

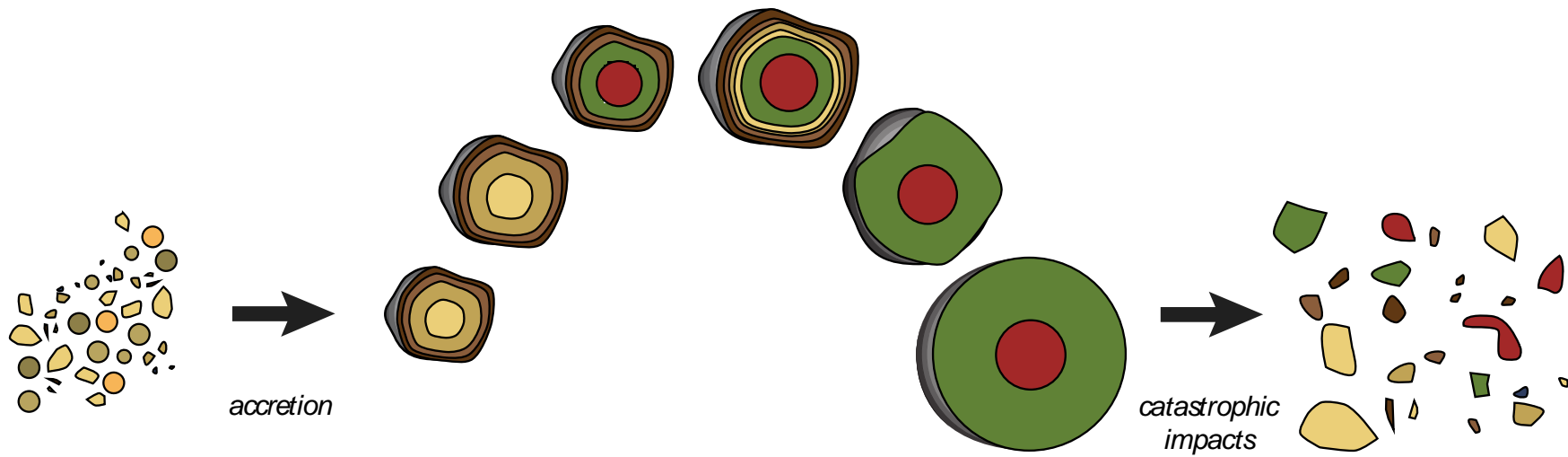
# How did the Earth get its water?

