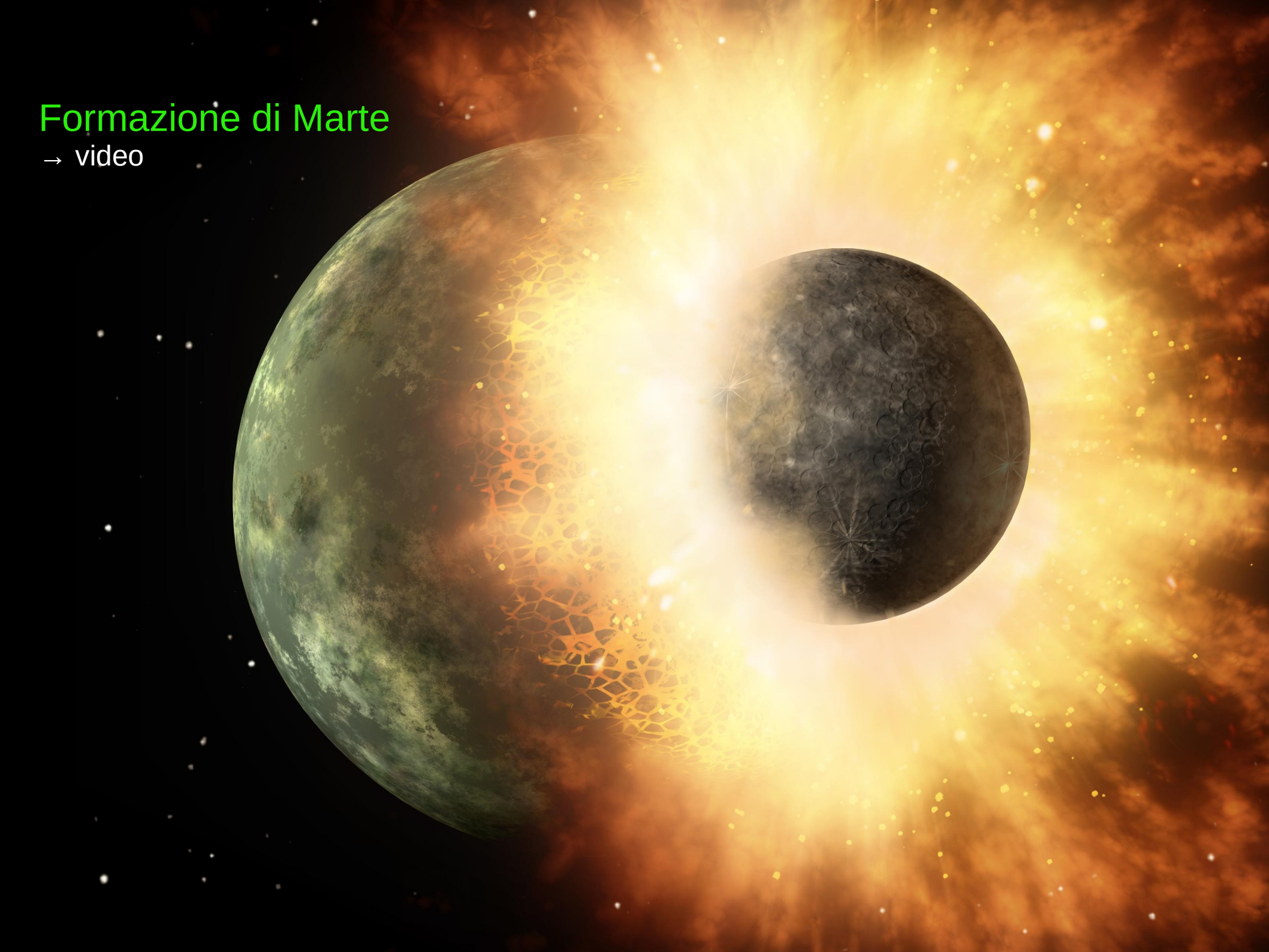
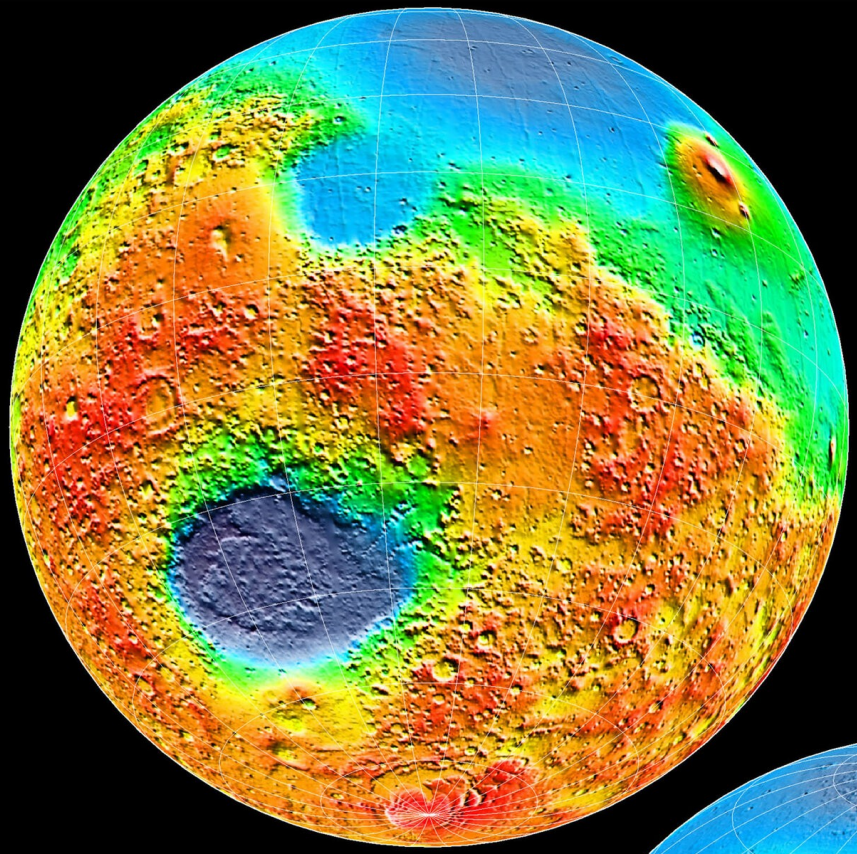
Geologia e struttura marziane

Interreg
Fondo Europeo di Sviluppo Regionale
UNIONE EUROPEA
ITALIA SVIZZERA - ITALIE SUISSE - ITALIEN SCHWEIZ
ASTRONETILO

