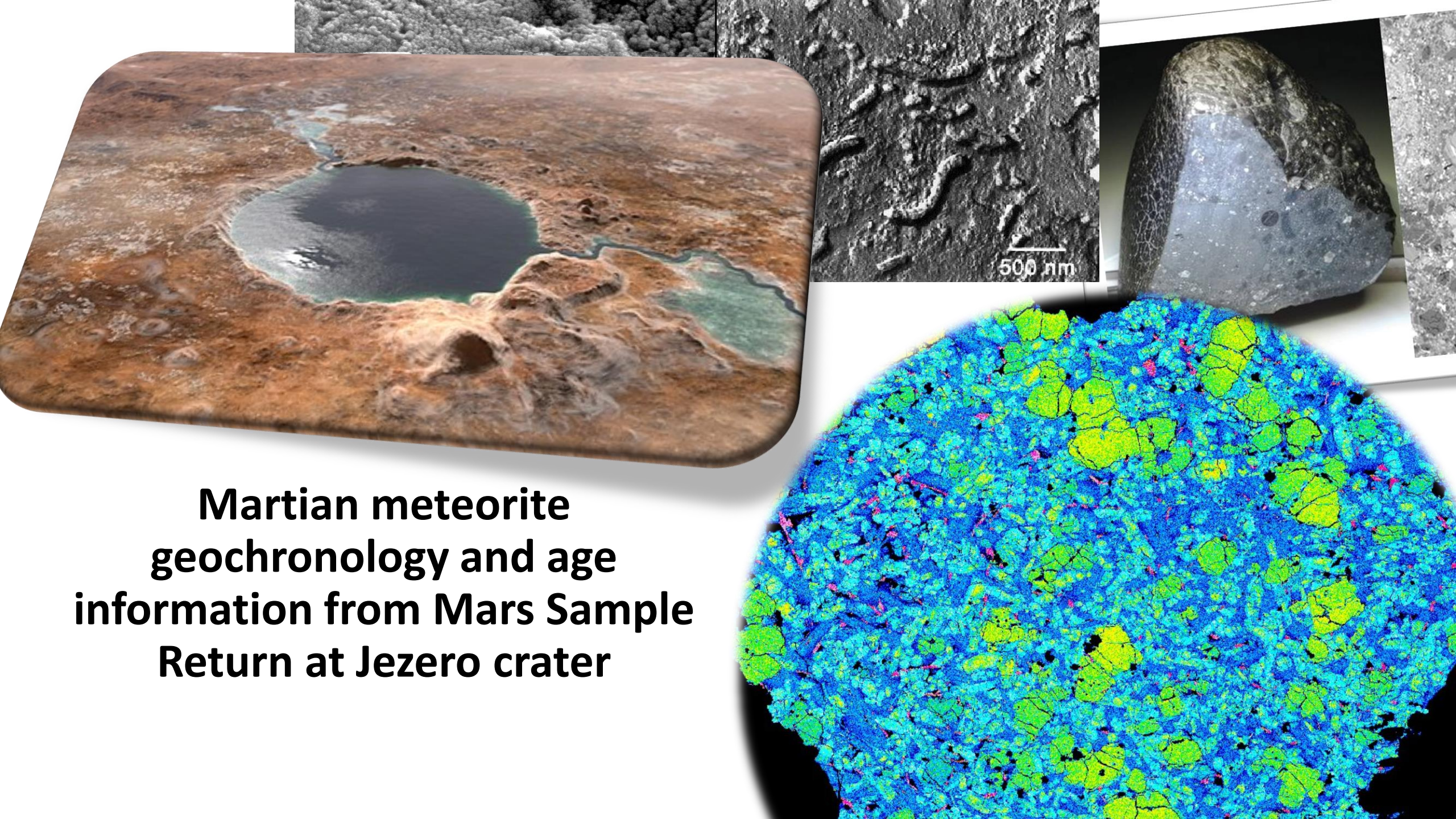




**Martian meteorite
geochronology and age
information from Mars Sample
Return at Jezero crater**

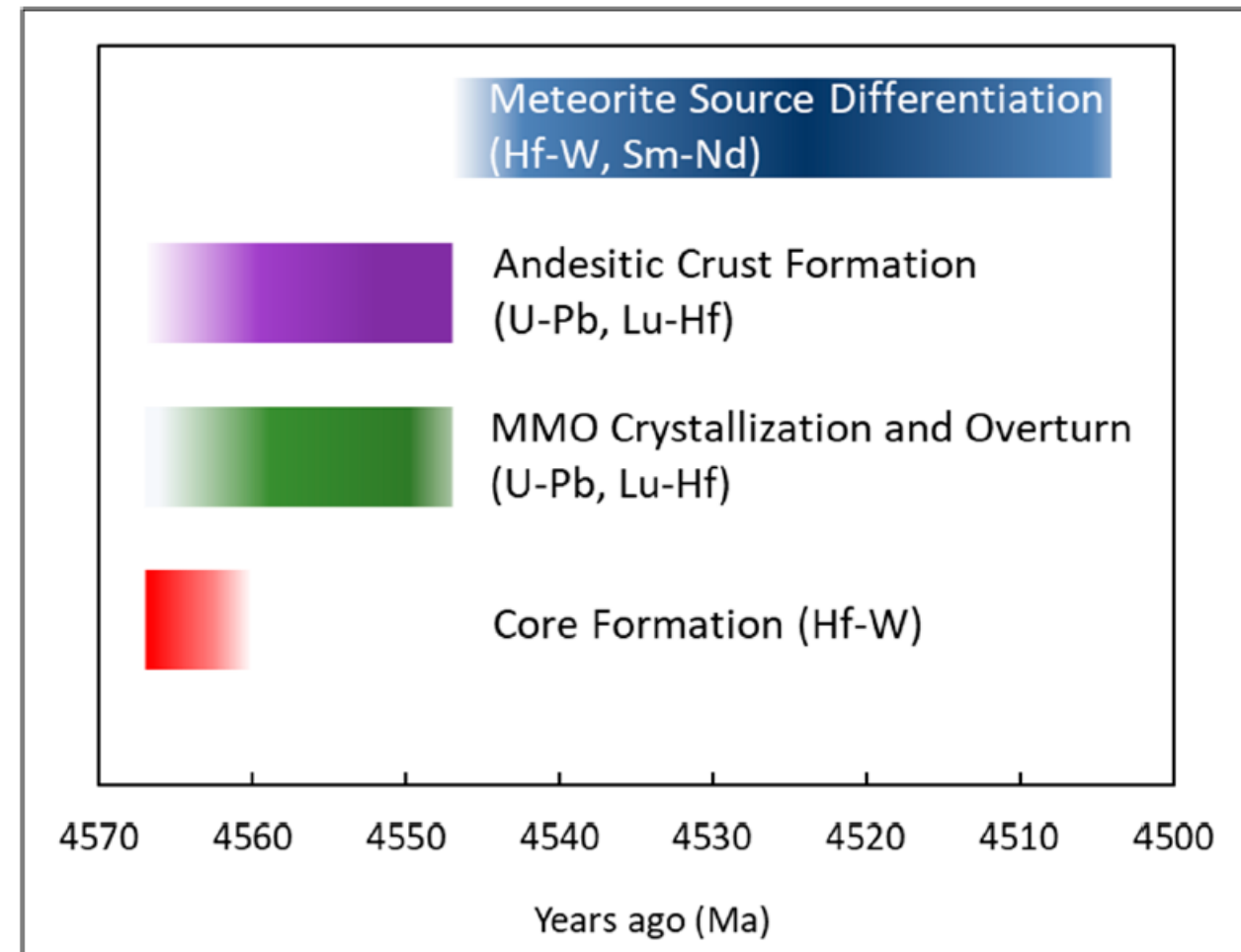
Martian meteorites

A chronological framework for Mar's formation – accretion, core formation and differentiation time-scales