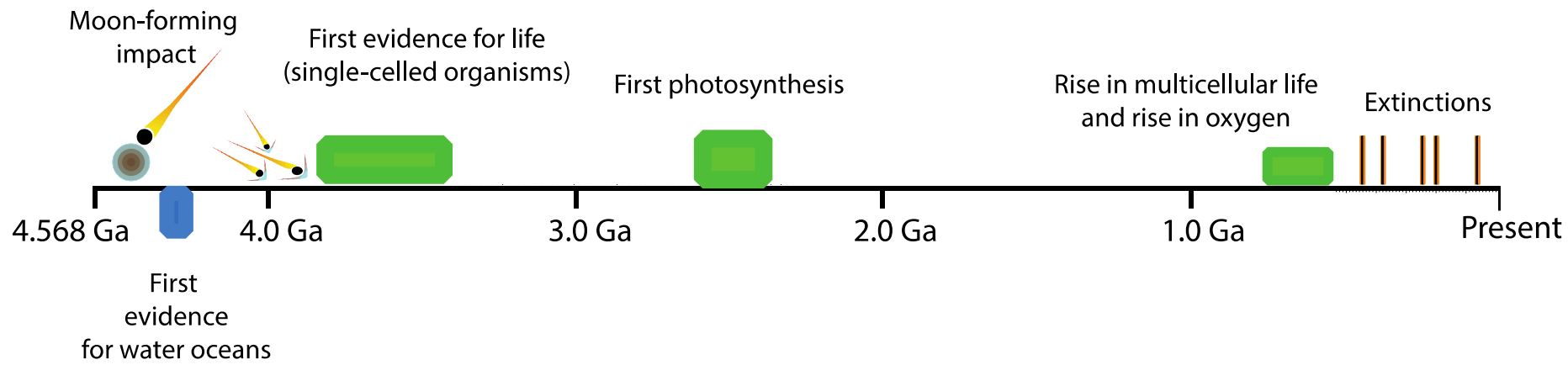
Lindy Elkins-Tanton

School of Earth and Space  
Exploration

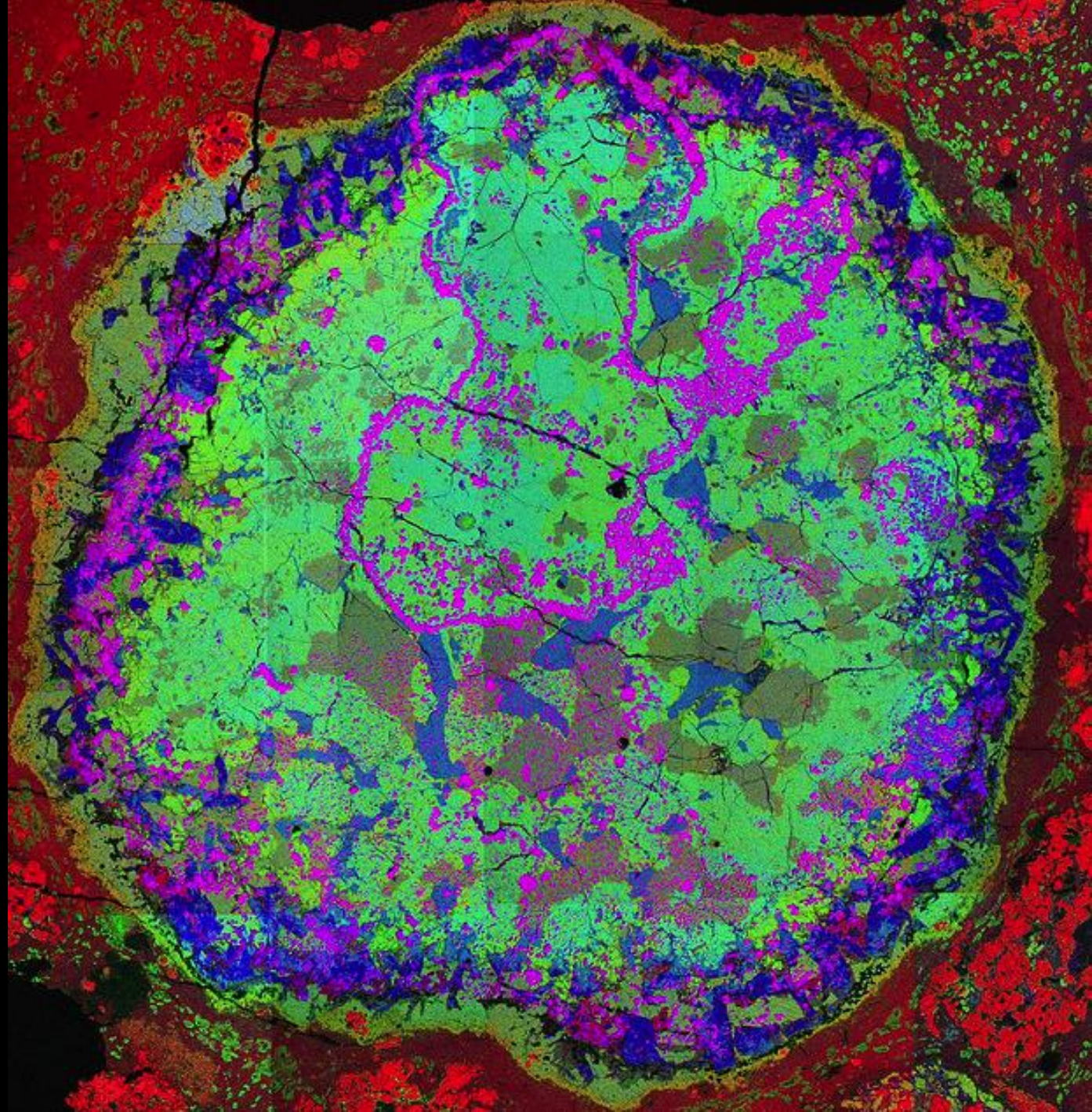
Arizona State University