Formazione di Marte

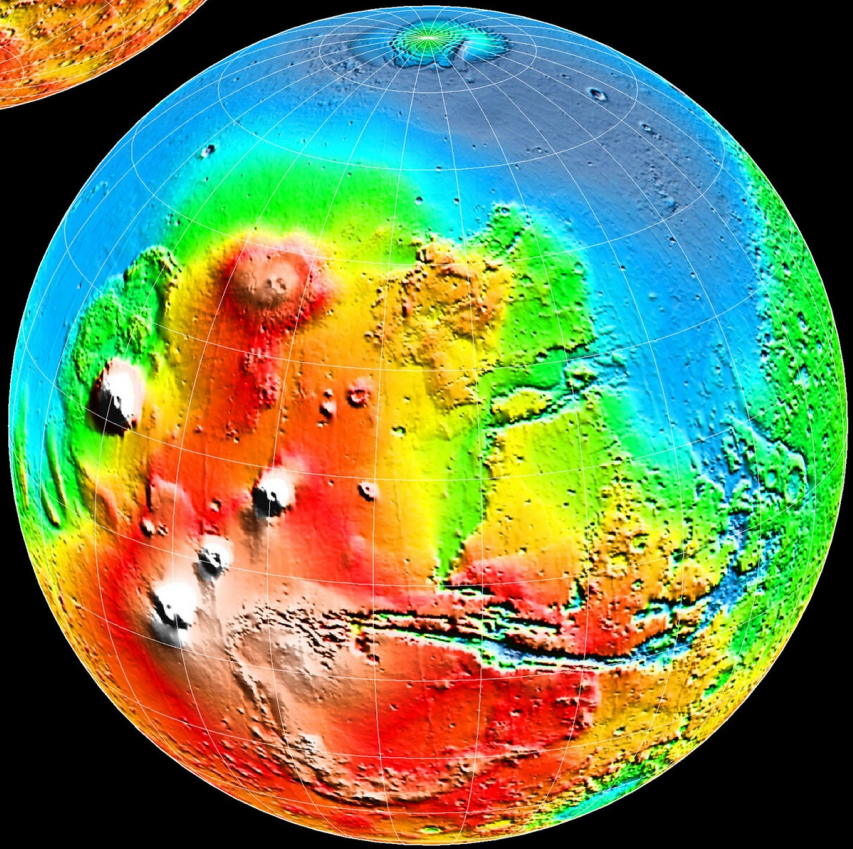
→ video



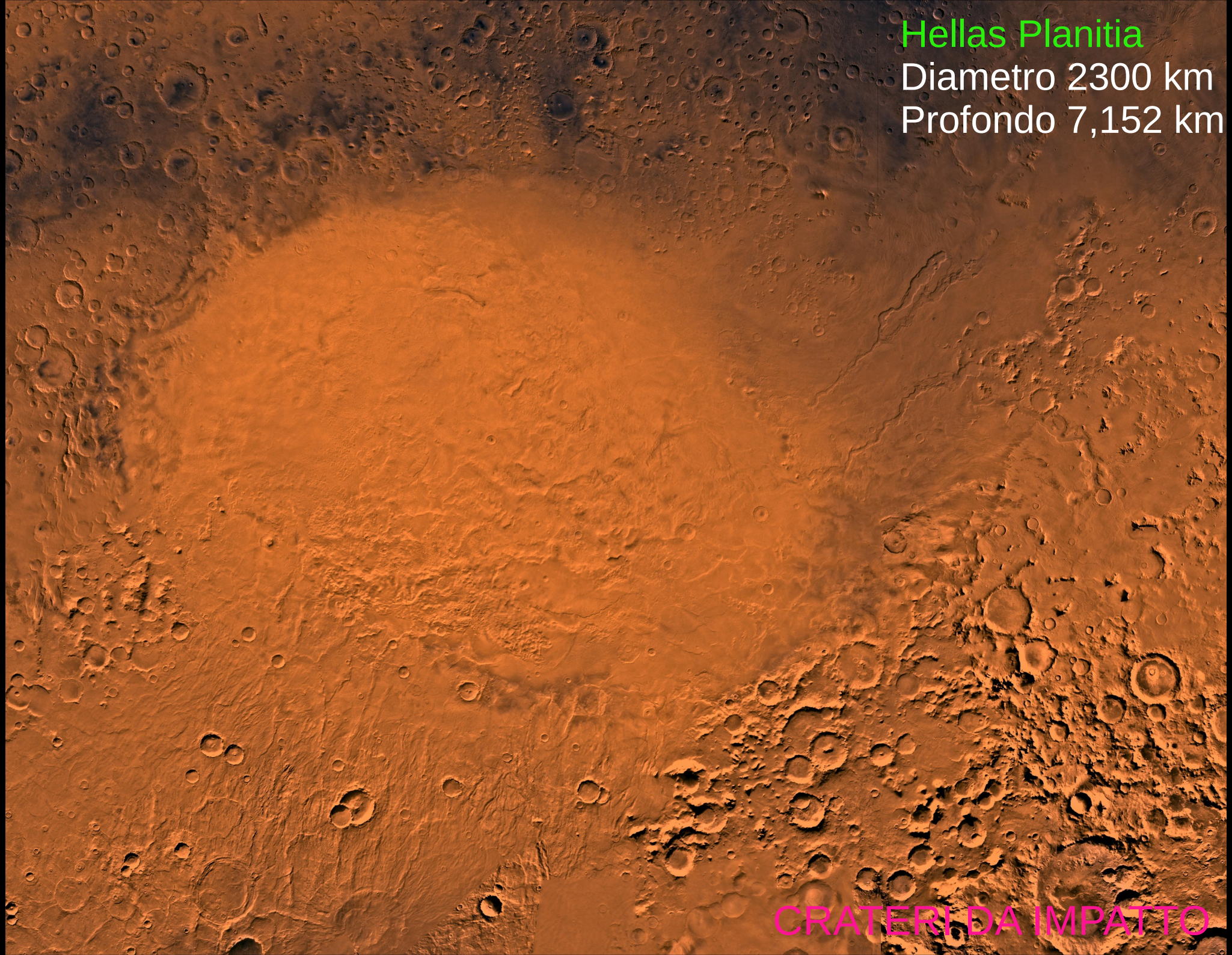


Vastitas Borealis
Area pari al 40%
della superficie marziana

Differenza morfologica
tra emisfero boreale e
australe



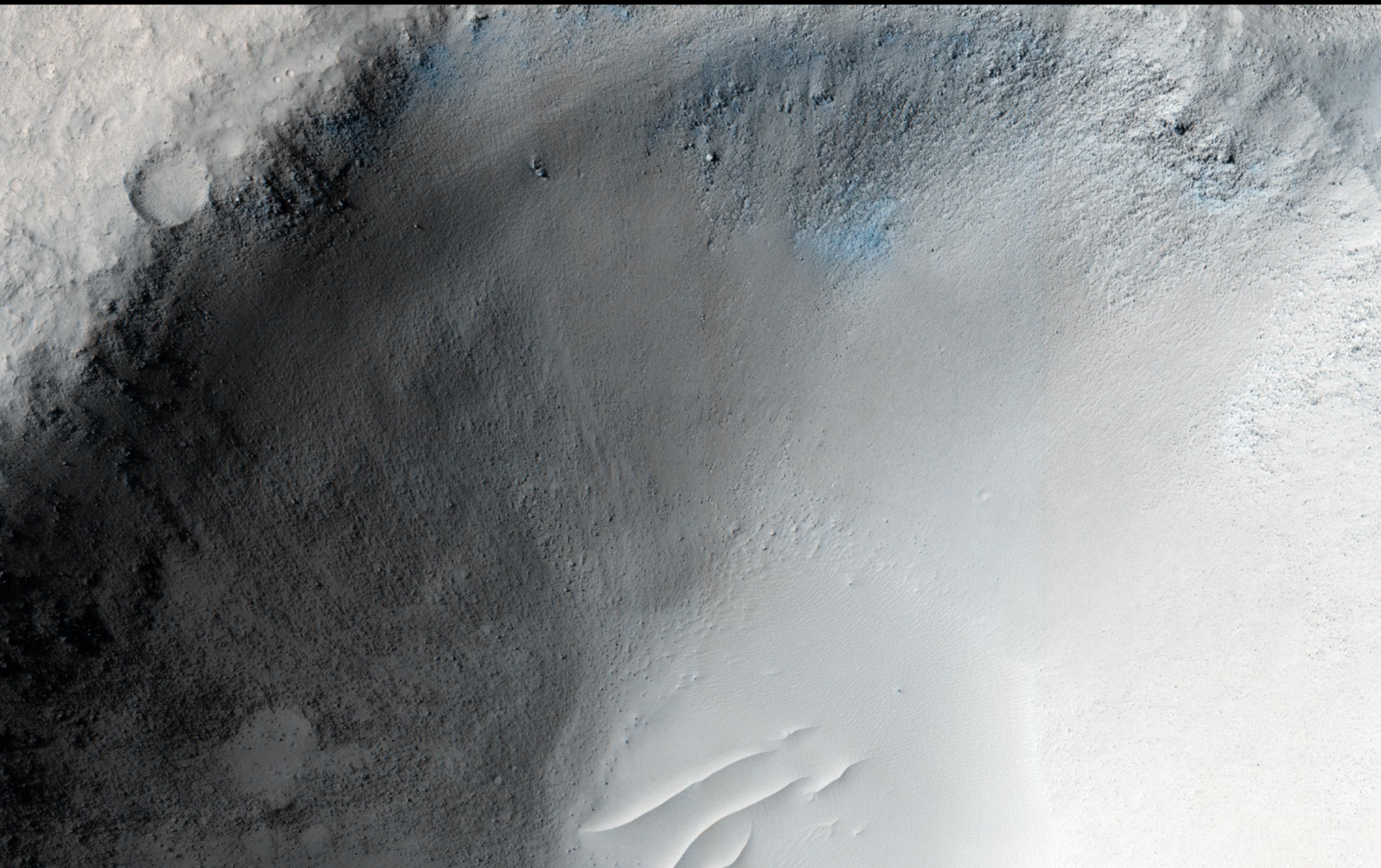
CRATERI DA IMPATTO


Hellas Planitia
Diametro 2300 km
Profondo 7,152 km
CRATERI DA IMPATTO

CRATERI DA IMPATTO

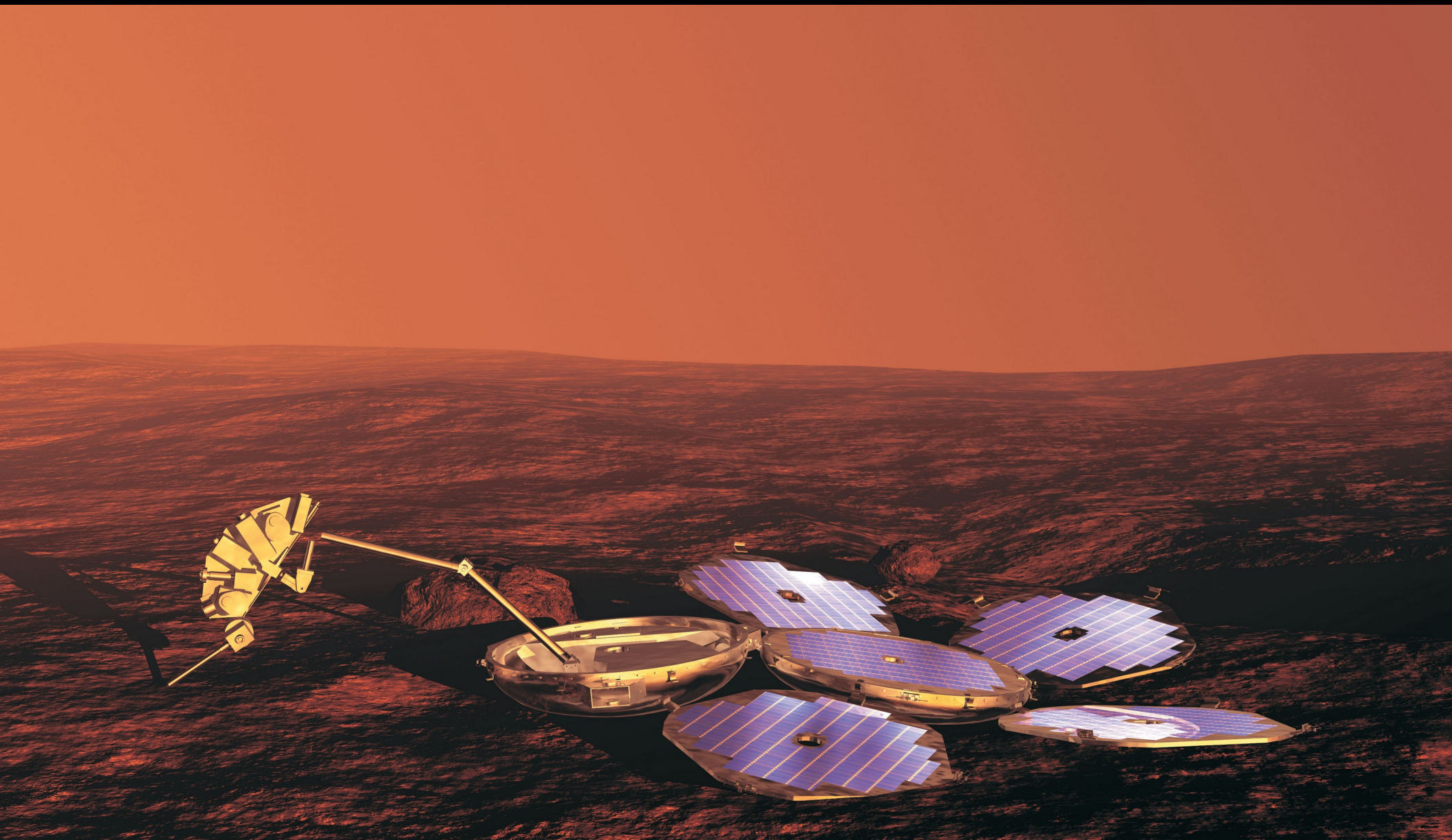
CRATERI DA IMPATTO