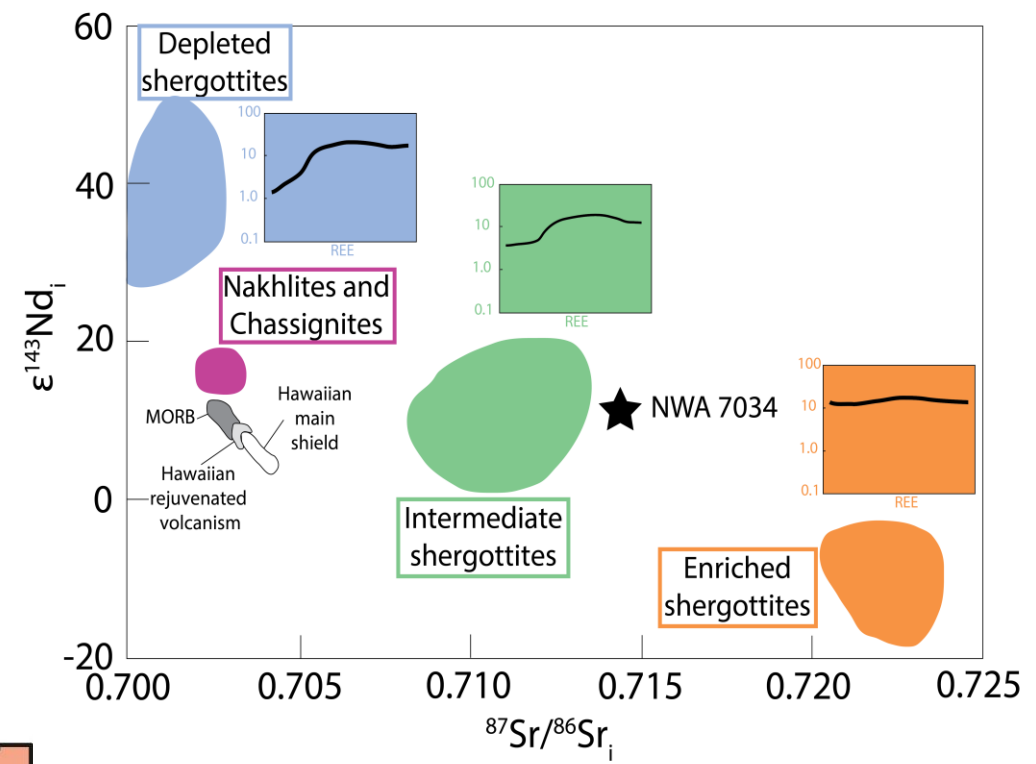
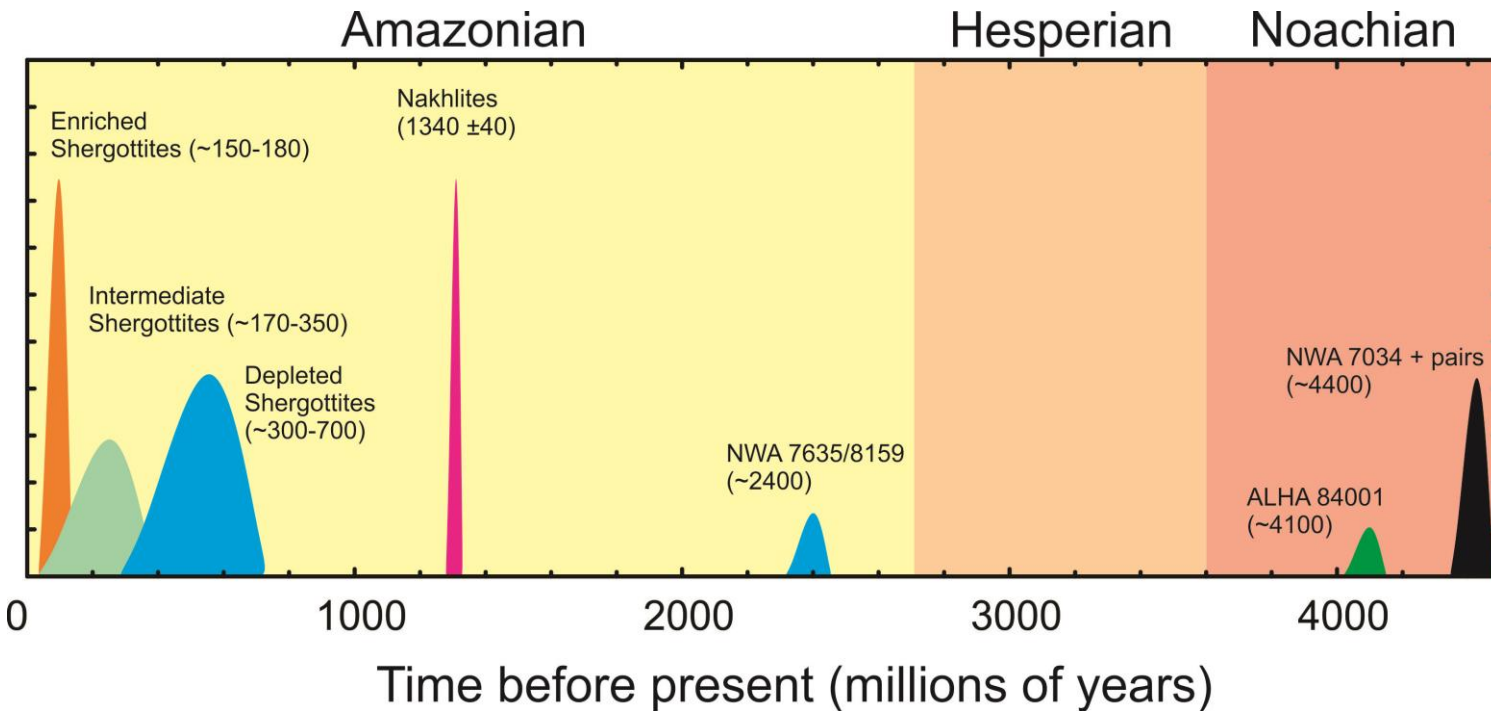
An imperfect record of magmatic events on Mars, showing basaltic volcanism occurring from ~4400 to ~150 Ma