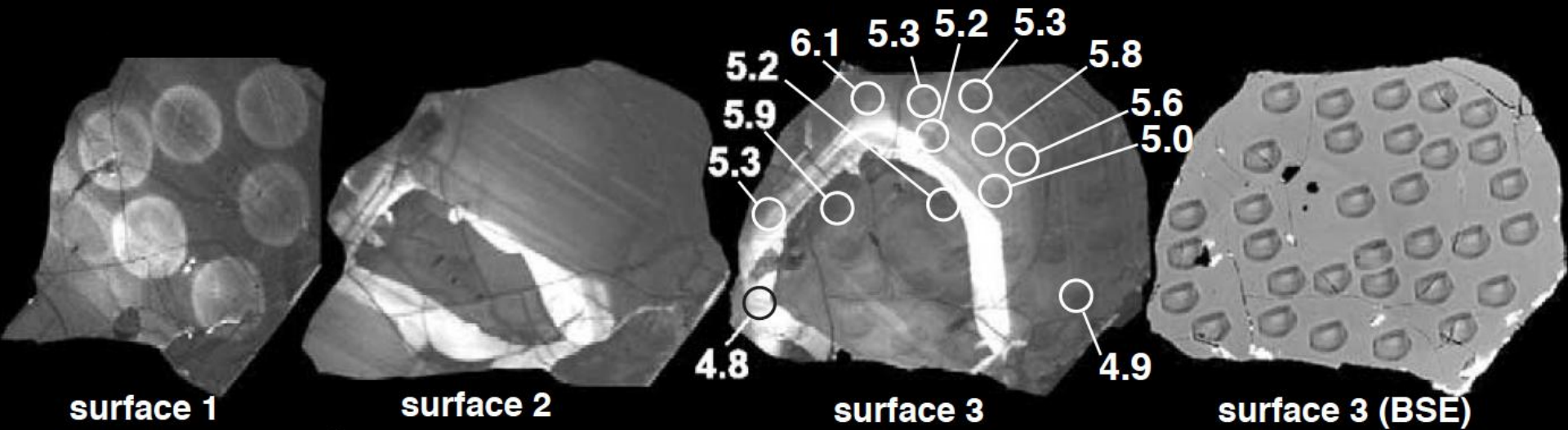





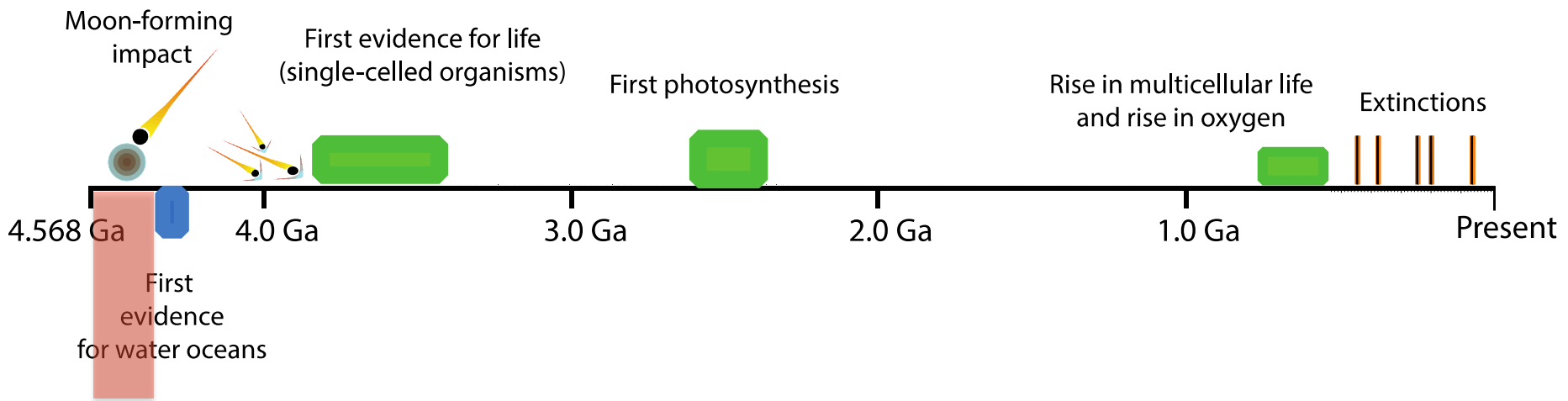




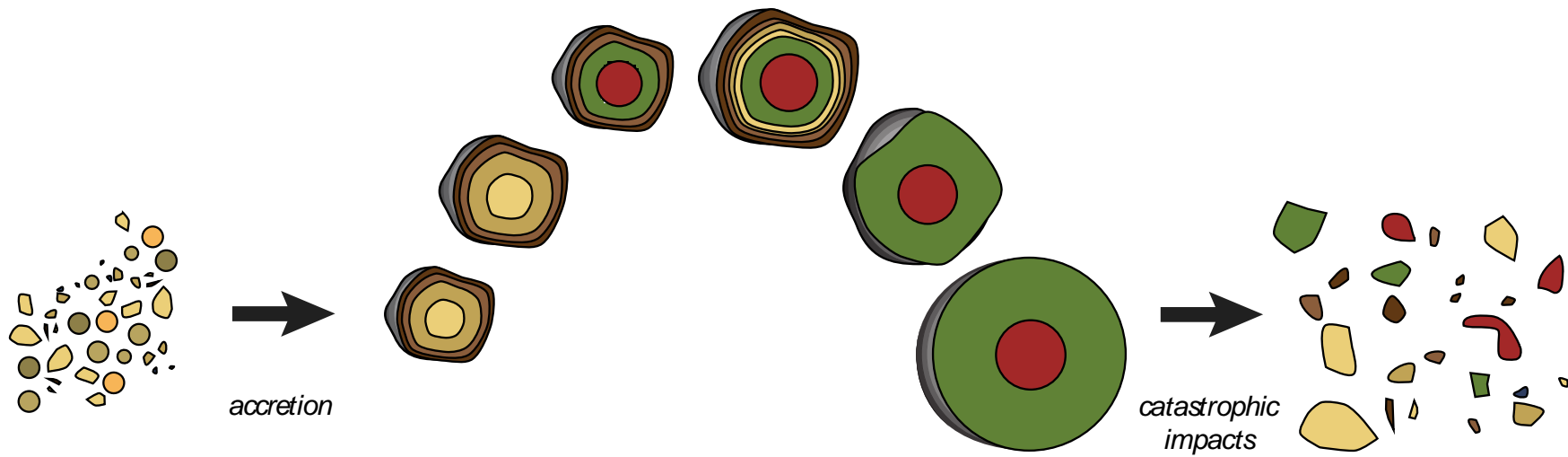




**(ab) W74/2-36:  $4404 \pm 4$   $5.4 \pm 0.4\%$ .