Isidis Planitia
Diametro 1000 km



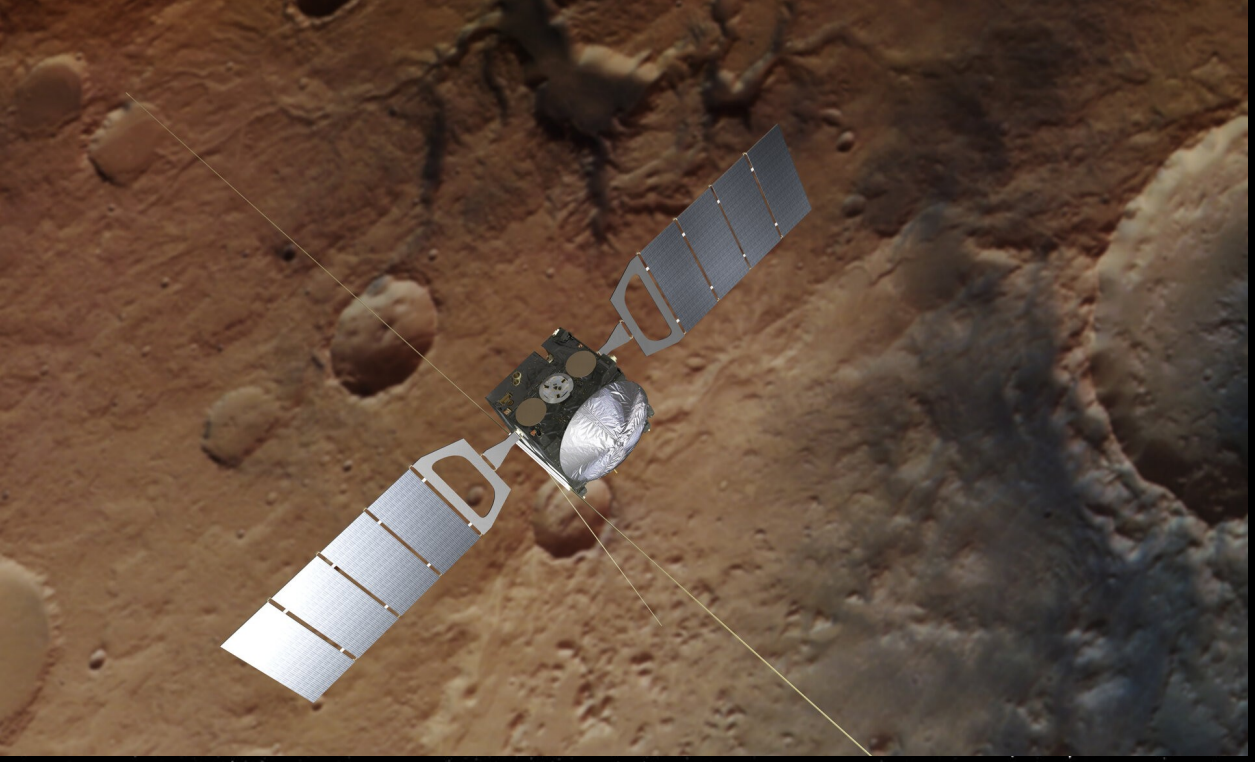
CRATERI DA IMPATTO

Isidis Planitia:
sito di atterraggio per Beagle 2

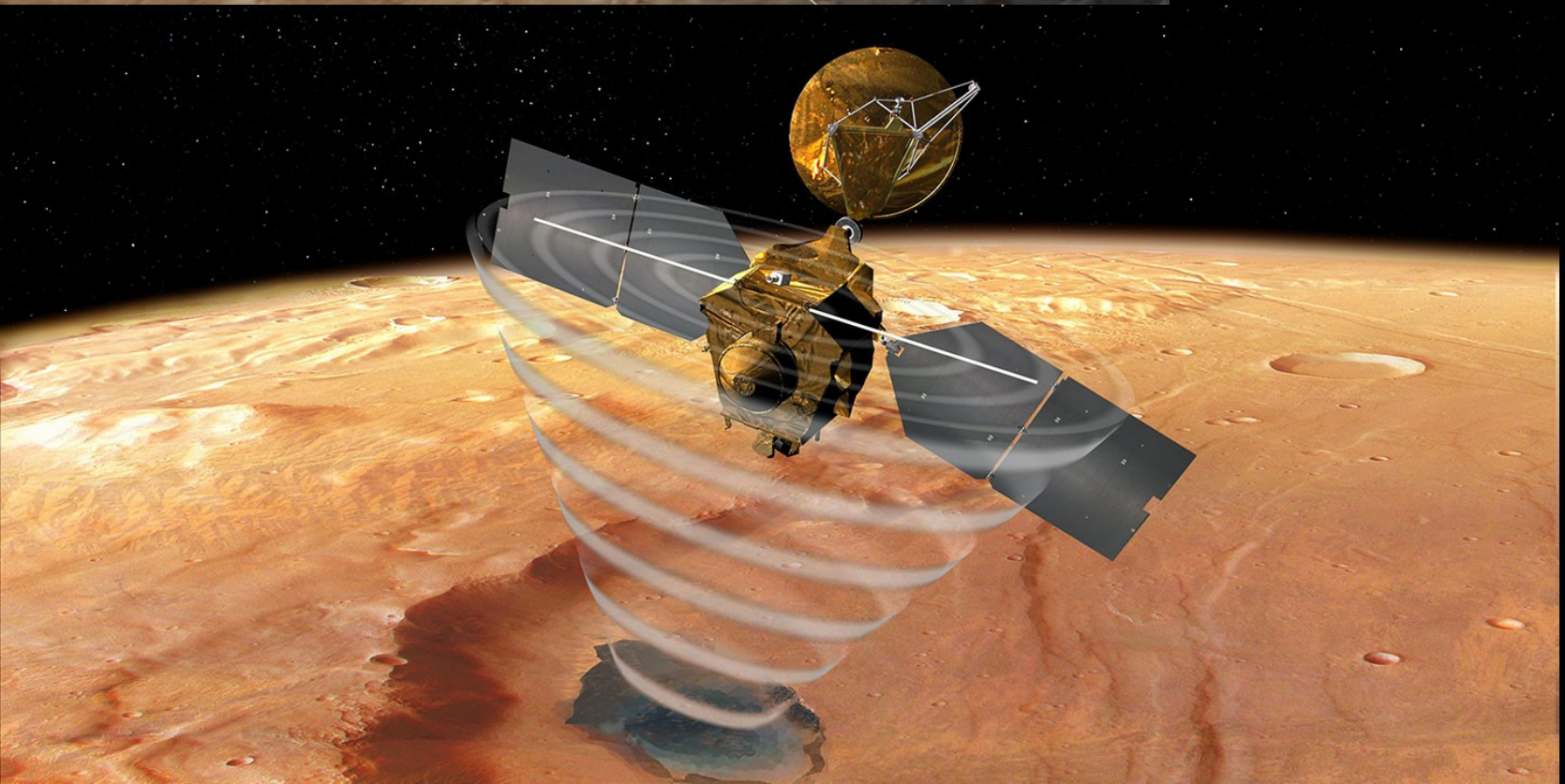


CRATERI DA IMPATTO

L’acqua dentro Hellas Planitia



Mars Express

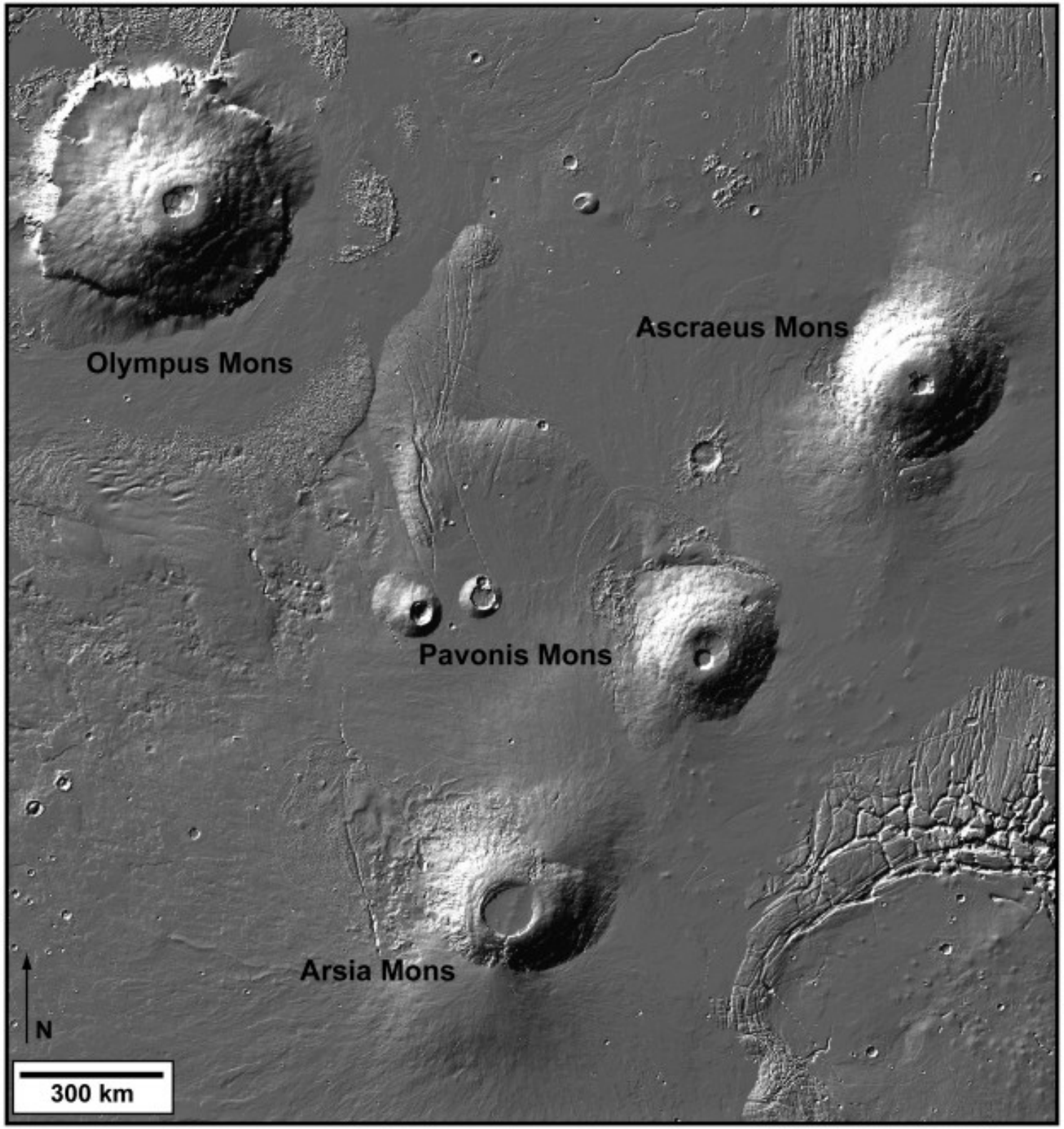


SHARAD di MRO

VULCANI

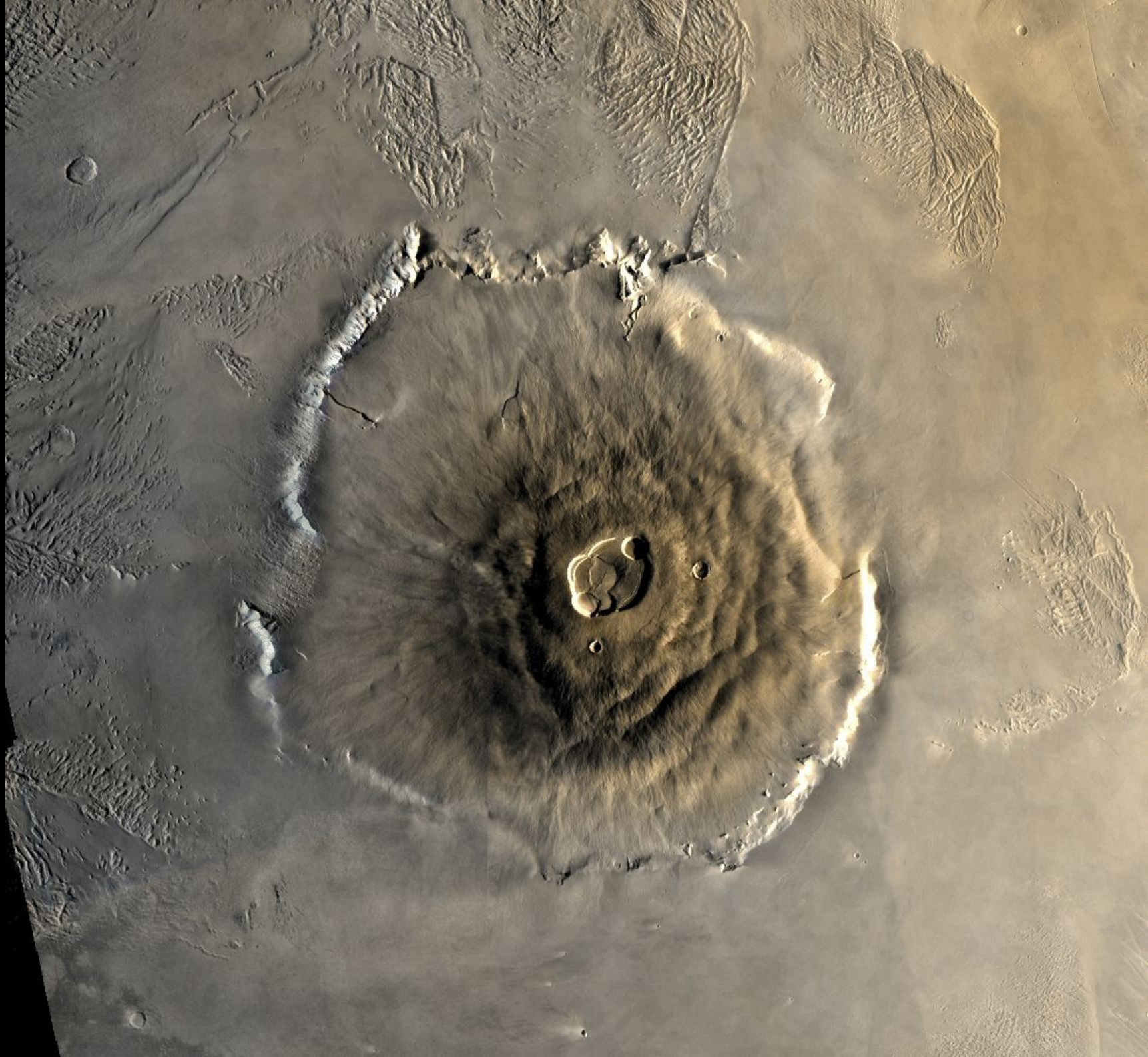
Tharsis Montes
Arsia Mons 20 km
Pavonis Mons 14 km
Ascraeus Mons 18 km

Perchè sono così alti?