Different styles of magmatism (shergottites vs. nakhlites)

Record evidence for alteration, metamorphic processes and impact ejection ages as well as terrestrial residence

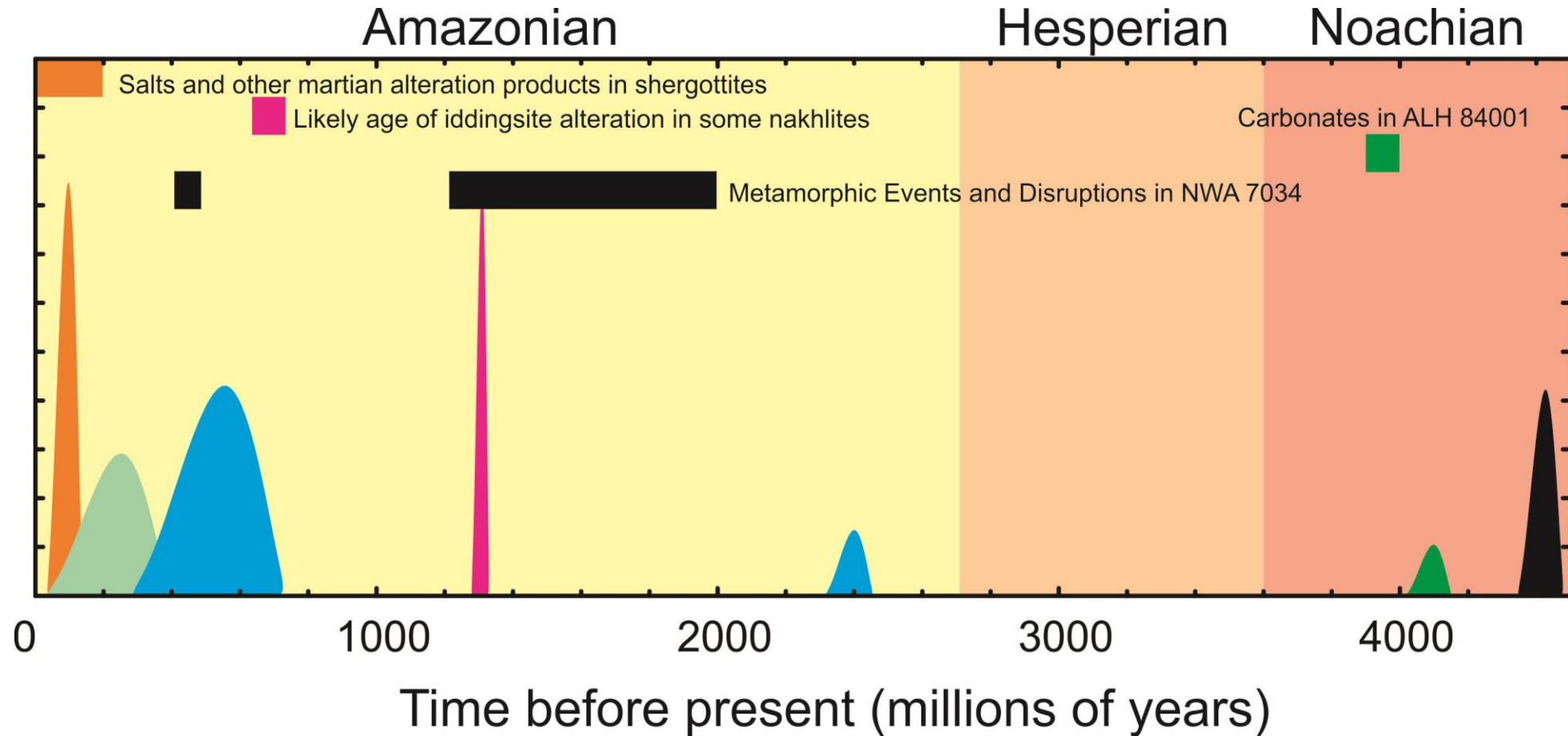


Meteorite crystallization ages



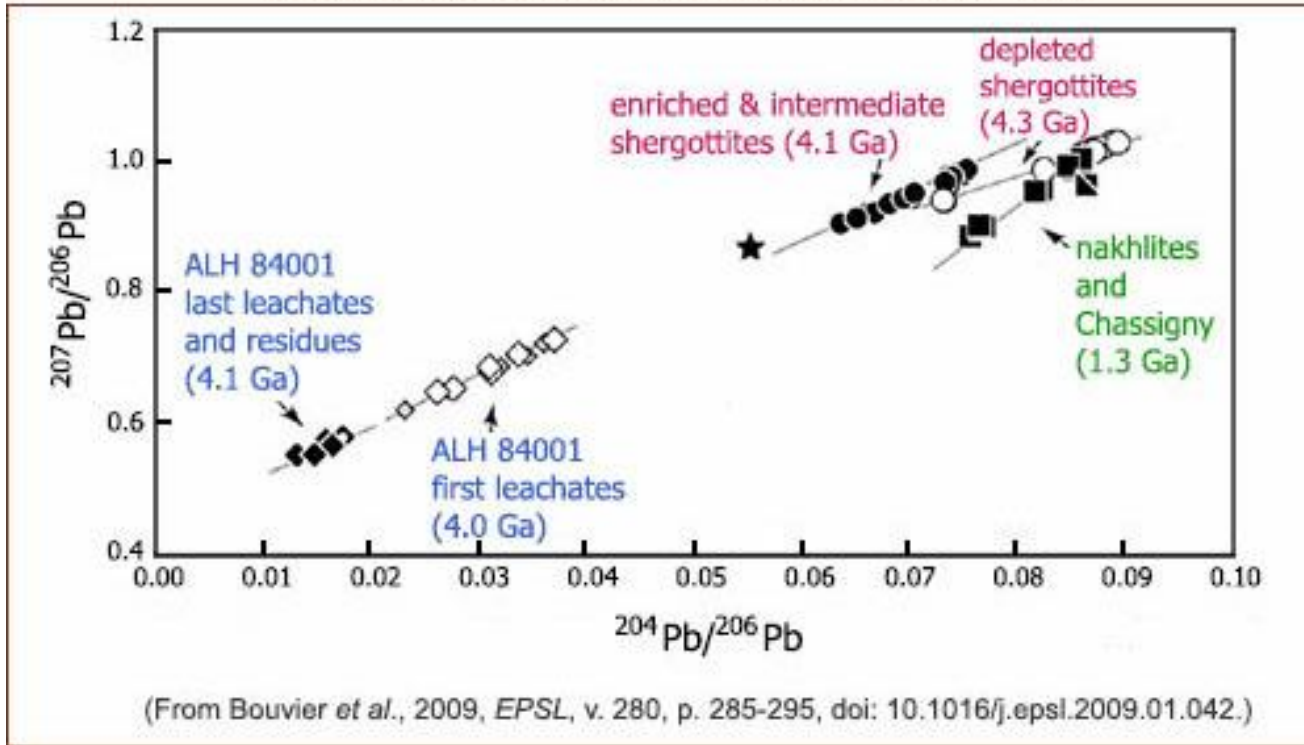
Udry et al. (2020) *JGR*

'Key events'



The martian lead paradox?