**  100 microns



270 Myr

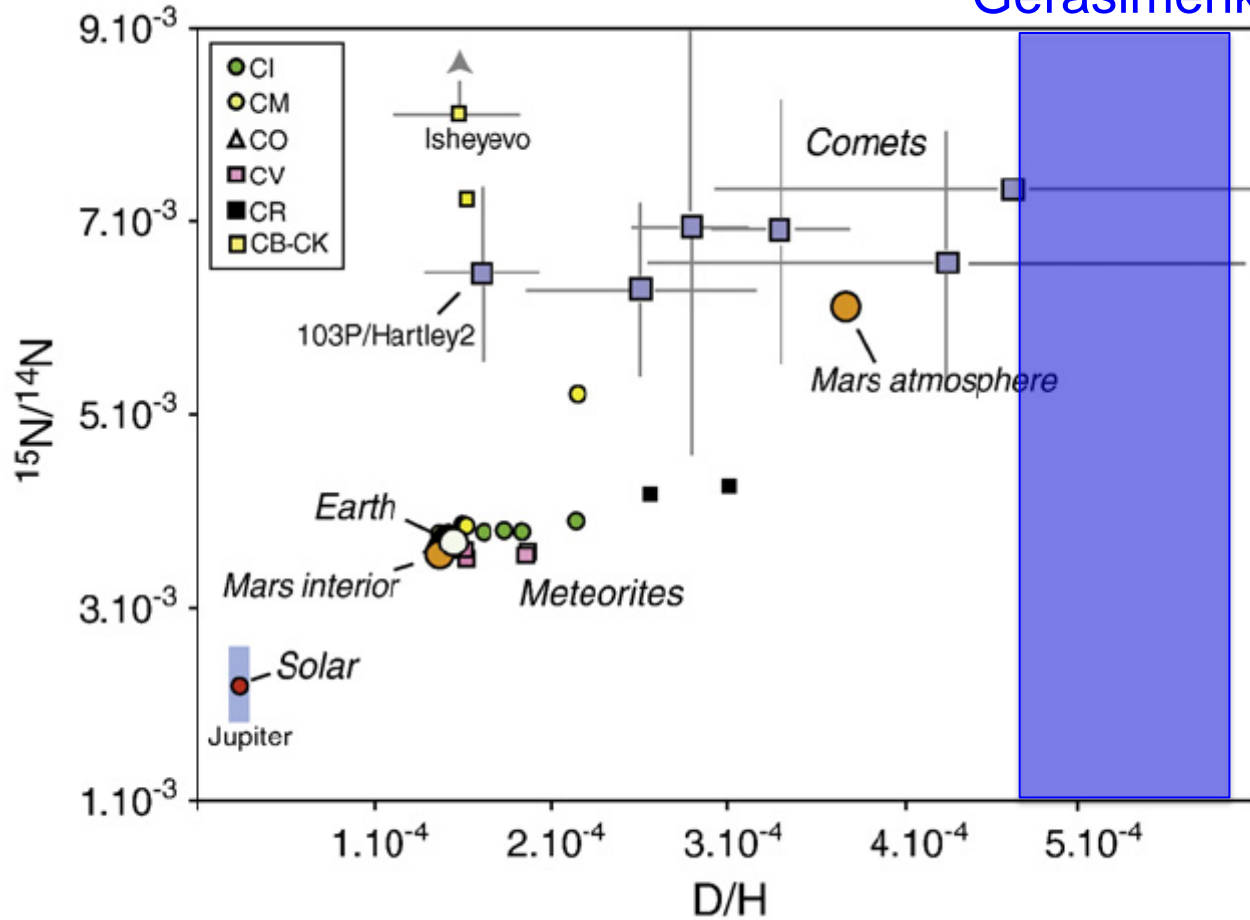






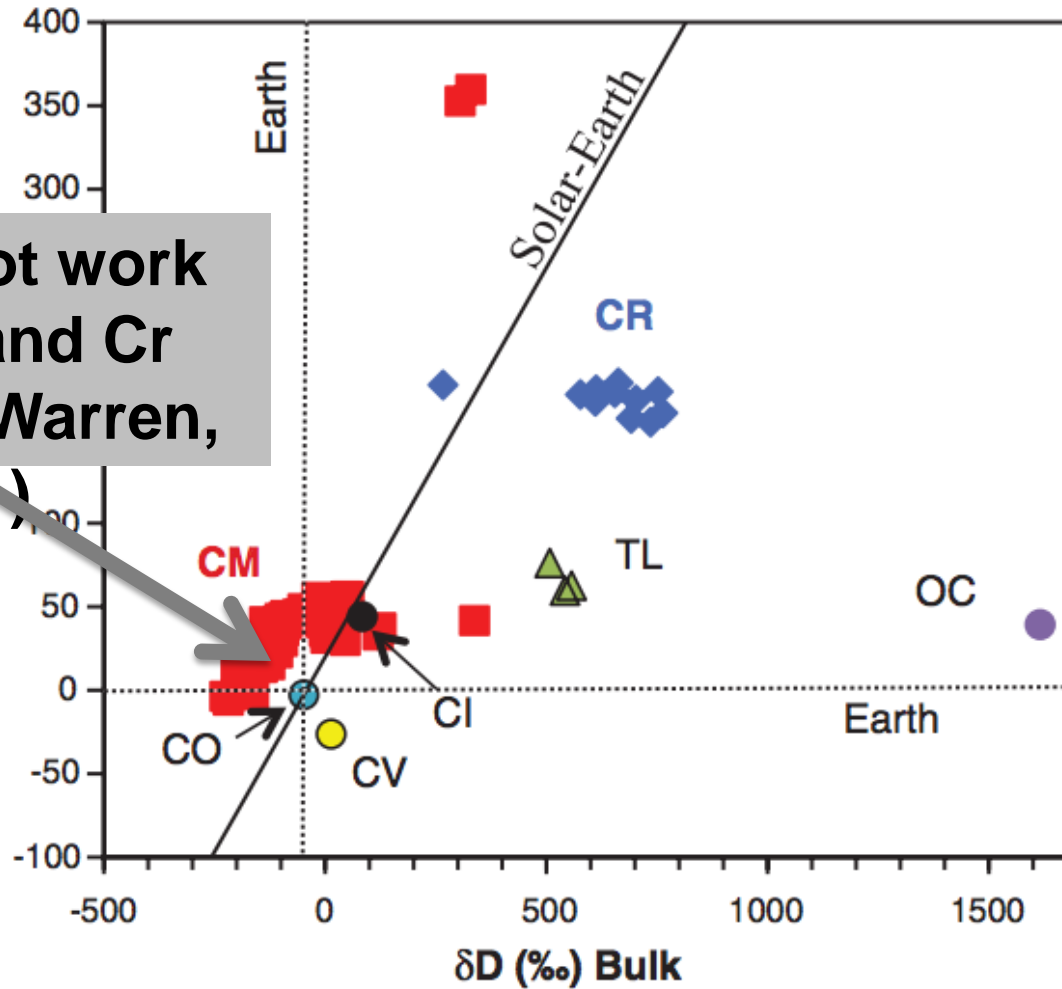
# Most water on Earth came from rocky planetesimals