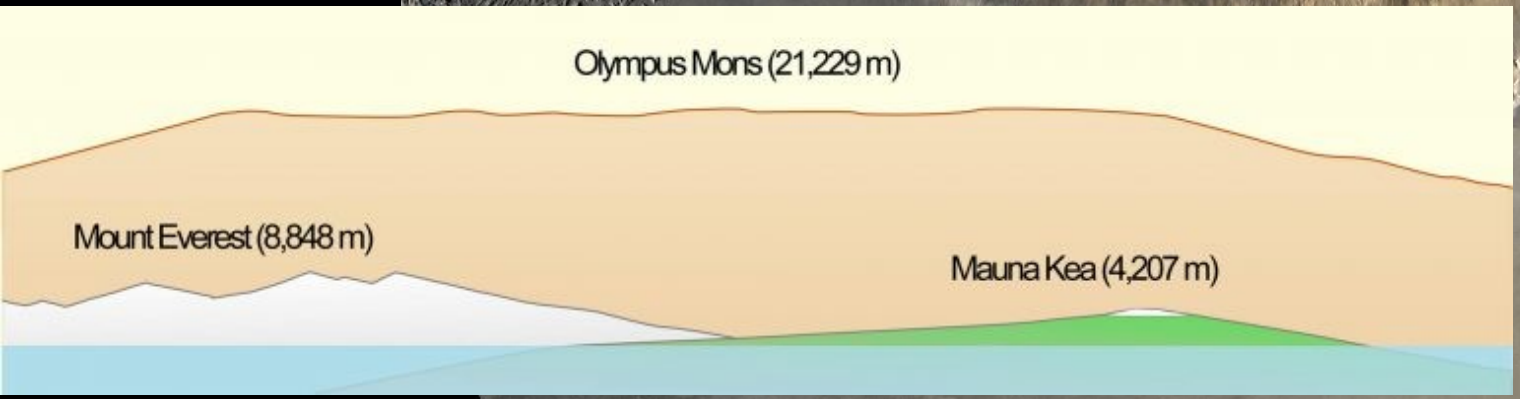
VULCANI

Mons Olympus
25 km



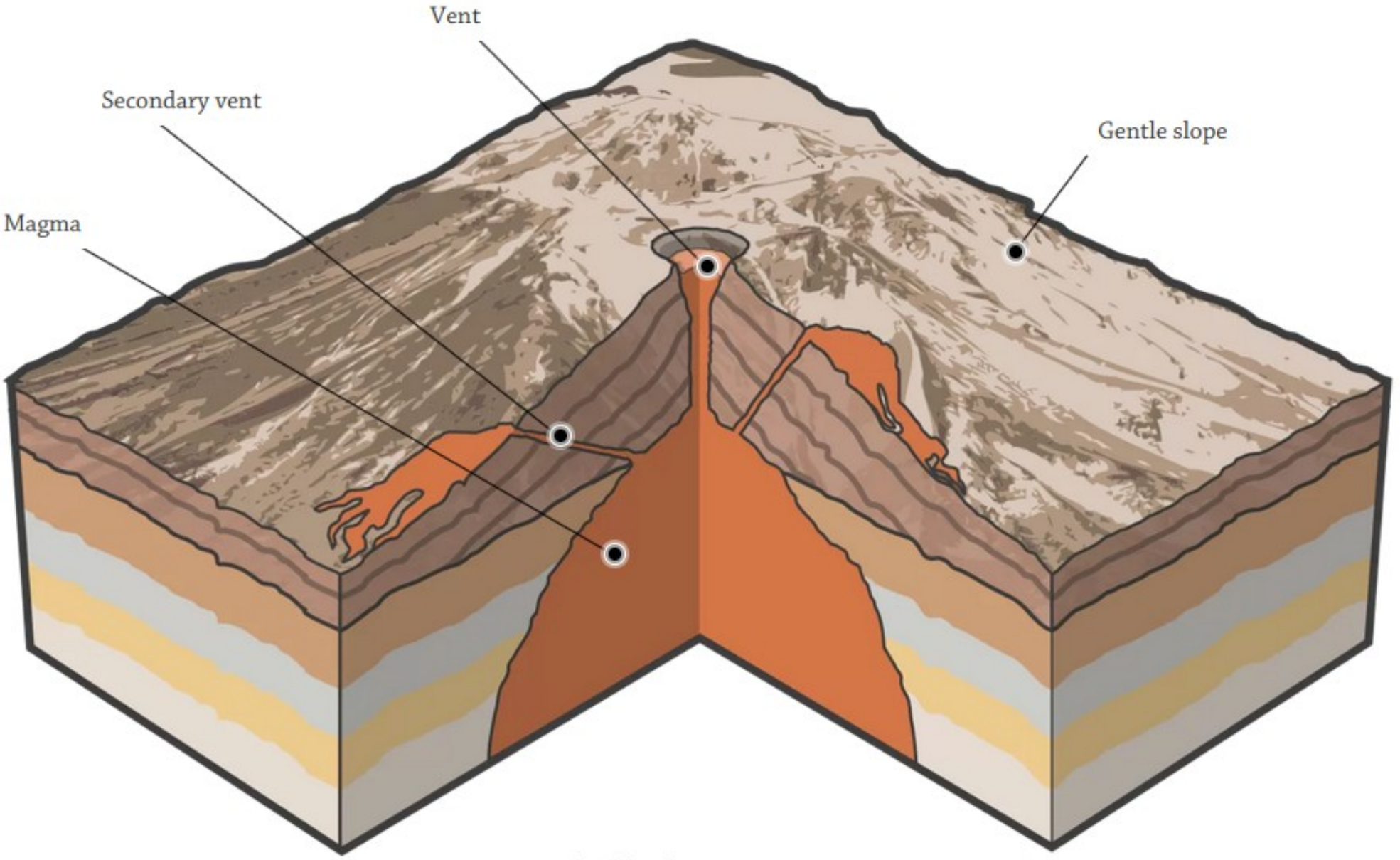
VULCANI

Mons Olympus
25 km



VULCANI

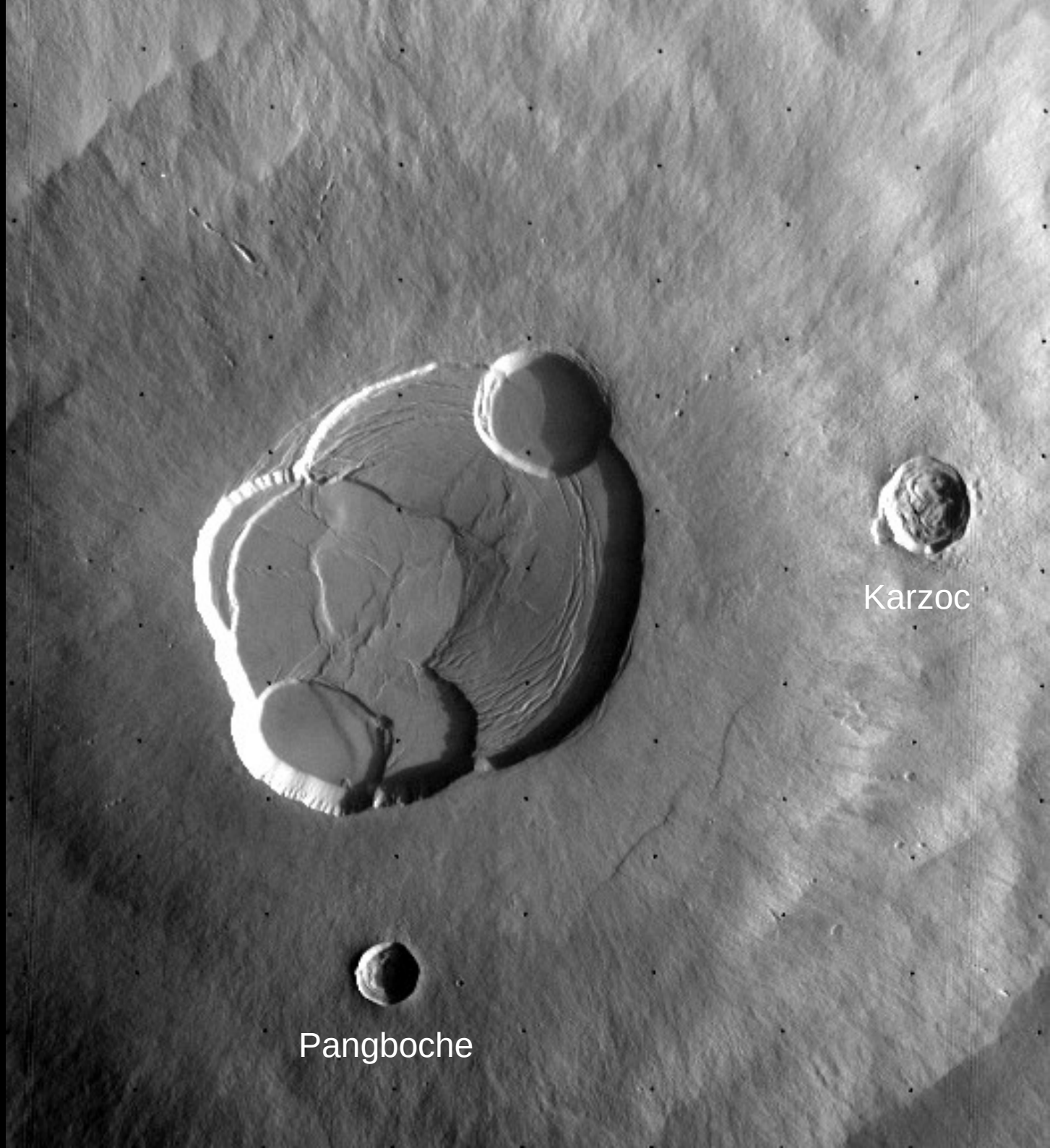
Vulcano a scudo



VULCANI

Mons Olympus
Crateri
Pangboche 10,4 km
Karzok 15,6 km

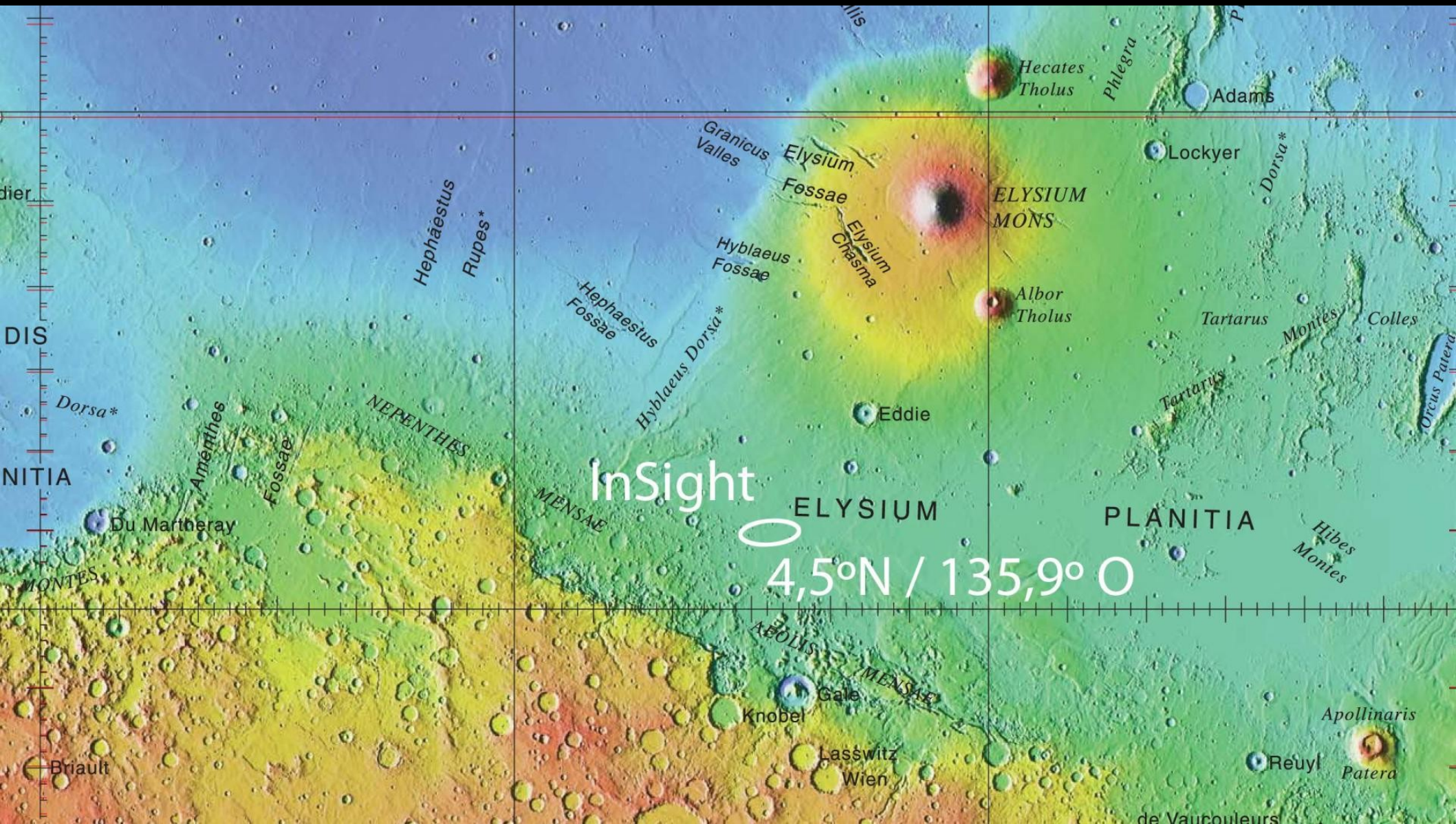
6 caldere sovrapposte



VULCANI

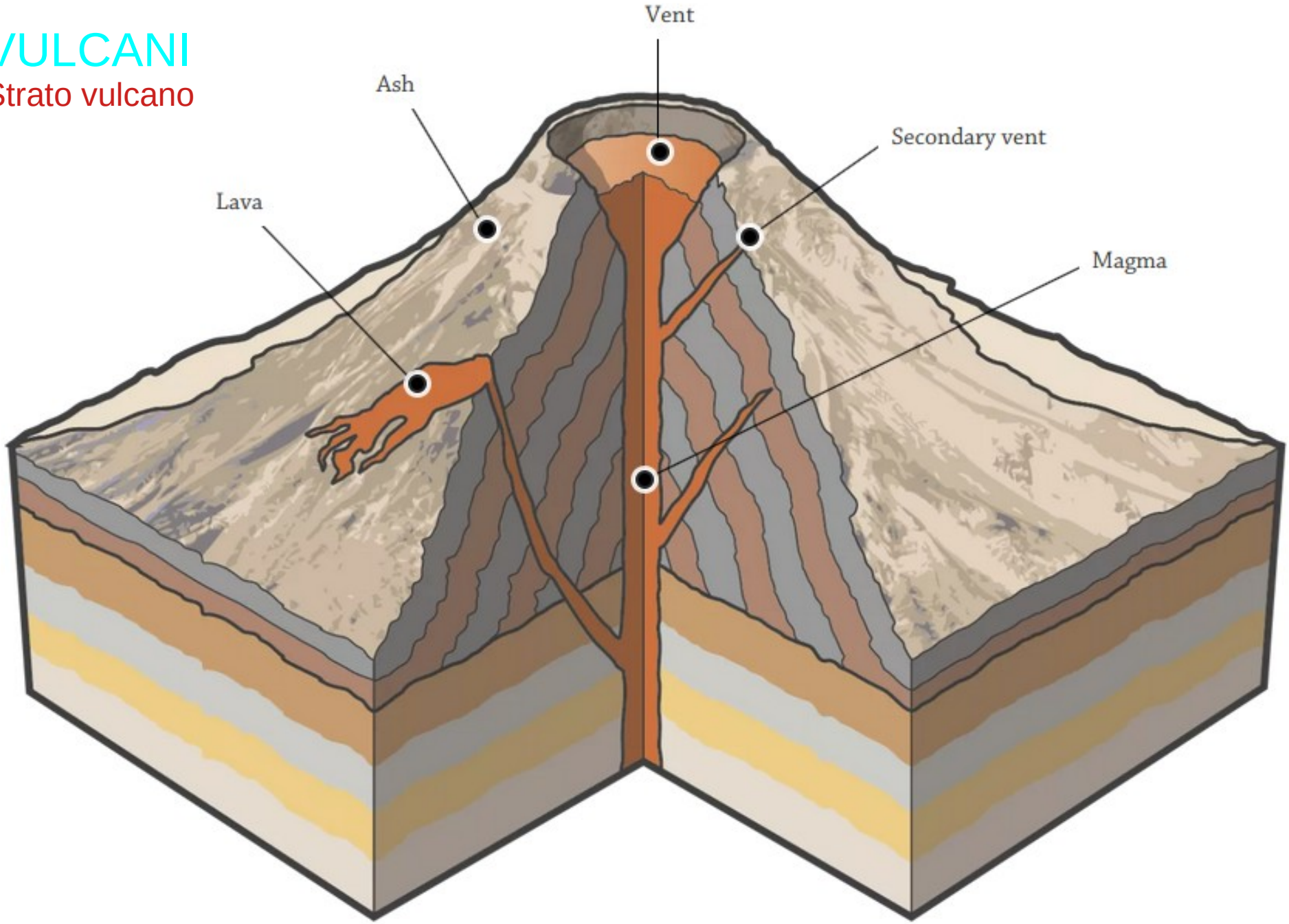
Utopia Planitia

Elysium Mons 13 km
Albor Tholus, Hecates Tholus 4,5 km



VULCANI

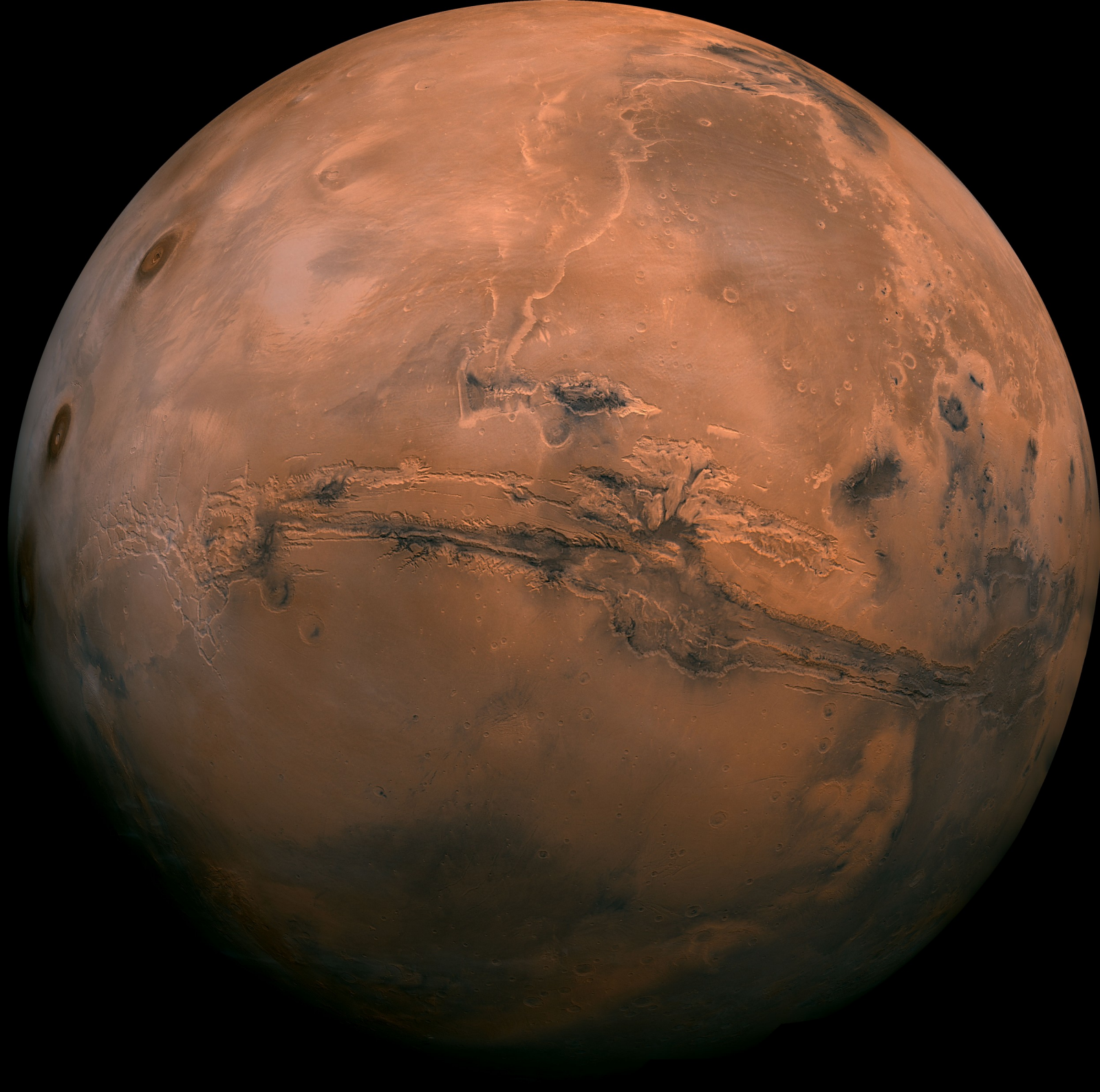
Strato vulcano



Stratovolcano

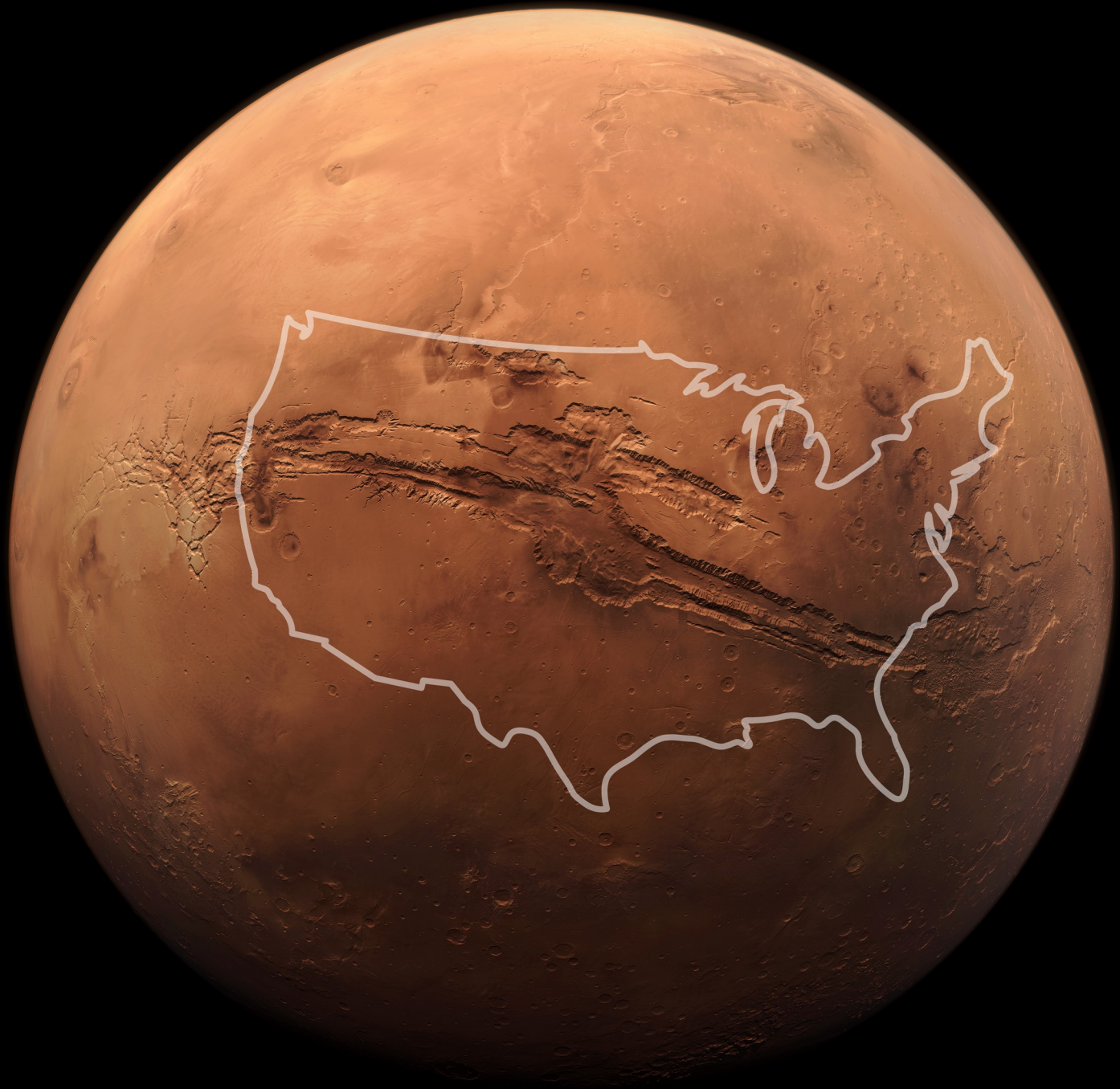
CANYON

Valles Marineris



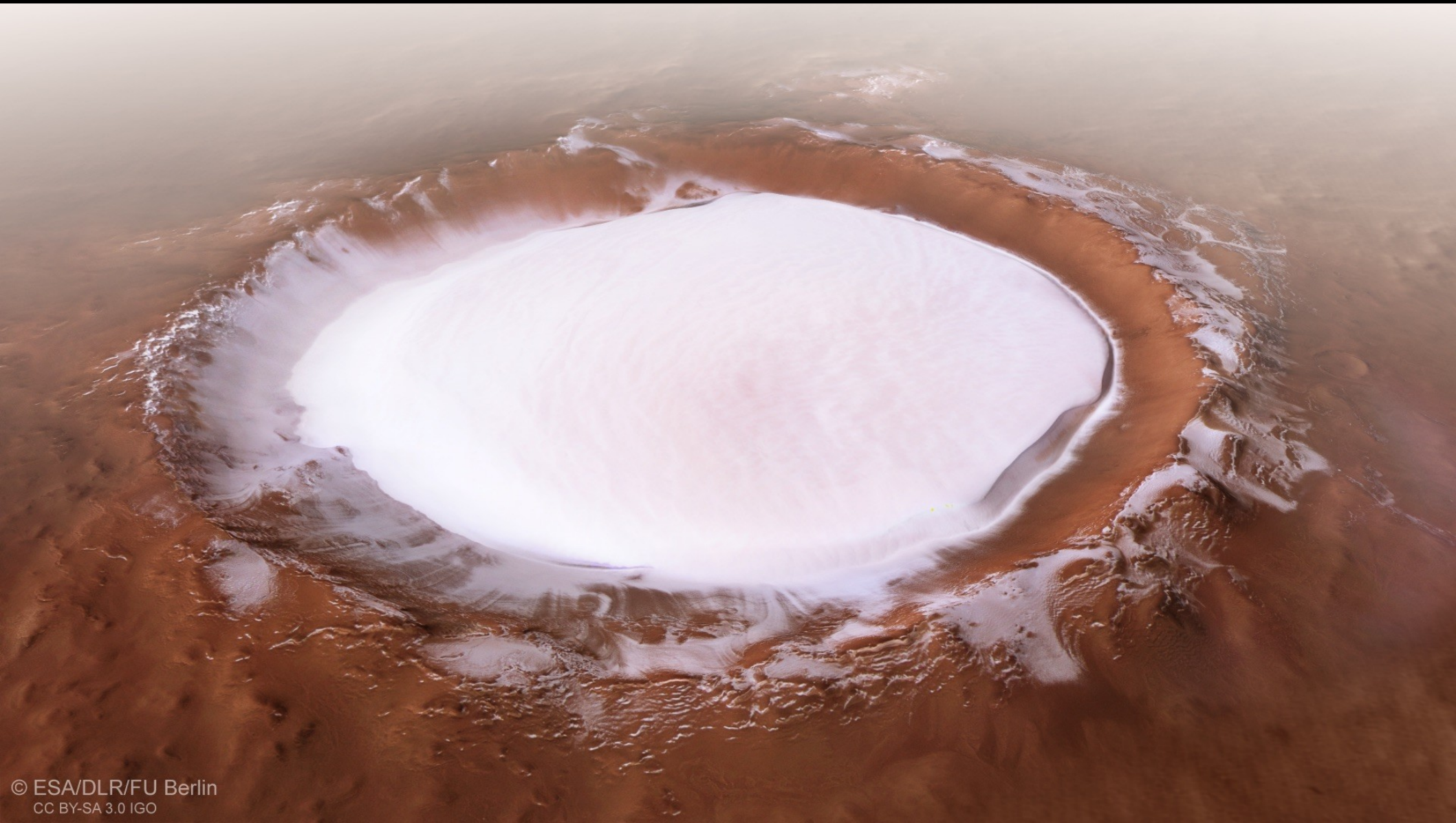