Pb-Pb Isochrons of Martian Meteorites



(From Bouvier *et al.*, 2009, *EPSL*, v. 280, p. 285-295, doi: 10.1016/j.epsl.2009.01.042.)

Pb-Pb 'isochrons' for shergottites indicate old apparent ages (>4 Ga)

Where measured in shergottites, Rb-Sr, Sm-Nd, Lu-Hf, Re-Os, Ar-Ar, U-Pb baddleyite are in agreement

Arguments for terrestrial contamination of Pb, **but surface contamination on Mars also possible**

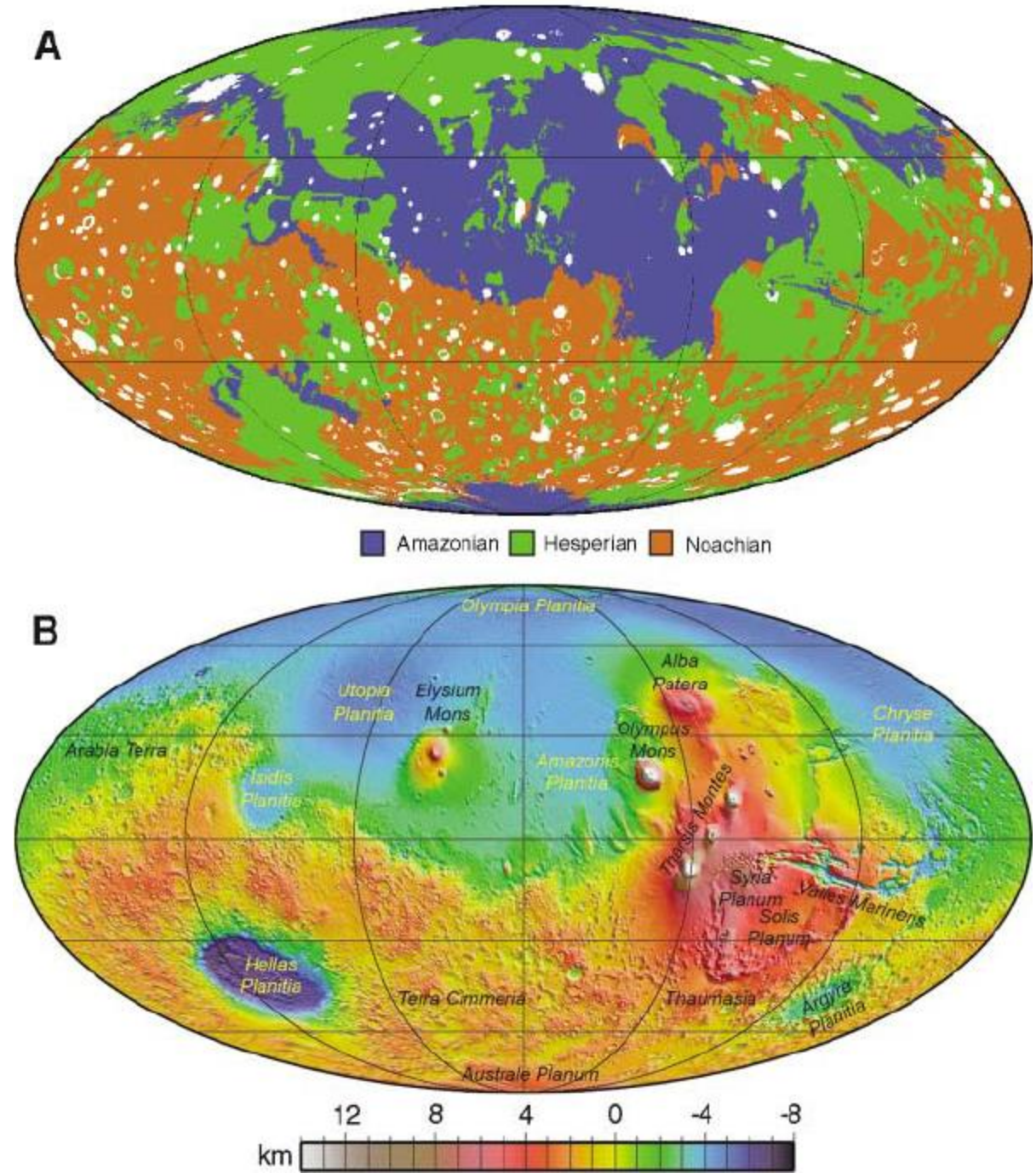
From PSRD Discoveries Website (G. Jeff Taylor)