Comet 67P/Churyumov-Gerasimenko



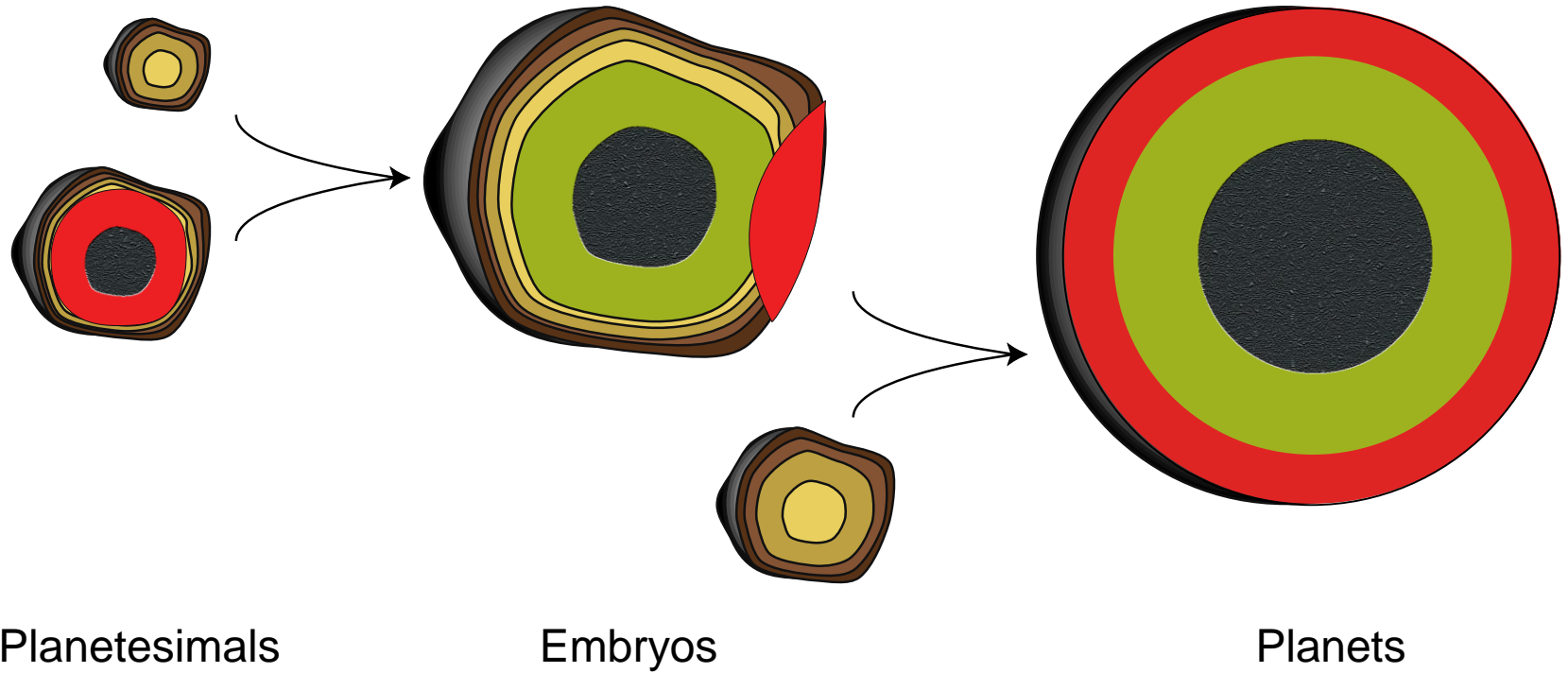
More specifically, from CI chondrites

COs do not work  
bc of Ti and Cr  
isotopes (Warren,  
2011)