CANYON

Valles Marineris



L’ACQUA DI MARTE

Cratere Korolev

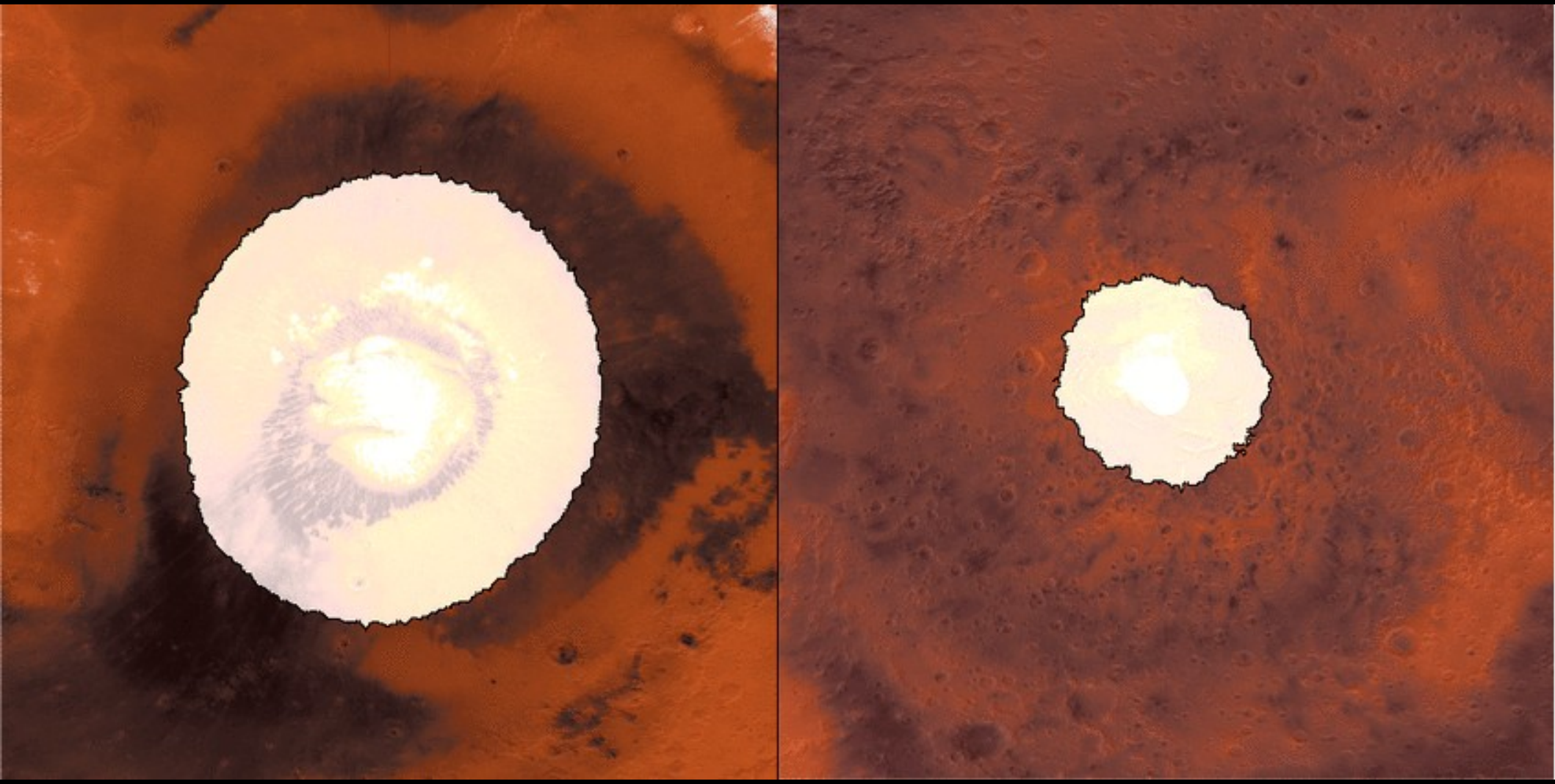


L’ACQUA DI MARTE

Calotte polari

L’ACQUA DI MARTE

Calotte polari
Variazioni stagionali

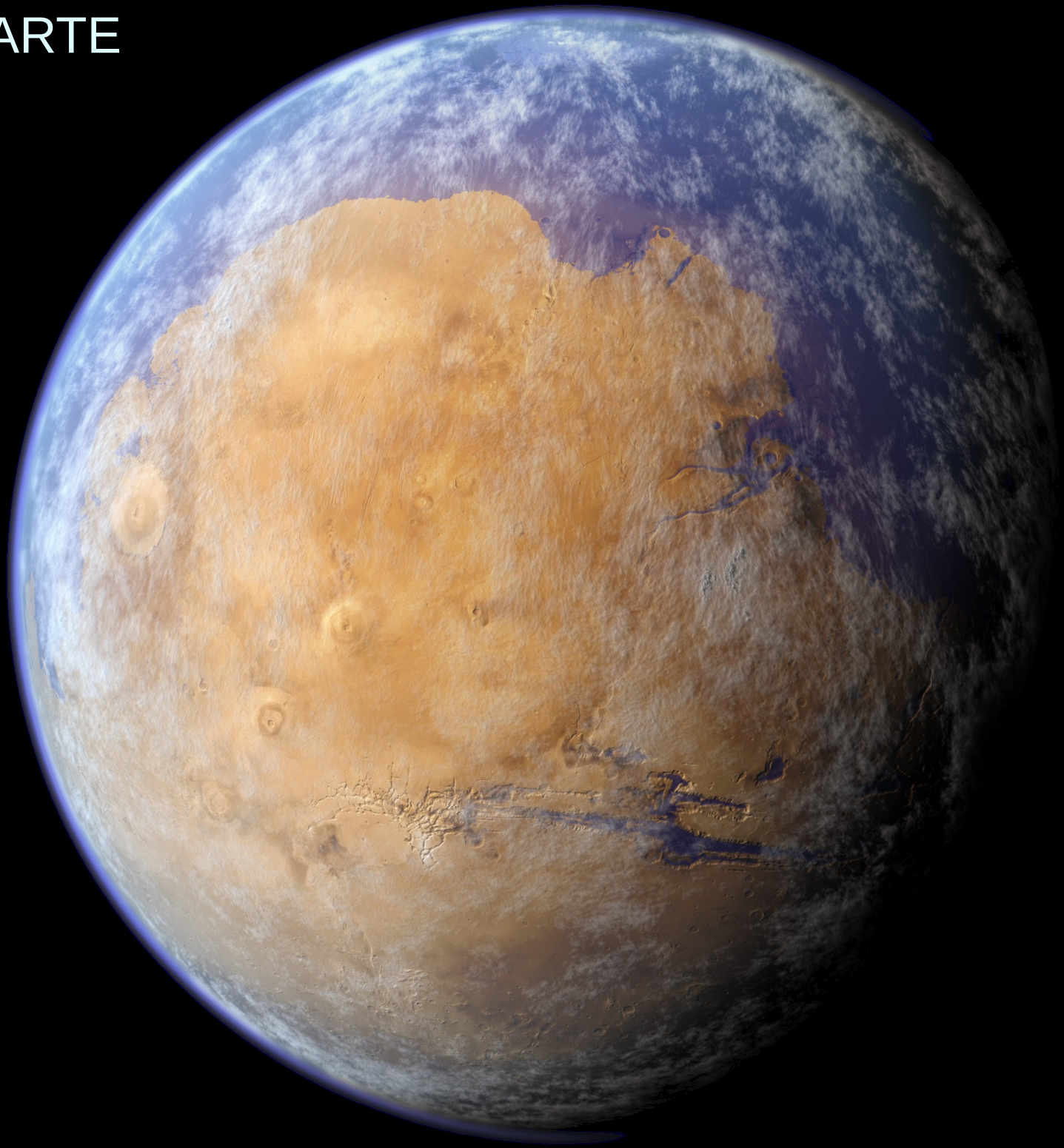


L’ACQUA DI MARTE

Permafrost

L’ACQUA DI MARTE

4 miliardi di anni fa:
oceano che ricopriva
1/3 del pianeta?



L’ACQUA DI MARTE

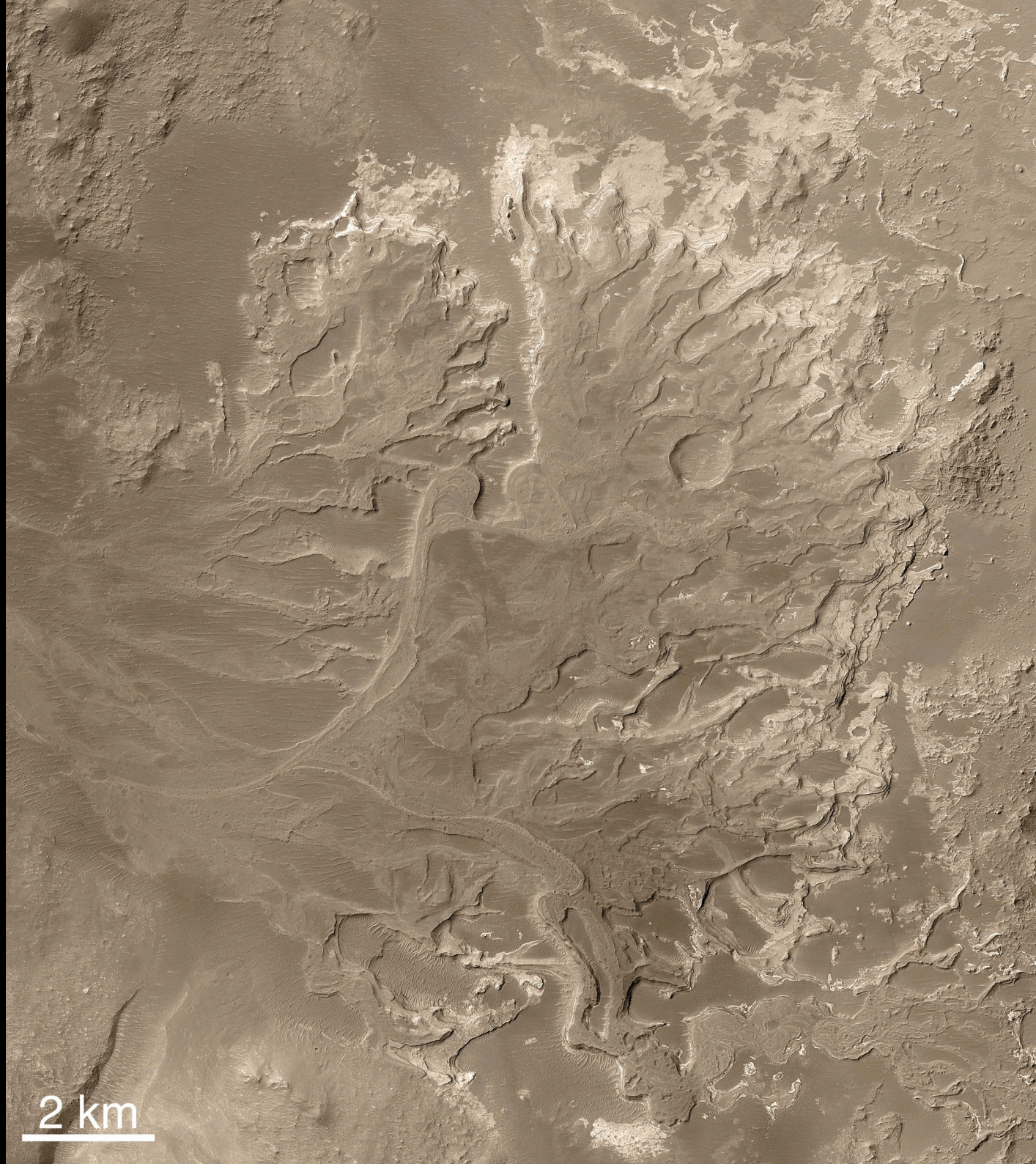
Osuga Valles
lunghezza 164 km,
profondità fino addirittura 20 km

Originata a seguito di inondazioni catastrofiche?

L’ACQUA DI MARTE

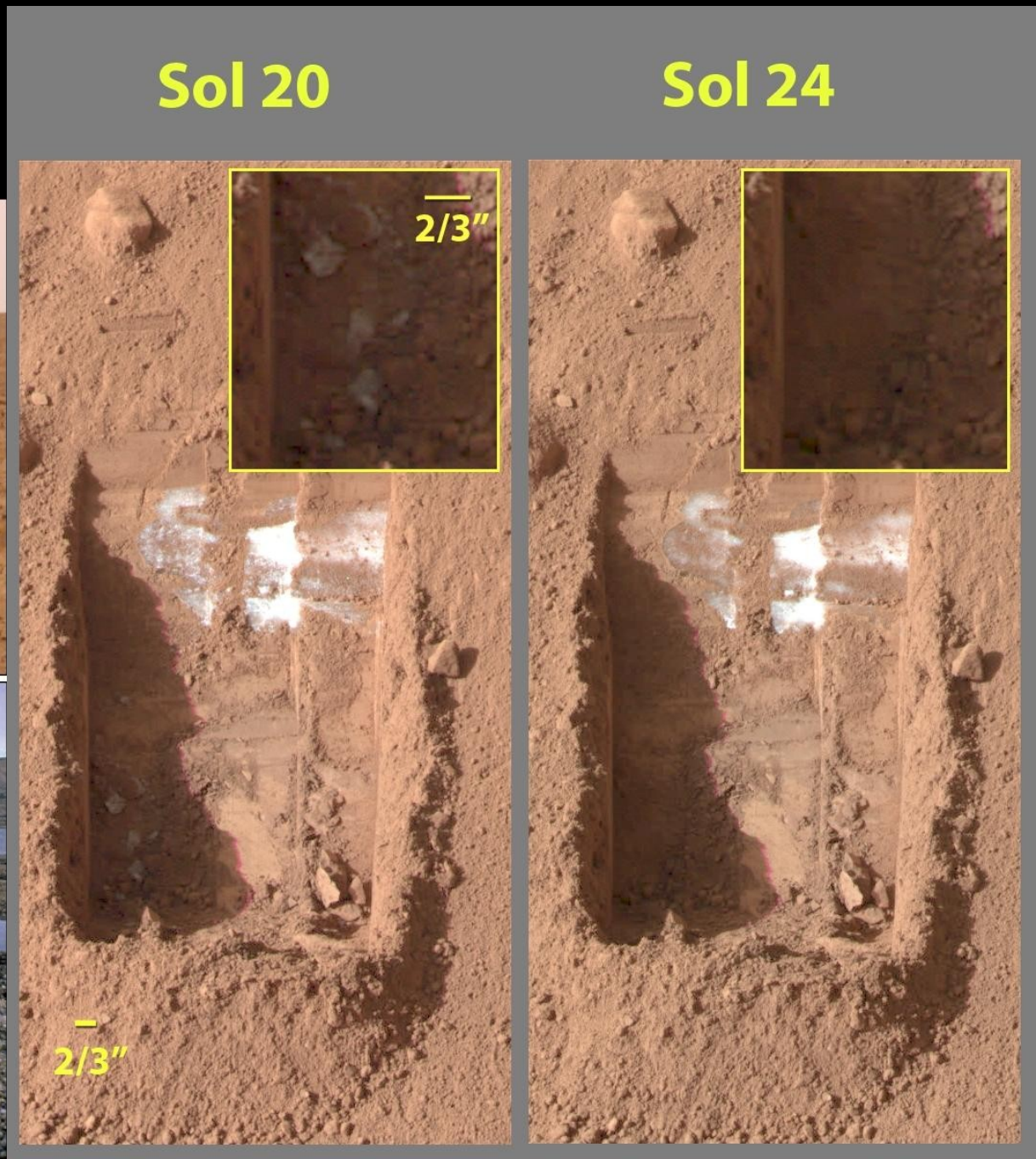
Cratere Eberswalde
Esempio
di antico delta fluviale