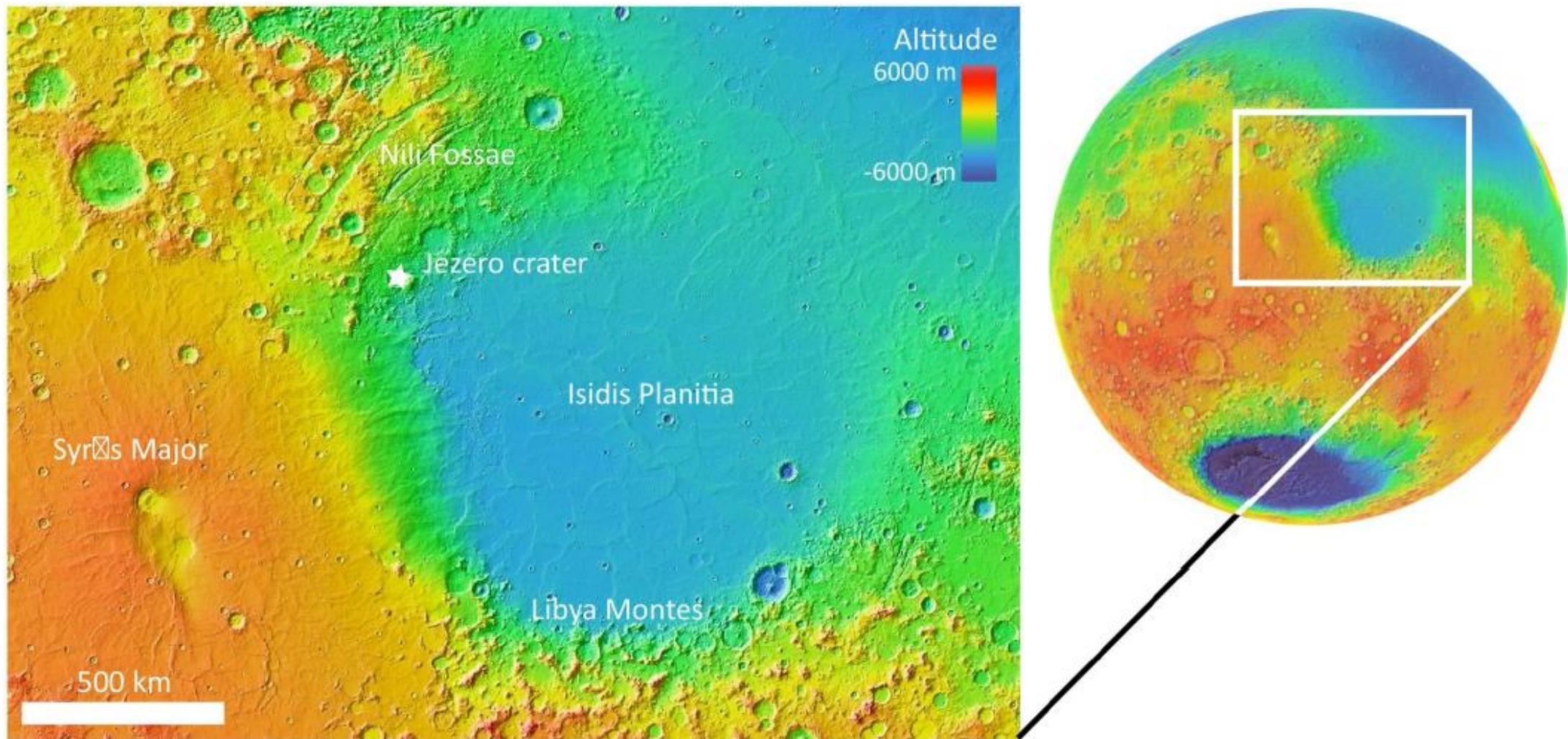
No source information

Majority of meteorites Amazonian in age.

Likely sources for nakhlites possibly in Tharsis Montes region

*Major sources of uncertainty include **crater counting chronology**, spectral data and ground-truthing*



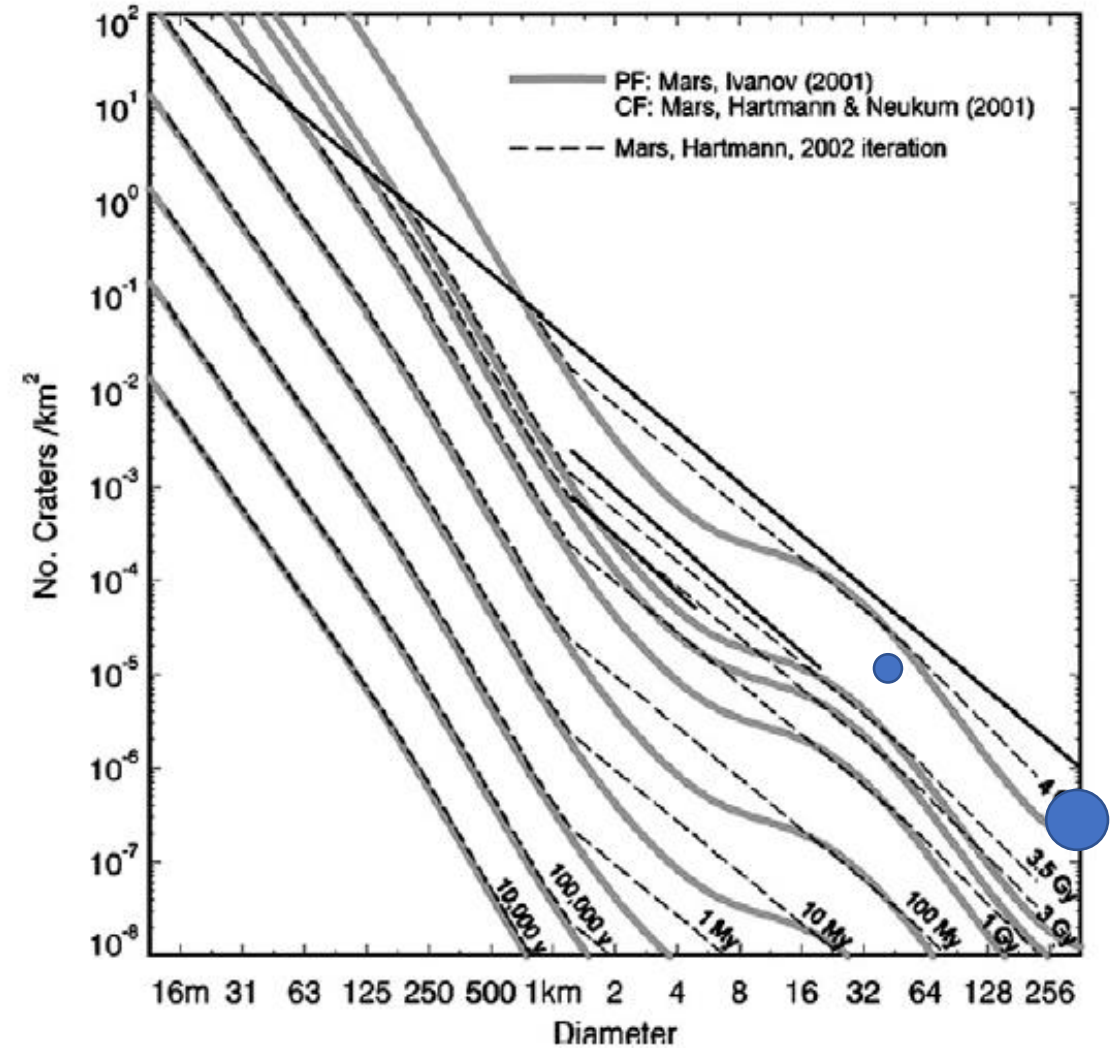


MSR from Jezero – (1) Eroded materials Nili Fossae, (2) volcanic deposits within Jezero; (3) impact ejecta materials?; (3) Jezero impact material; (4) Isidis Planitia Ejecta?; (5) Syrtis Major?

Chronology from MSR

Precise measurements in terrestrial laboratories (Ar-Ar, U-Pb, Rb-Sr, Sm-Nd) on rock materials as well as sedimentary and alteration products