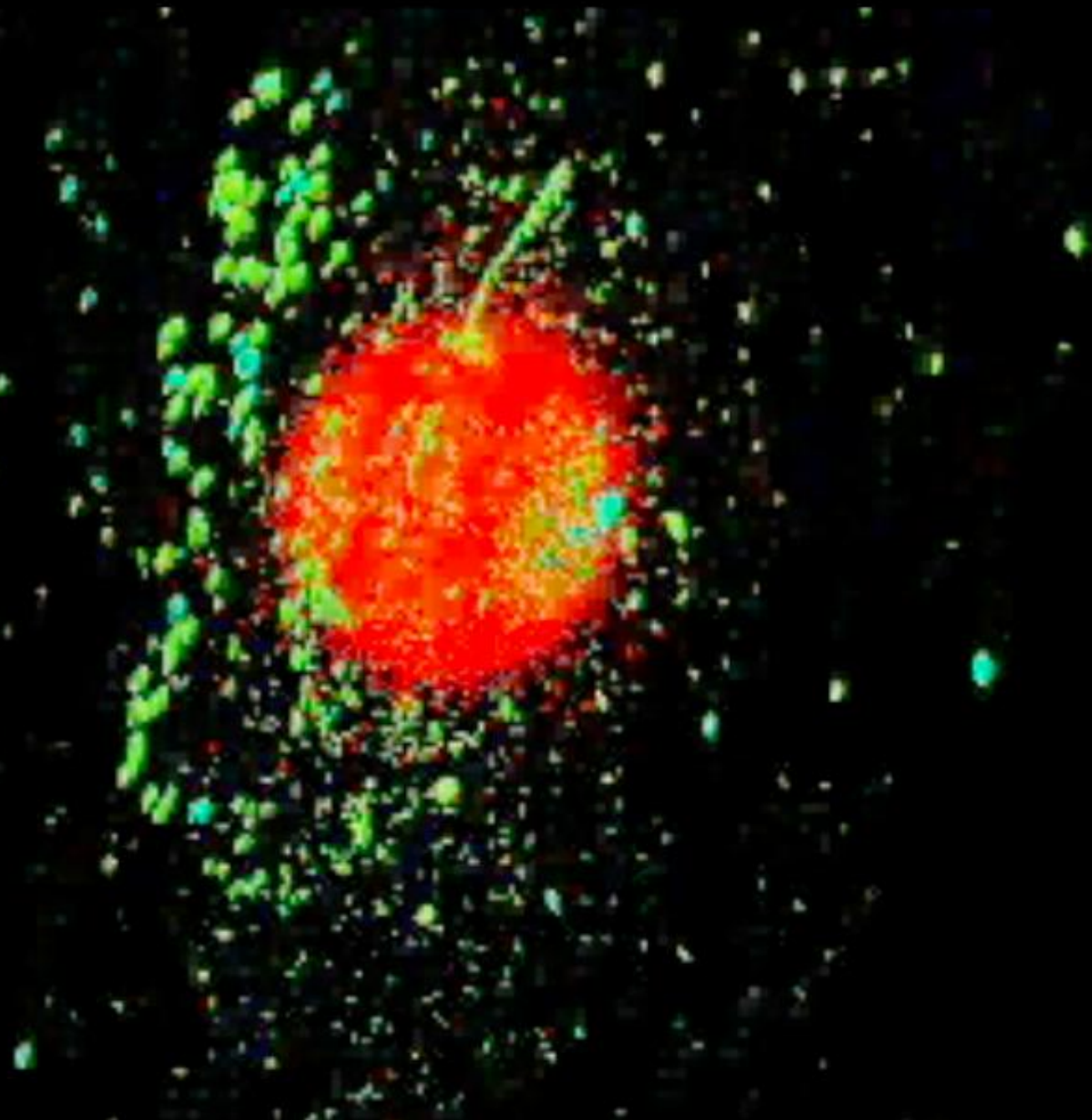
# Planets are built by giant impacts

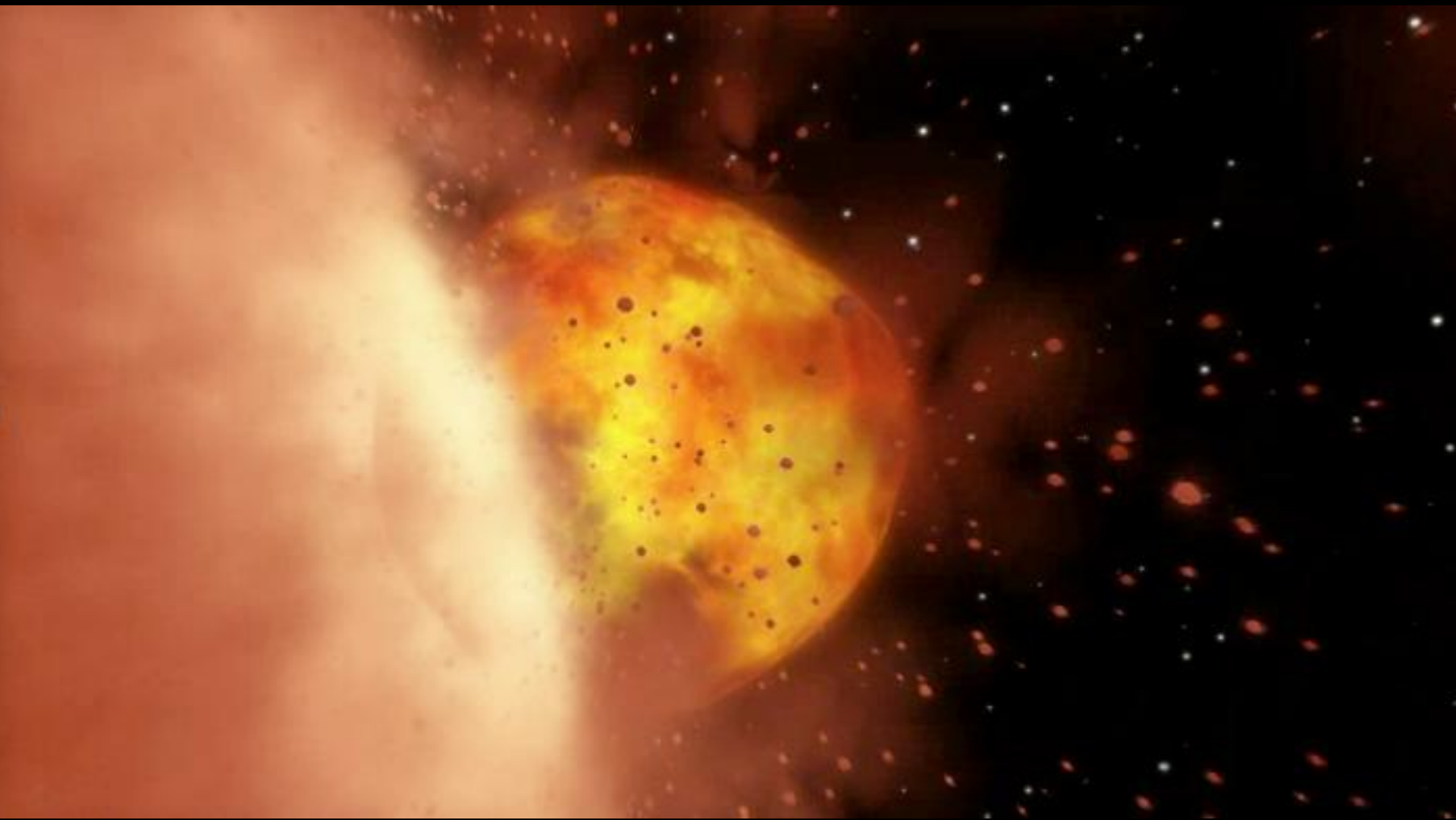
Process extends from first solids in the solar system to 10s to 100s of millions of years subsequent



