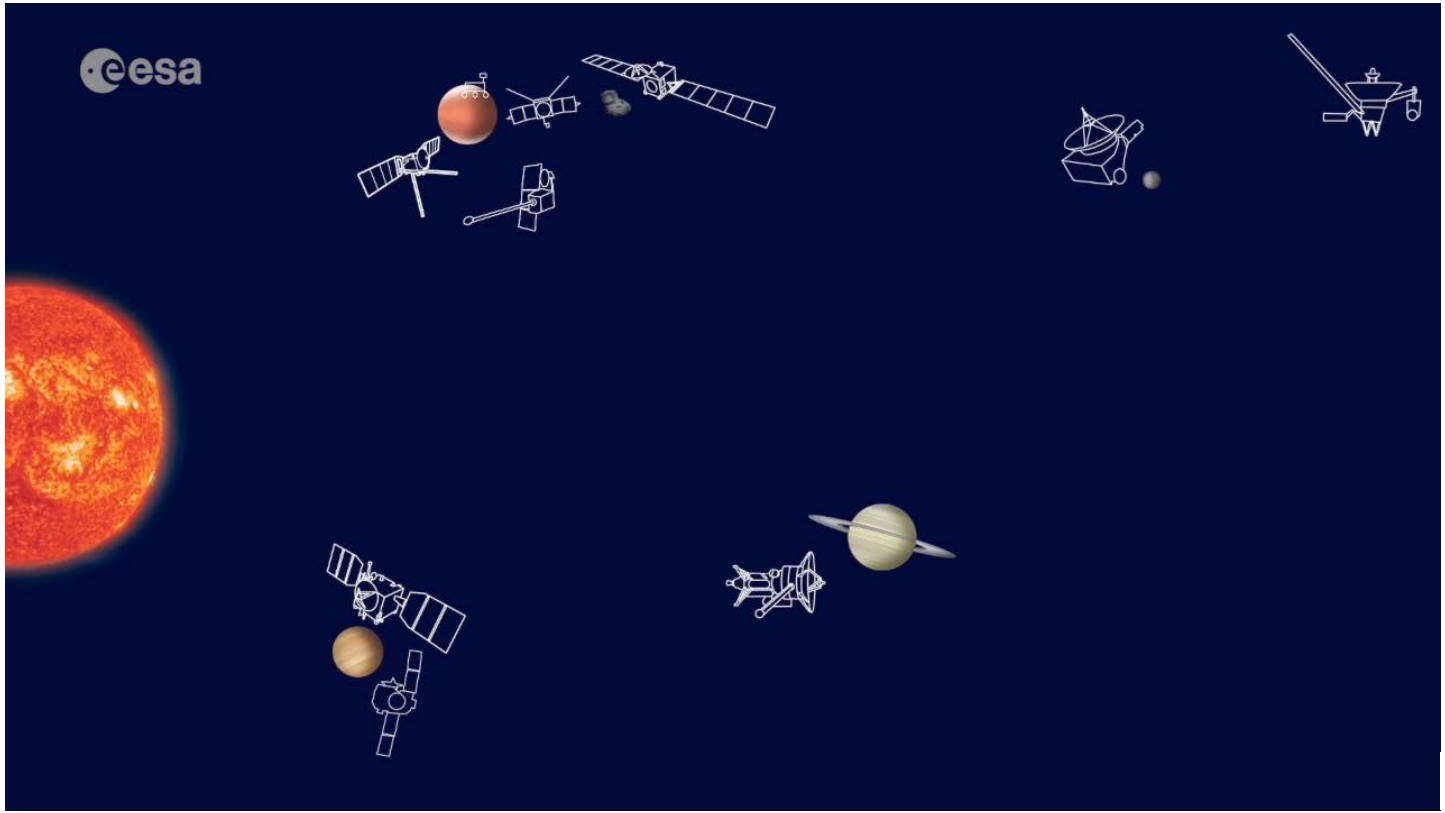
- **mass wasting features in craters on Phobos**
- **locations of the observed landslides correlate with slope increase by tidal effects**



Shi et al., 2017

Interplanetary media

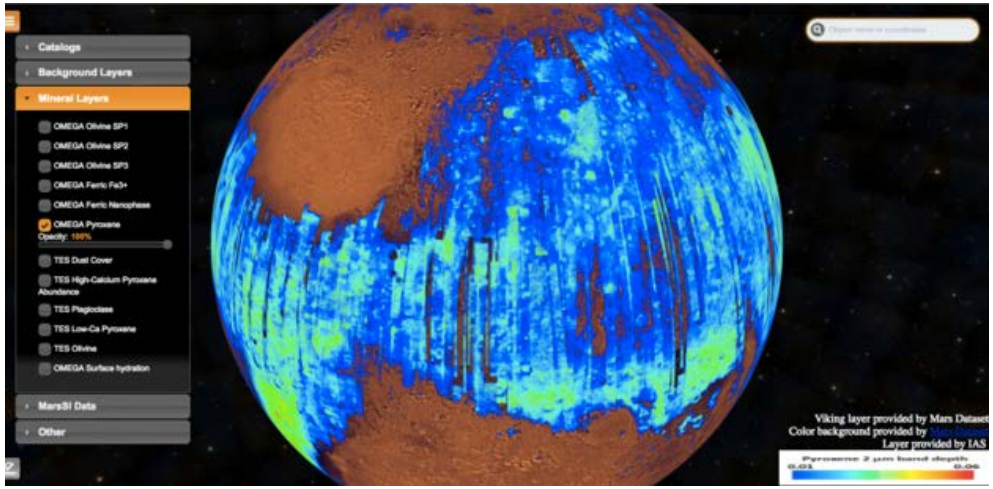
- **Propagation of Coronal Mass Ejection (CME) through the Solar System**



Witasse et al., 2017

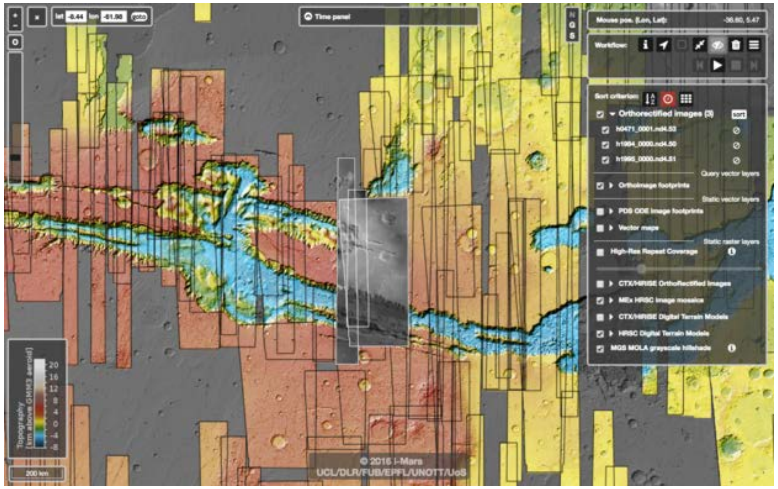
New tools for exploring the surface of Mars

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



- **Visualisation of the surface properties**

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



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

Poulet et al., 2017

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 !