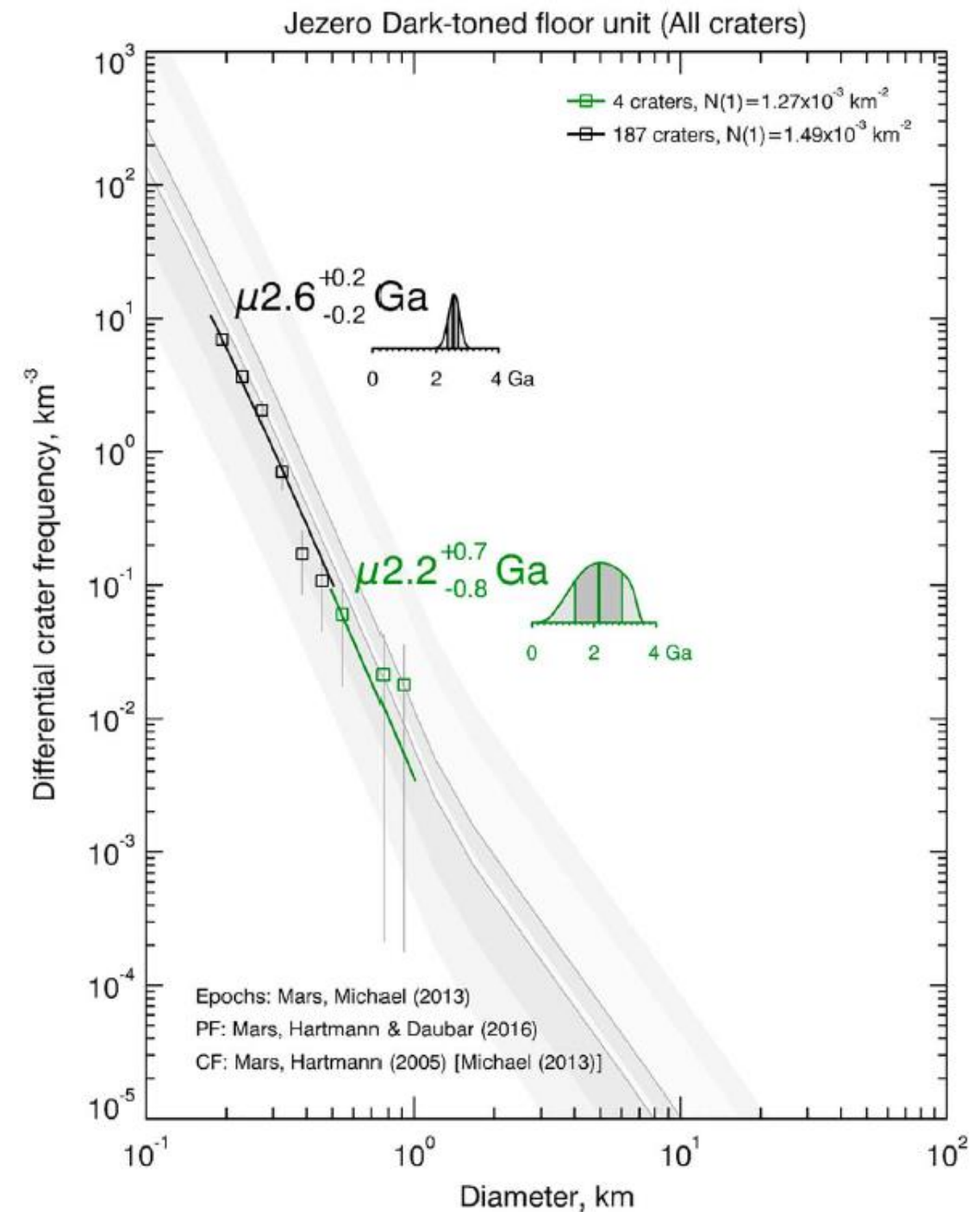
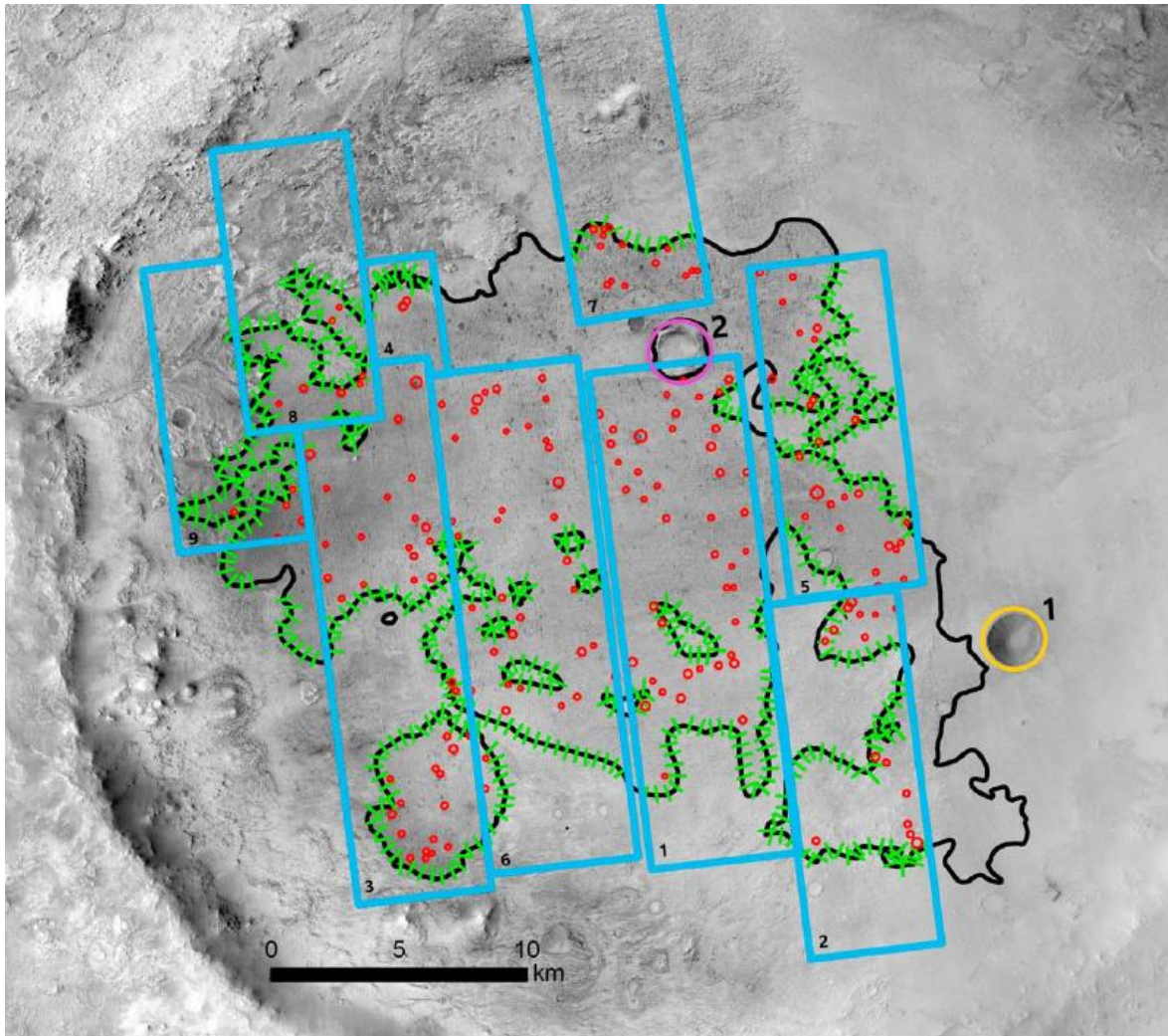
1. Impact chronology (Jerezo, Isidis, other impacts)
2. Volcanic chronology (e.g., Dark-toned unit inside Jezero, Nili Fossae)
3. Chronology of alteration processes (carbonates in Nili Fossae)