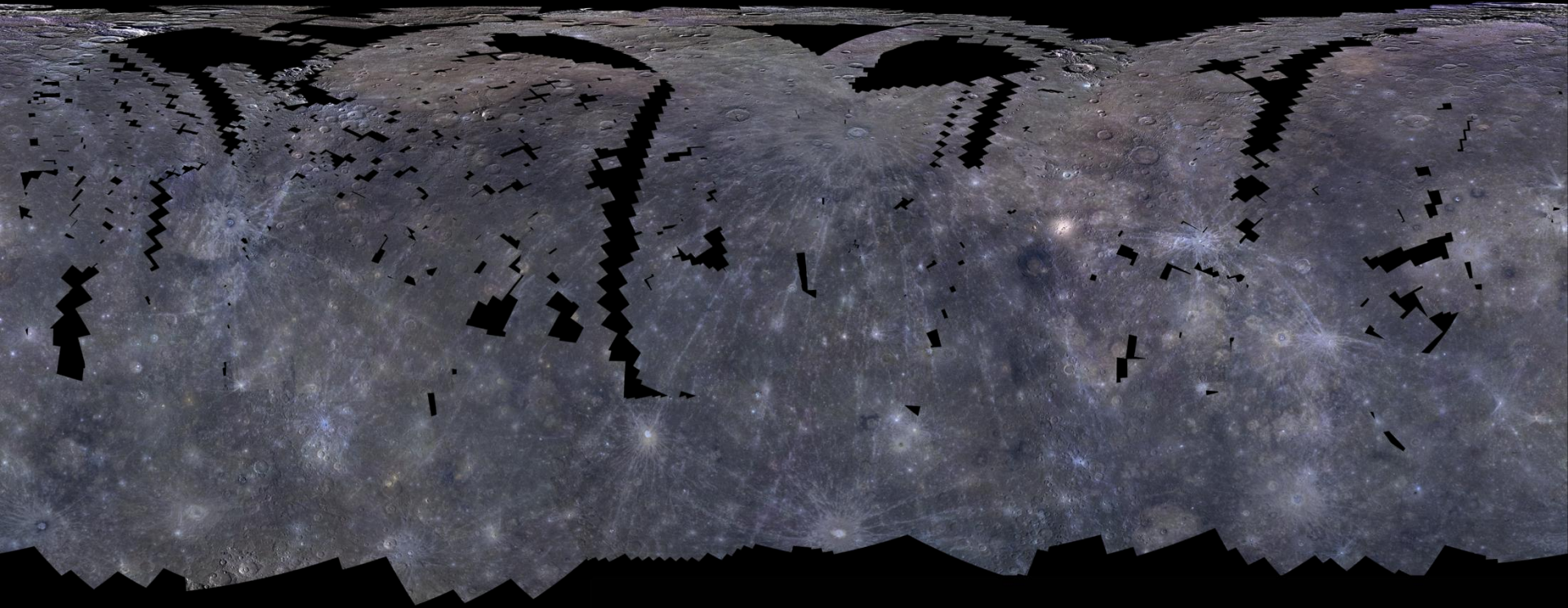


This is a still  
from Robin  
Canup's video,  
which can be  
seen at the site  
below.