Fonte:
Mars Global Surveyor/NASA



L’ACQUA DI MARTE

2008 Lander Phoenix



L’ACQUA DI MARTE

2019 Mars Reconnaissance Orbiter

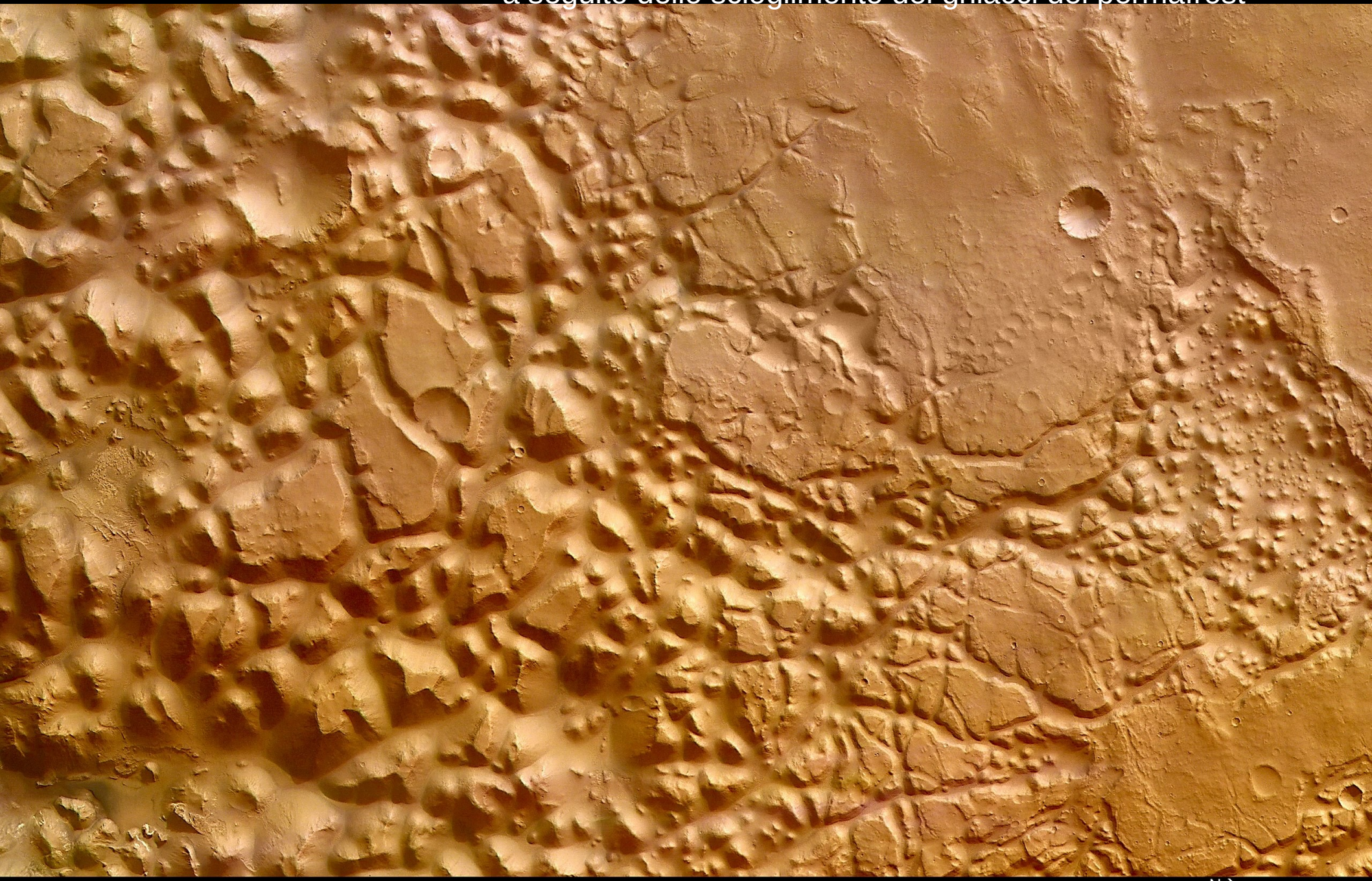
Striature scure sulle pareti del cratere Hale → sedimenti trascinati a valle da flusso d’acqua

L'ACQUA DI MARTE

Mars Express

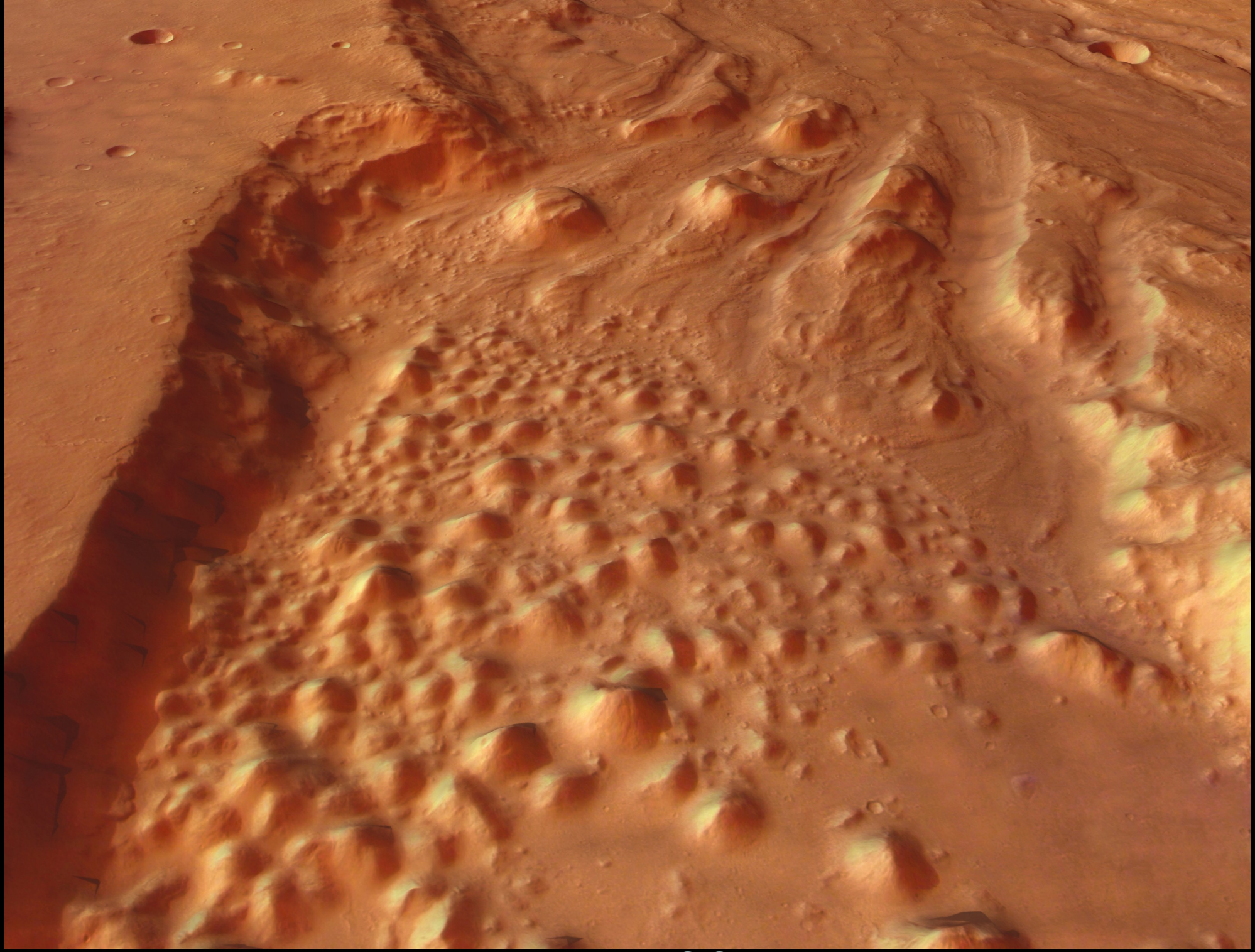
Zona tra la Iani Chaos e l'Ares Vallis

"Terreno caotico" originato da grandi alluvioni
a seguito dello scioglimento dei ghiacci del permafrost