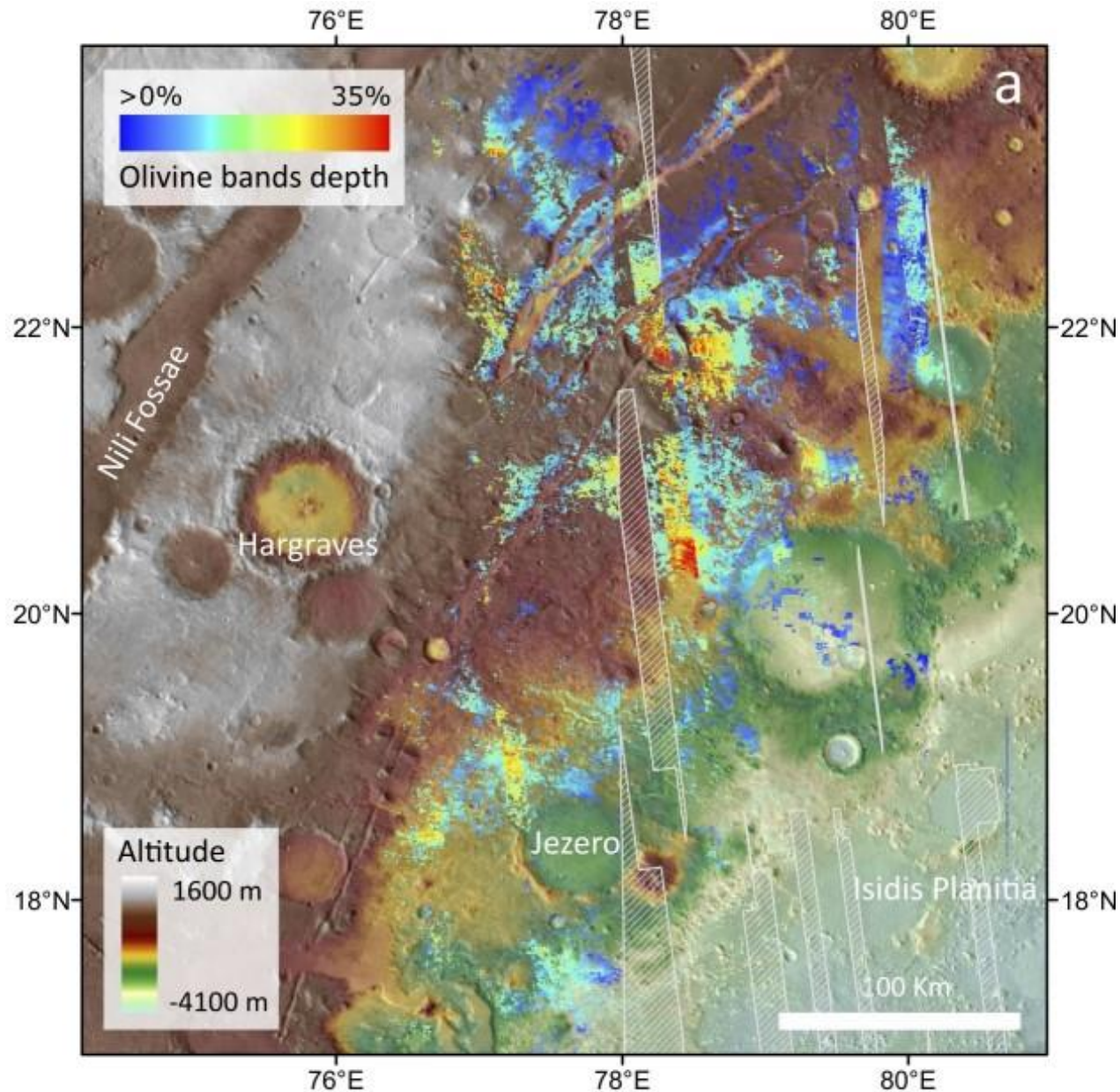
Crater Counting Chronology (CCC)

Dark-toned (Px-rich lava?) unit

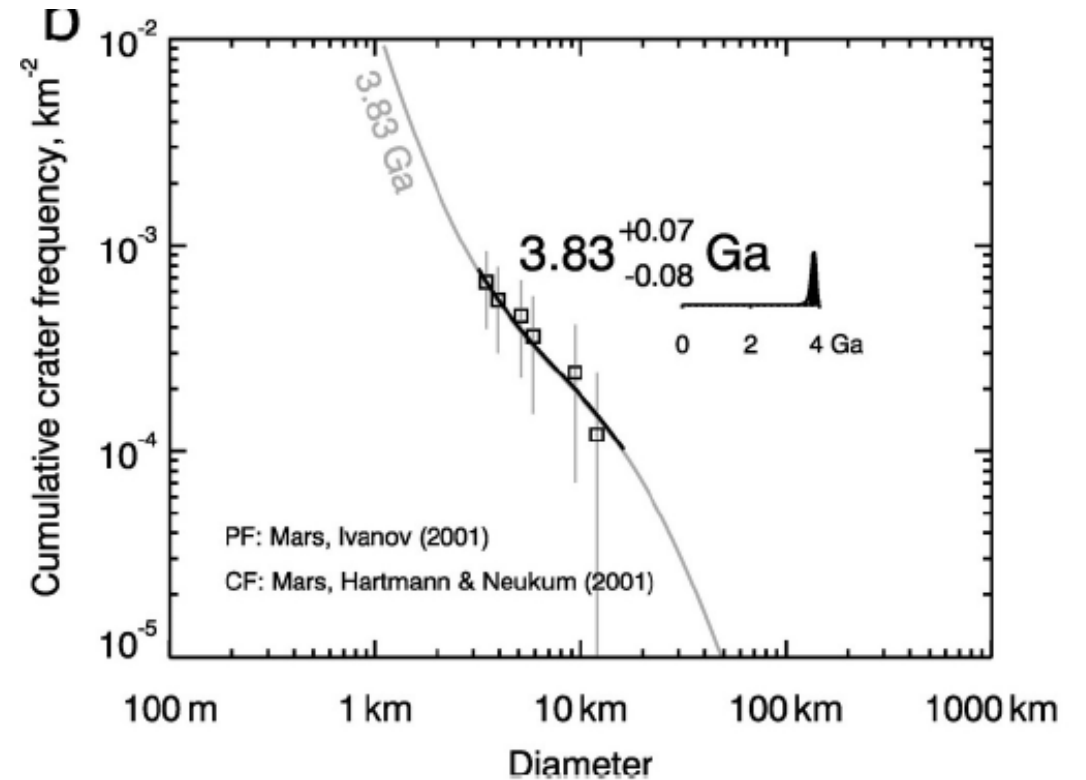
Shahrzad et al. (GRL, 2019)



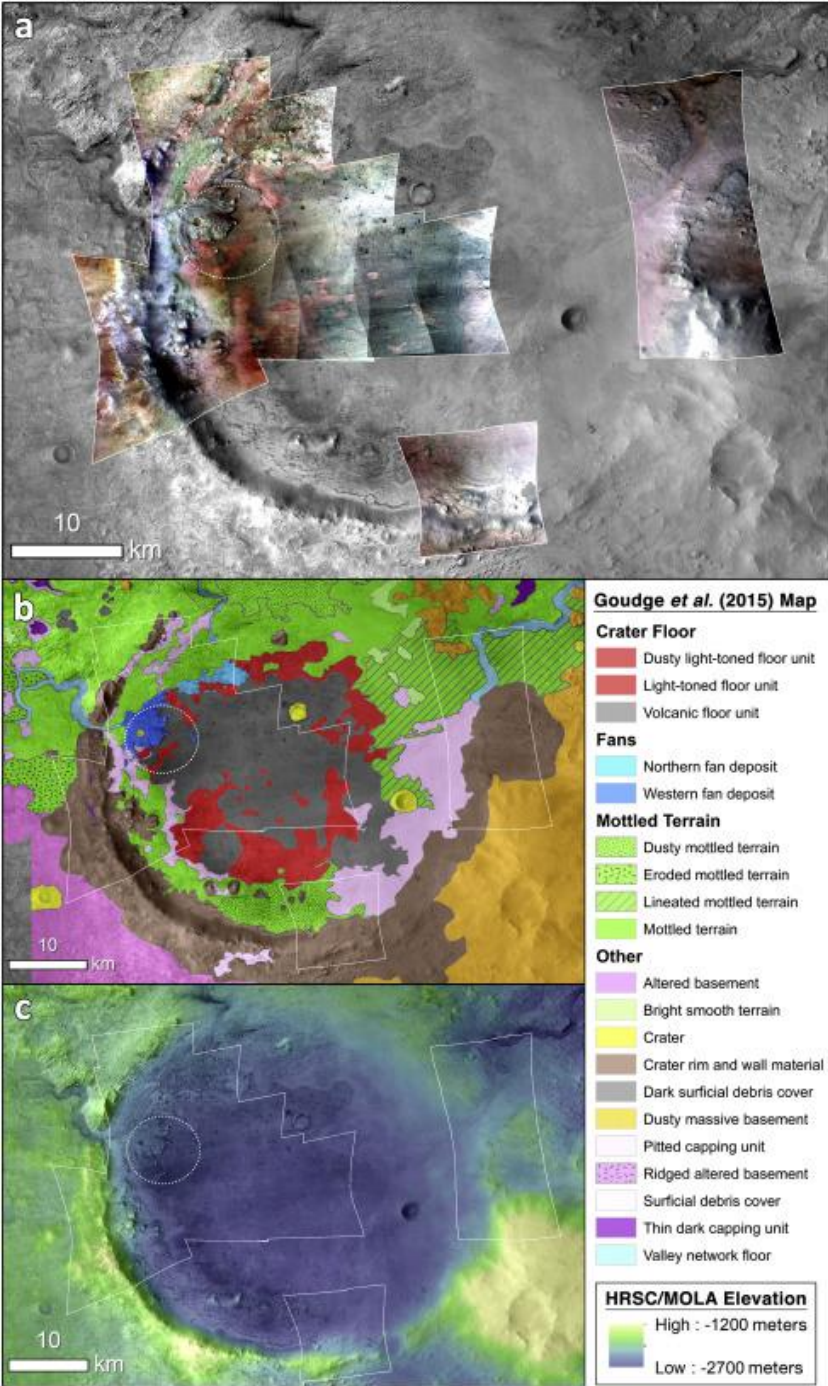
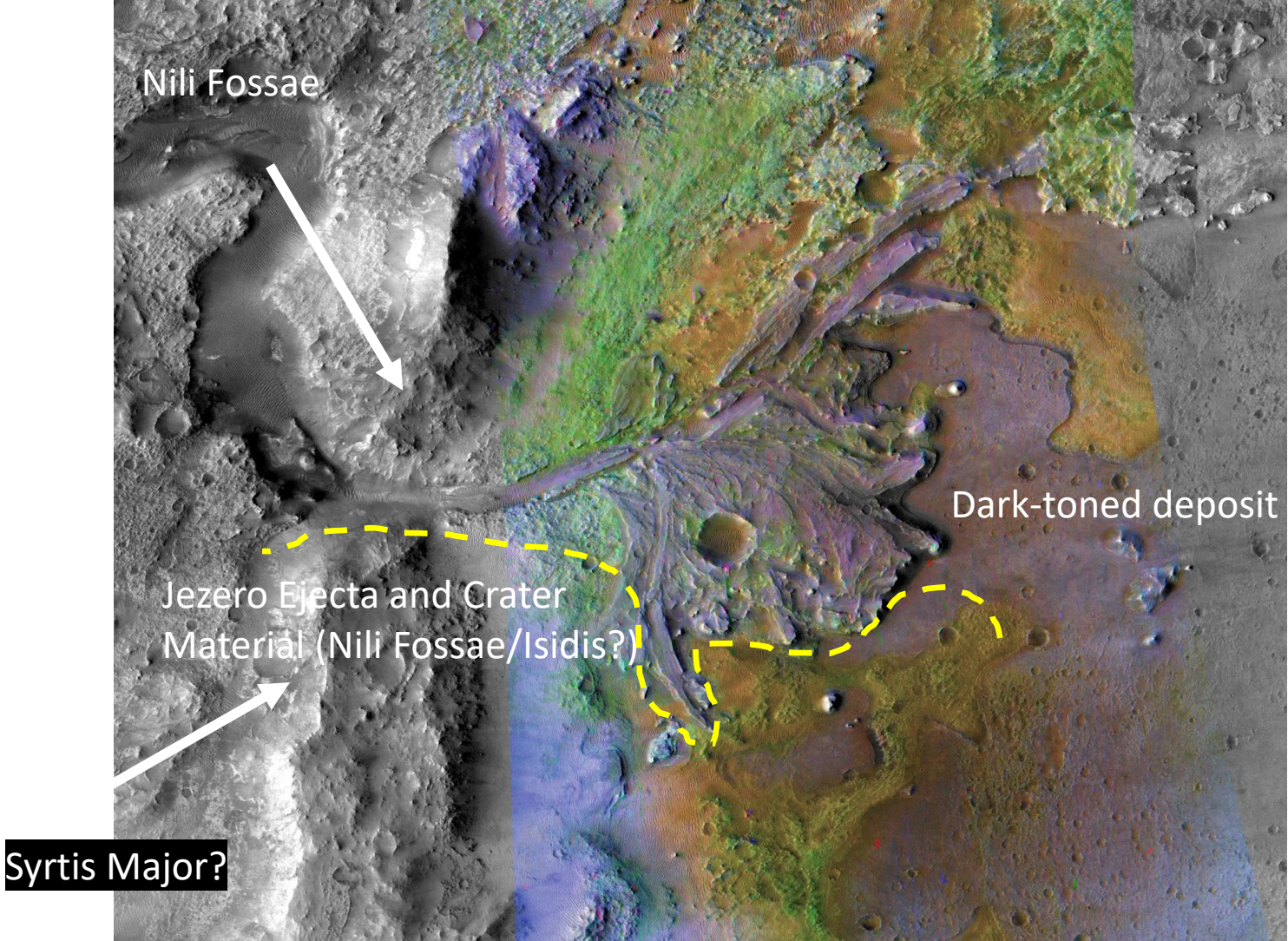
Olivine-rich region of Nili Fossae



Mandon et al. Icarus 2019



Jezero Crater



Jezero Crater Chronology