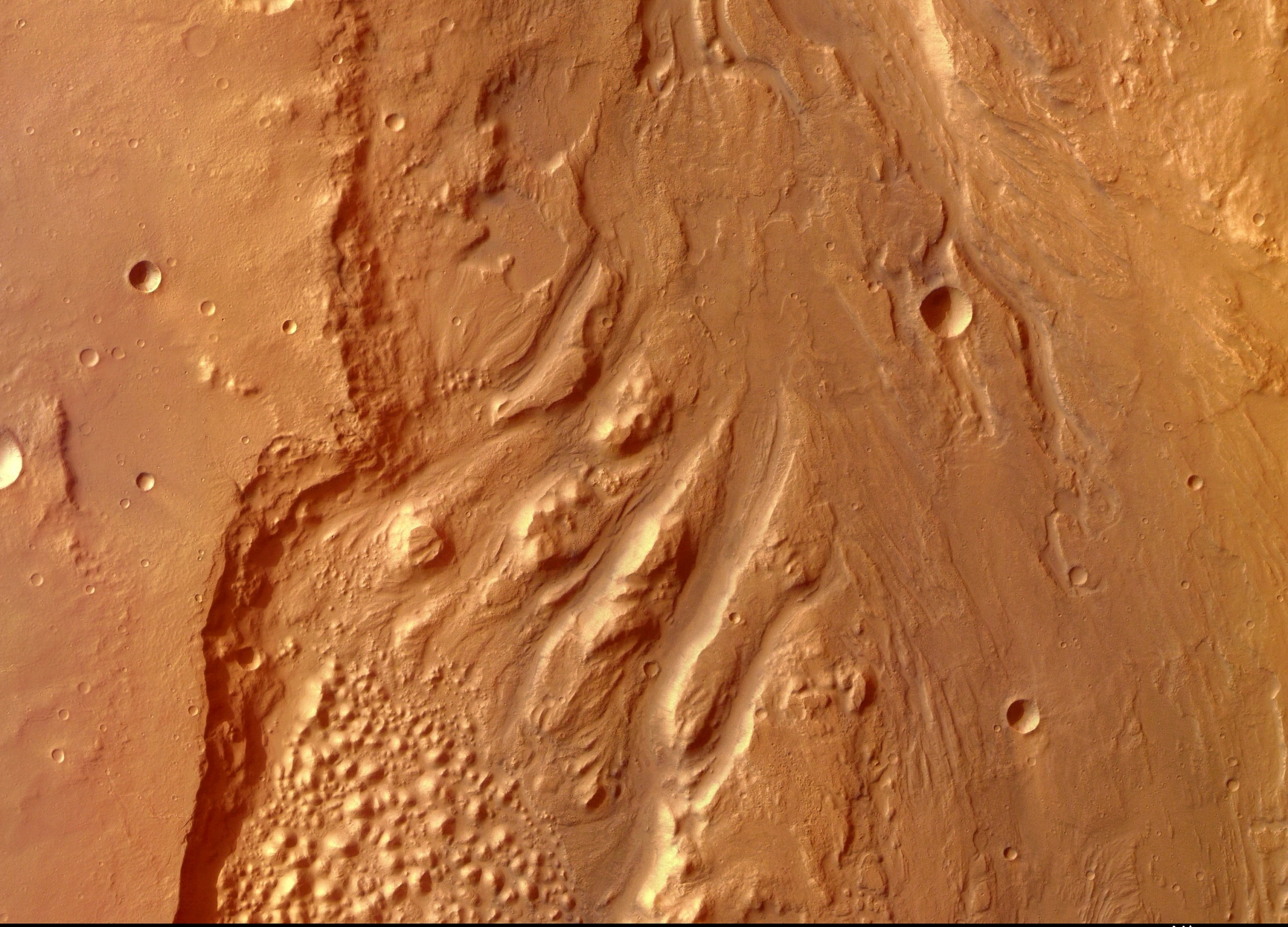


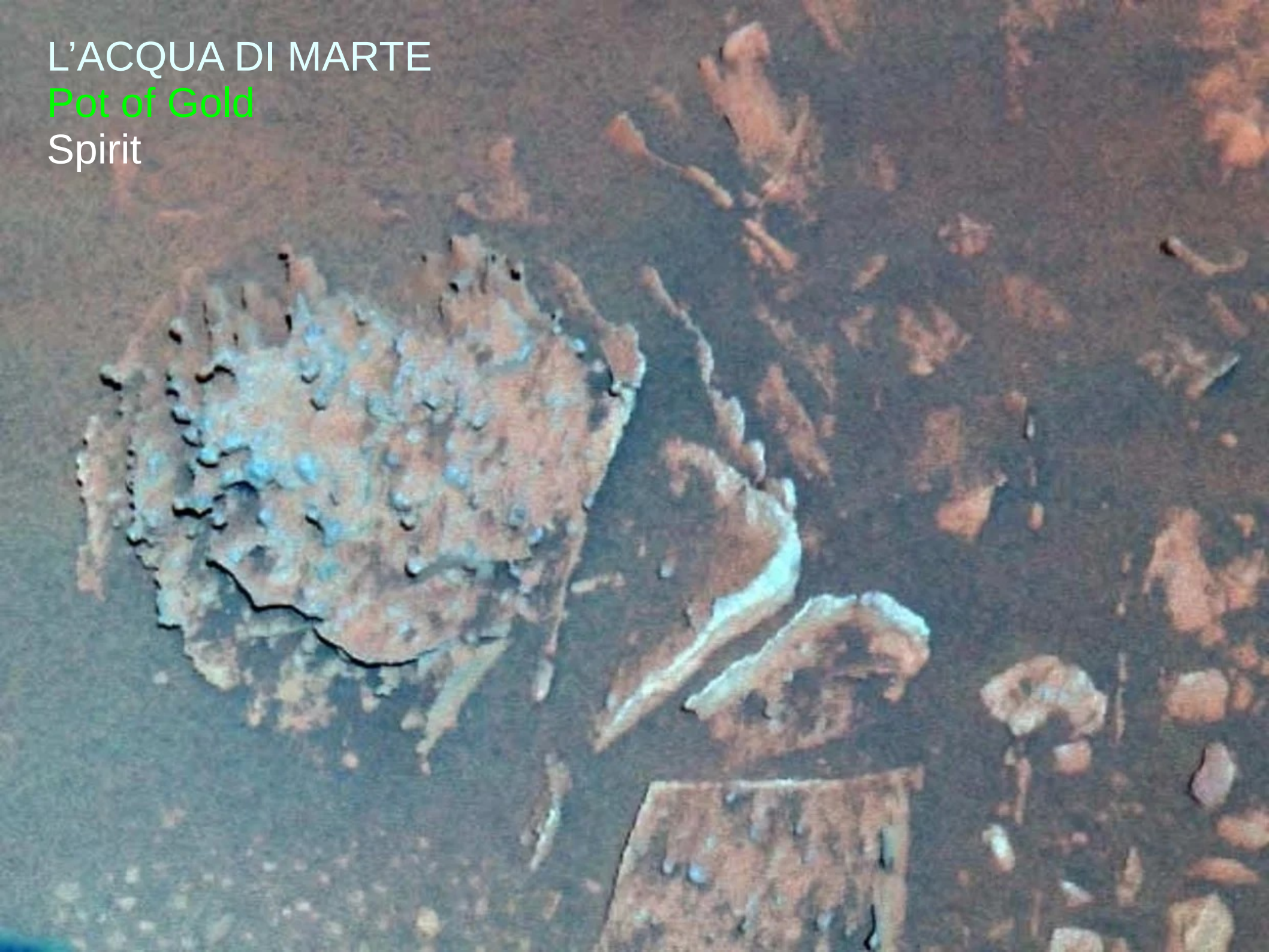
N→

10 km



L’ACQUA DI MARTE


© ESA/DLR/FU Berlin (G. Neukum)
L’ACQUA DI MARTE
N
10 km


L’ACQUA DI MARTE
Pot of Gold
Spirit

L’ACQUA DI MARTE

Pot of Gold

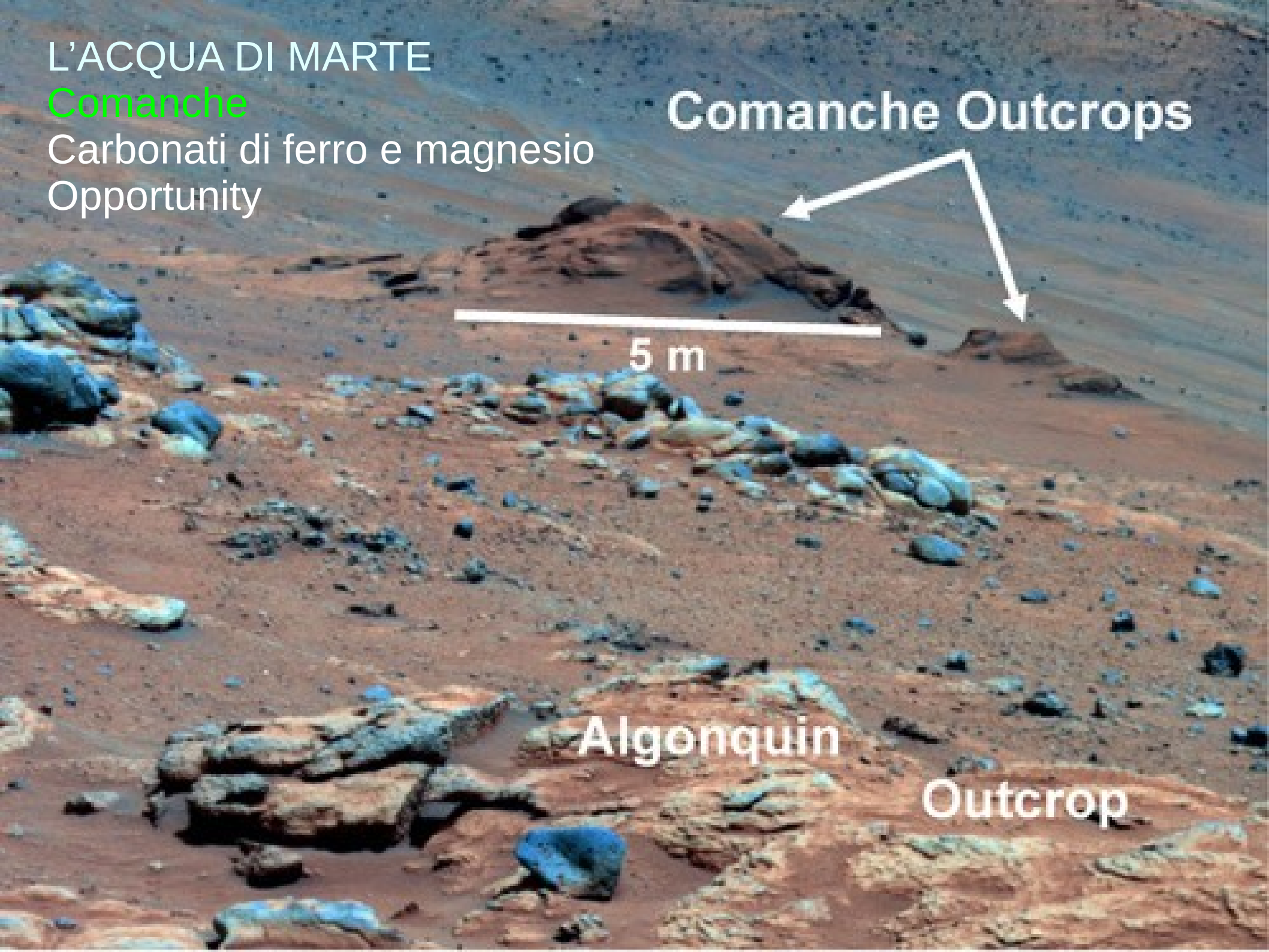
ematite

L’ACQUA DI MARTE

Comanche

Carbonati di ferro e magnesio

Opportunity

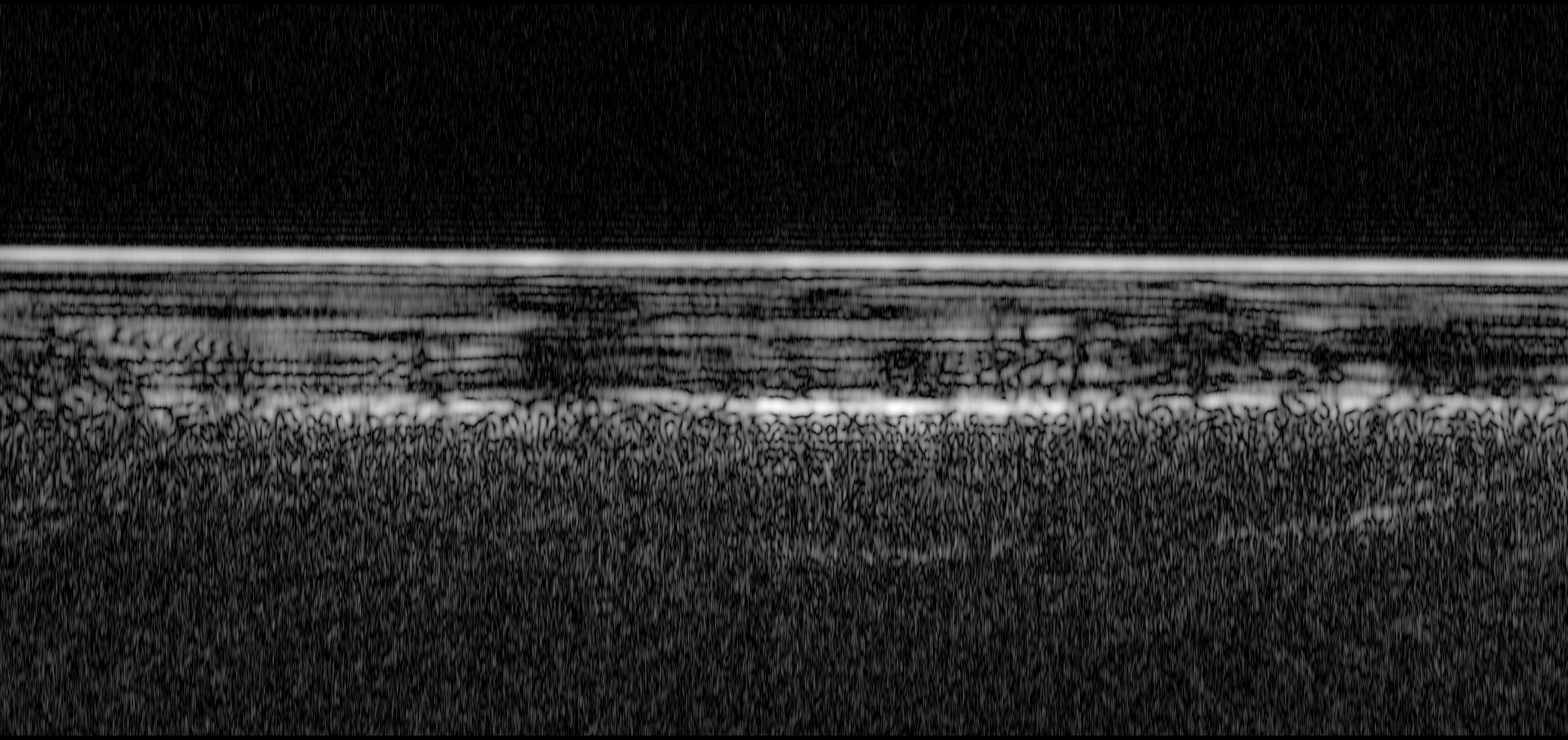


L’ACQUA DI MARTE
Cratere Endeavour
Solfati di calcio (gesso)
Opportunity

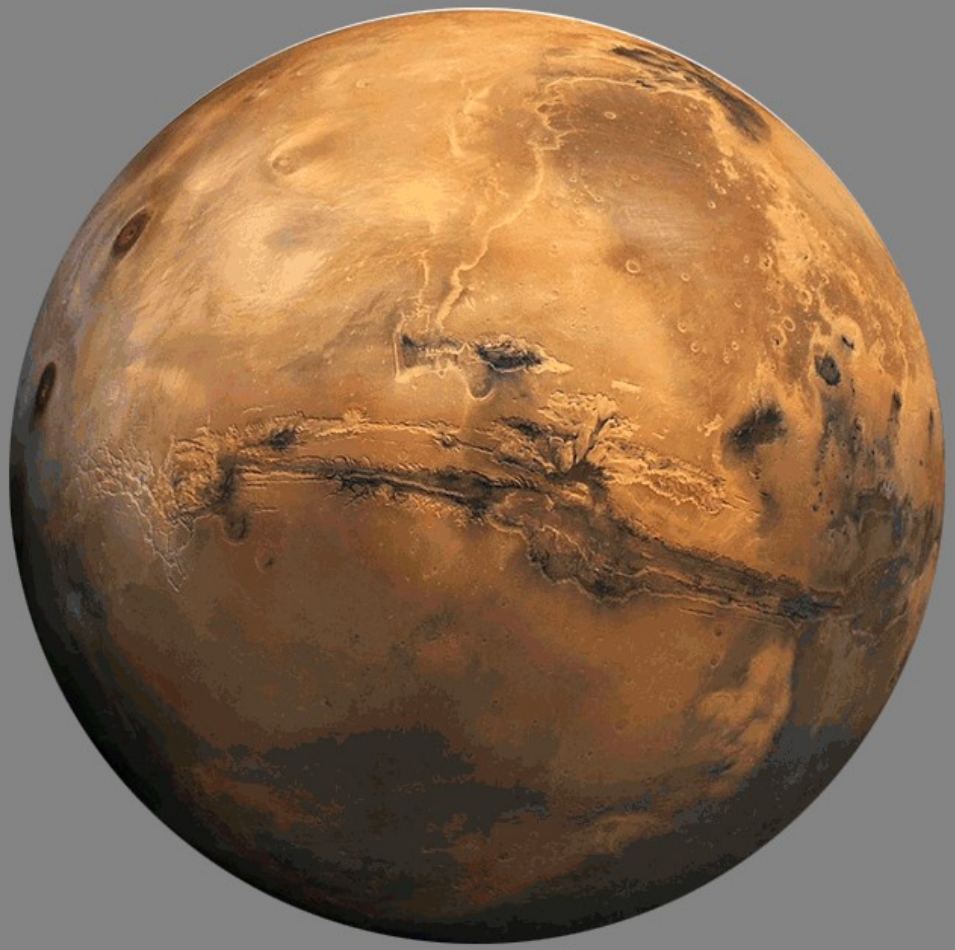
L’ACQUA DI MARTE

Radar Marsis di Mars Express

Acqua a 1,5 km di profondità → lago salmastro?



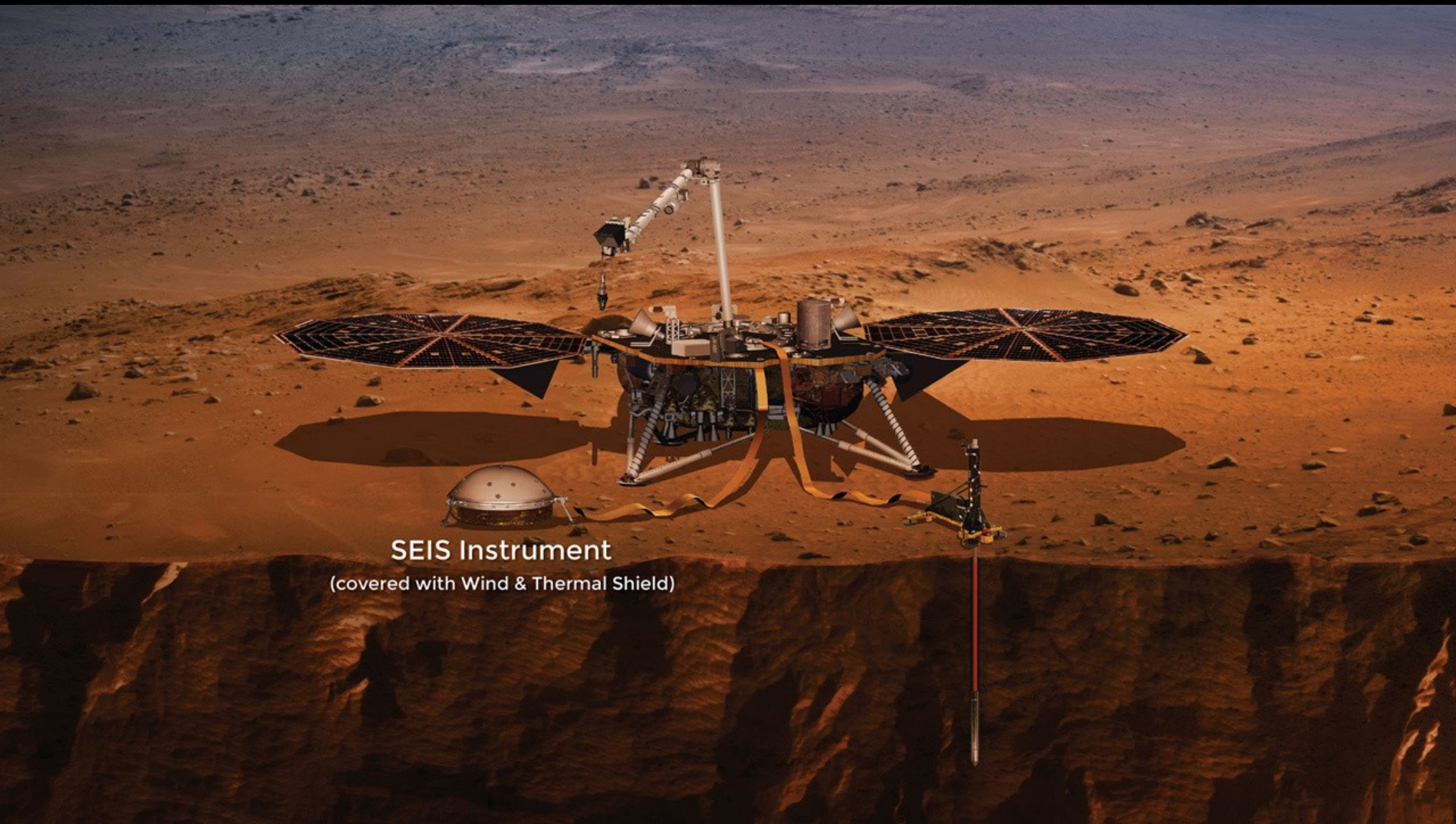
STRUTTURA INTERNA
Sismologia



STRUTTURA INTERNA

Sismologia

Insight



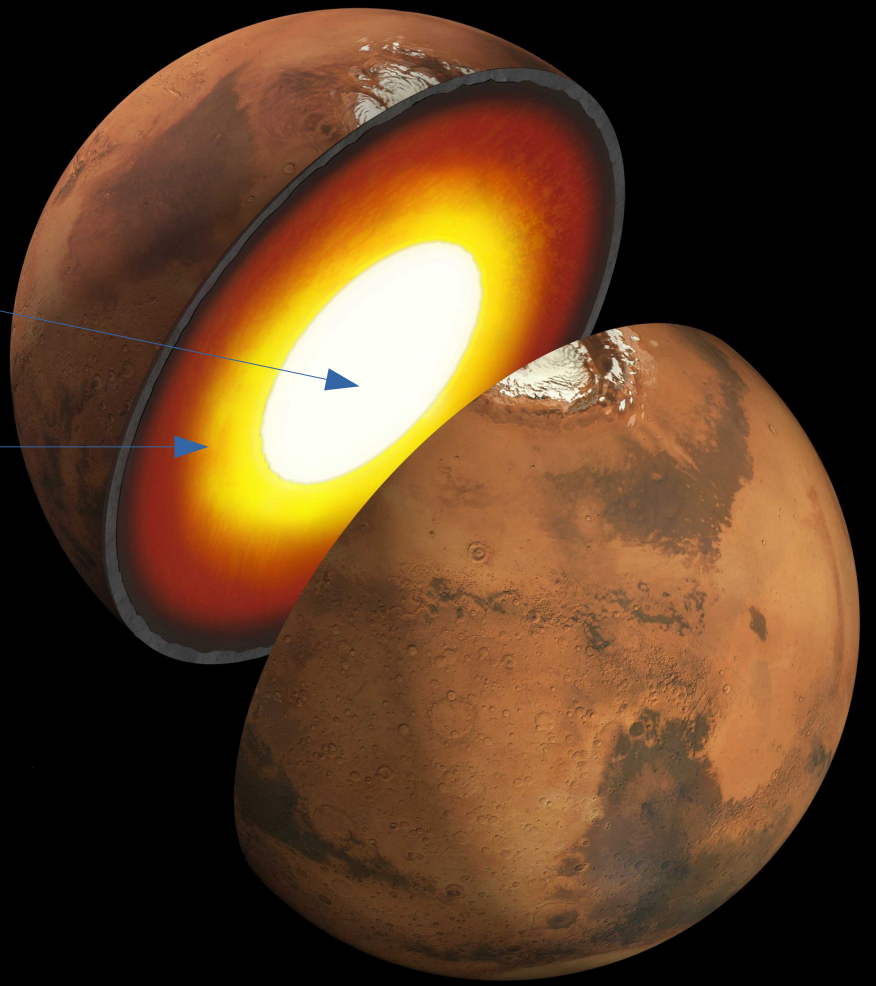
STRUTTURA INTERNA

Nucleo

Fe, Ni, S; diametro 2400 km

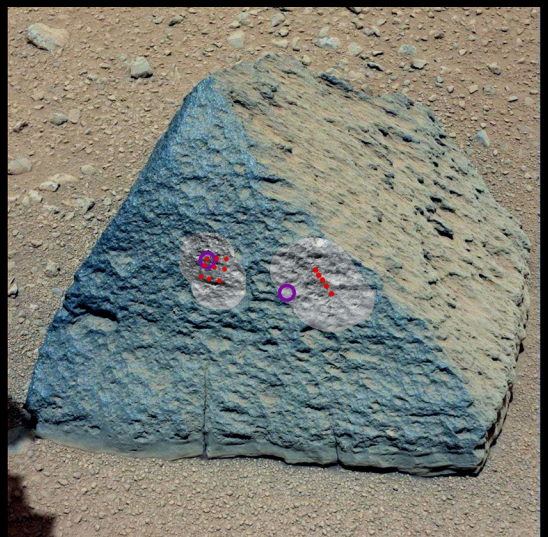
Mantello

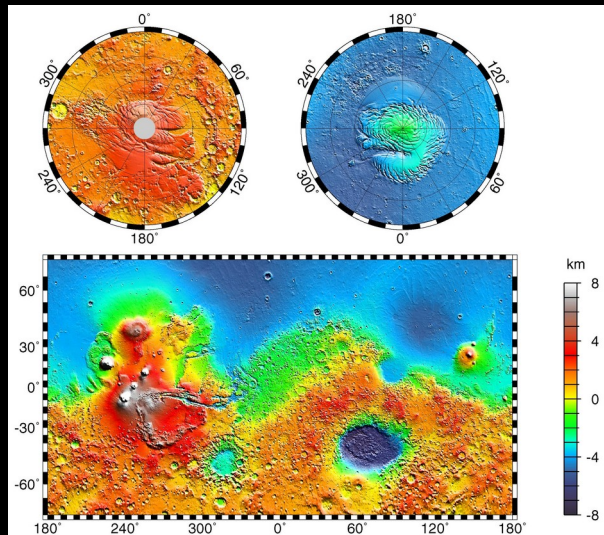
Costituito da peridotiti
→ rocce ricche di olivina
(minerale a base di Mg, Fe, silicati)



Crosta superficiale

Spessore fra 30 e 100 km
Quantità Fe_{Marte} = 2 quantità Fe_{Terra}
Rocce ricche di feldspati





ATMOSFERA

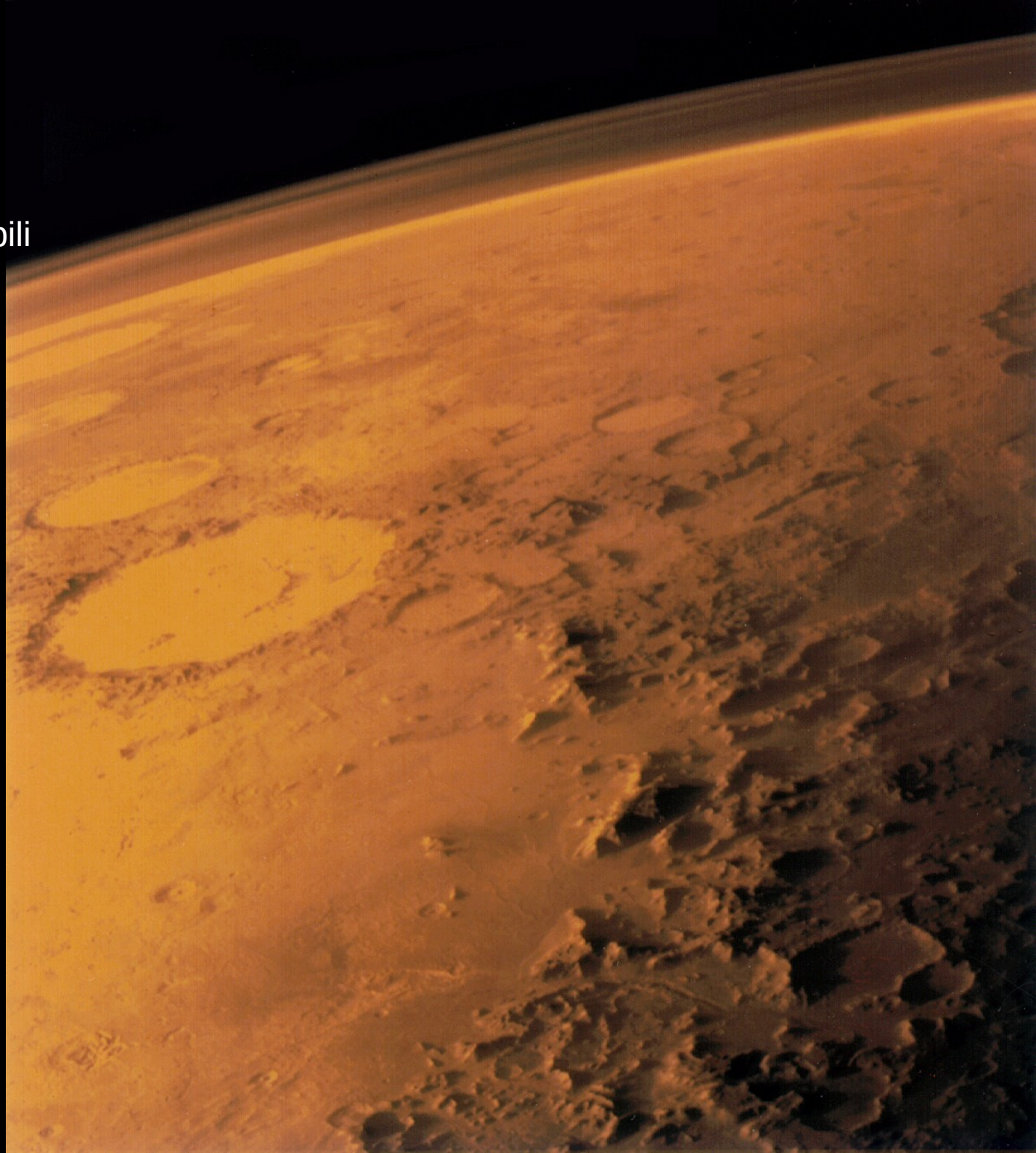
CO_2 95%

N_2 2,6%

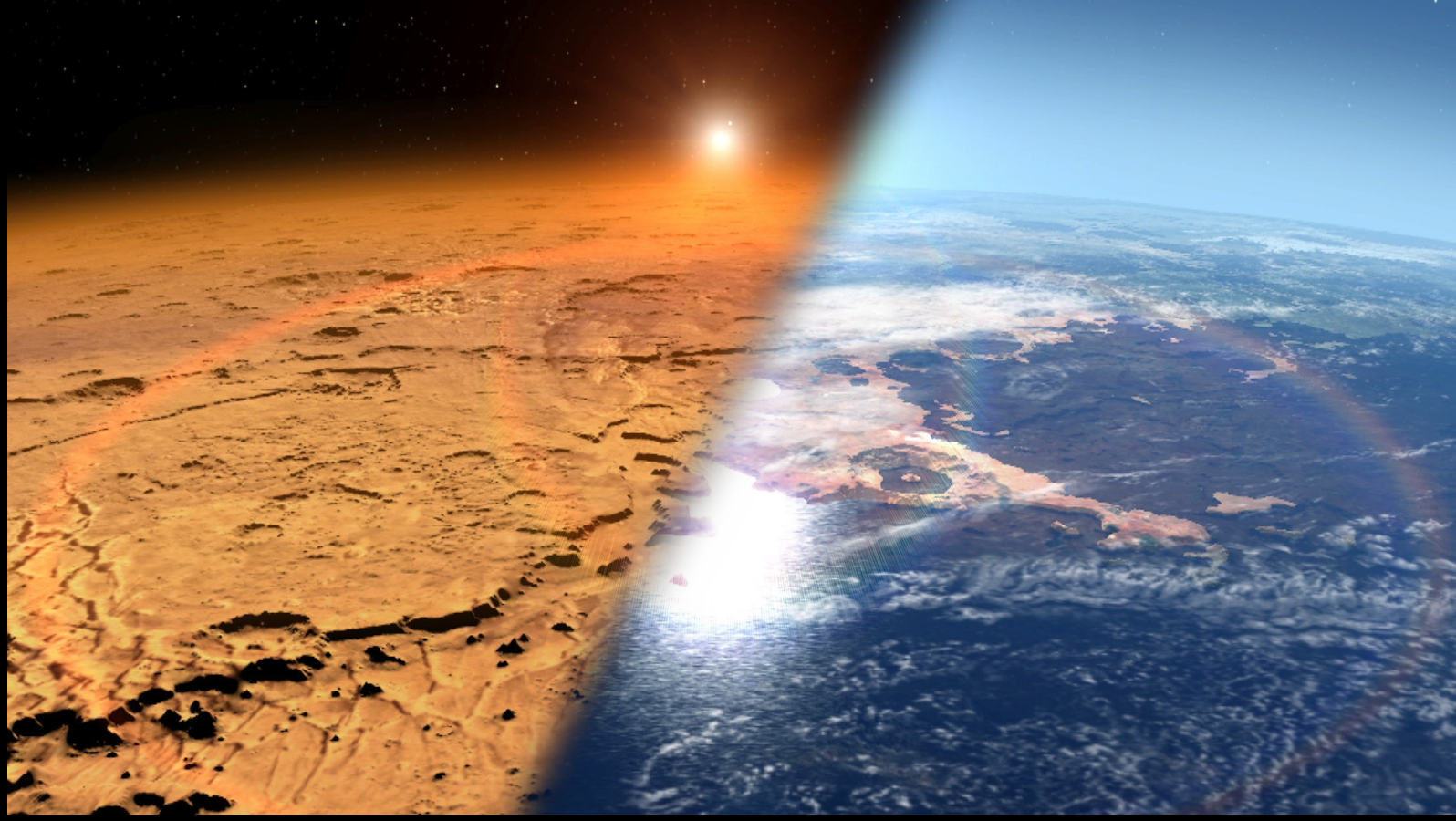
Ar 1,9%

Tracce O, H_2O, H, CO, gas nobili

$P = 1/100\ P_{terrestre}$

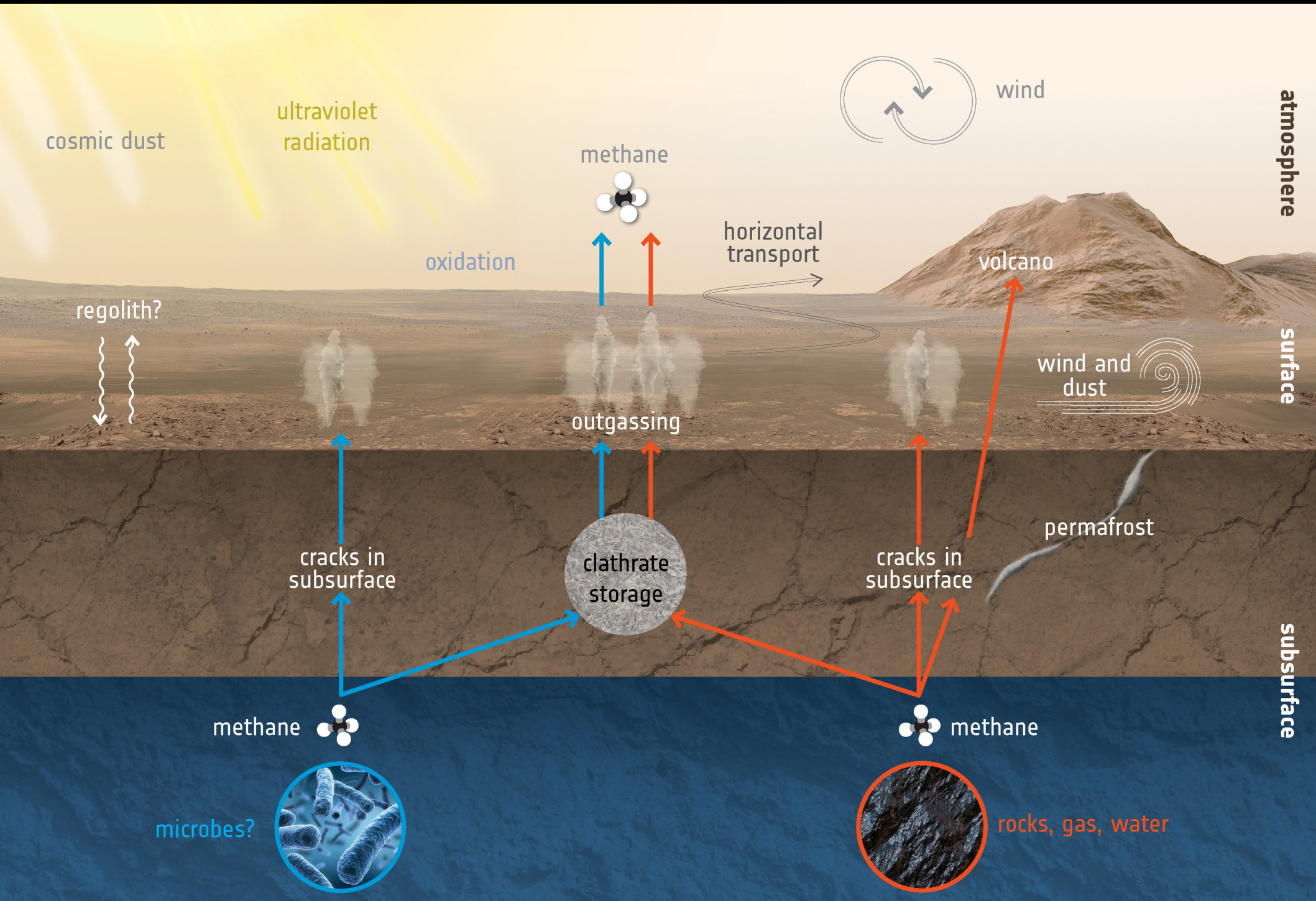


ATMOSFERA



ATMOSFERA

2003 scoperta del metano da parte di Mars Express



ATMOSFERA

Dust devils

MRO

Curiosity
vicino Mount Sharp
h = 50 m, d = 5 m

ATMOSFERA

MRO
2007
Utopia Planitia