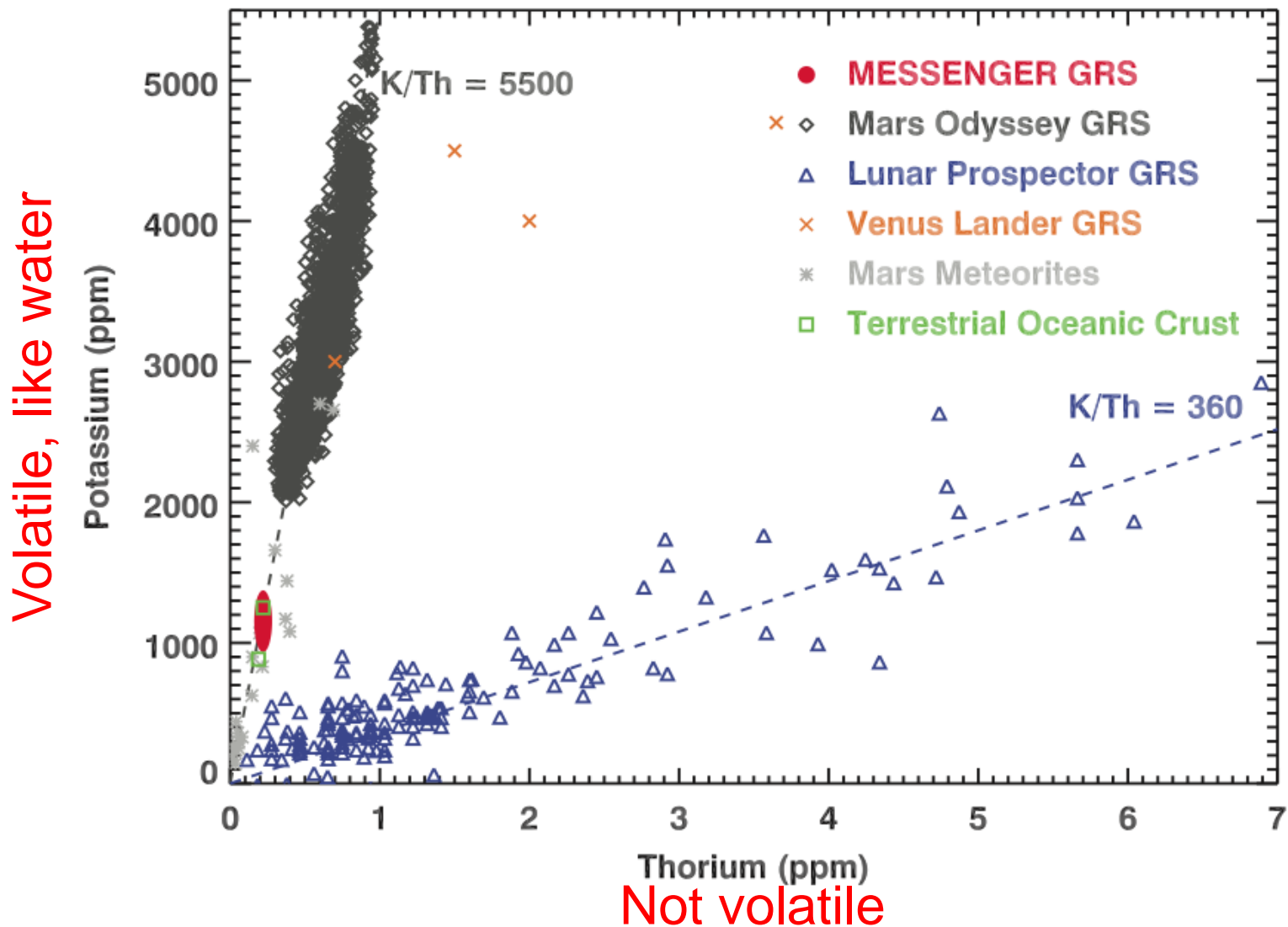


# Giant impacts do not completely devolatilize the planet: Mercury

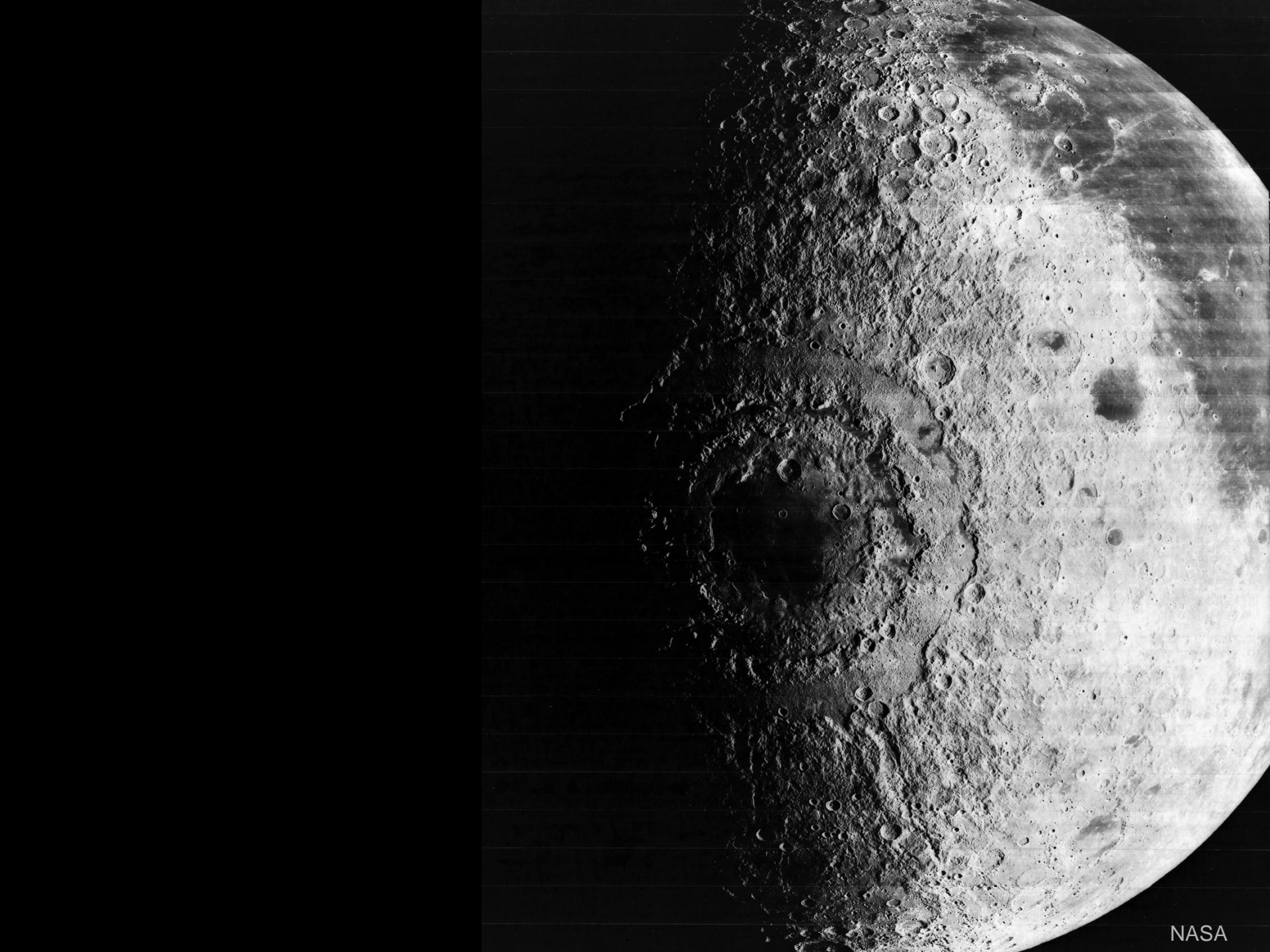




# Giant impacts do not completely devolatilize the planet: Mercury

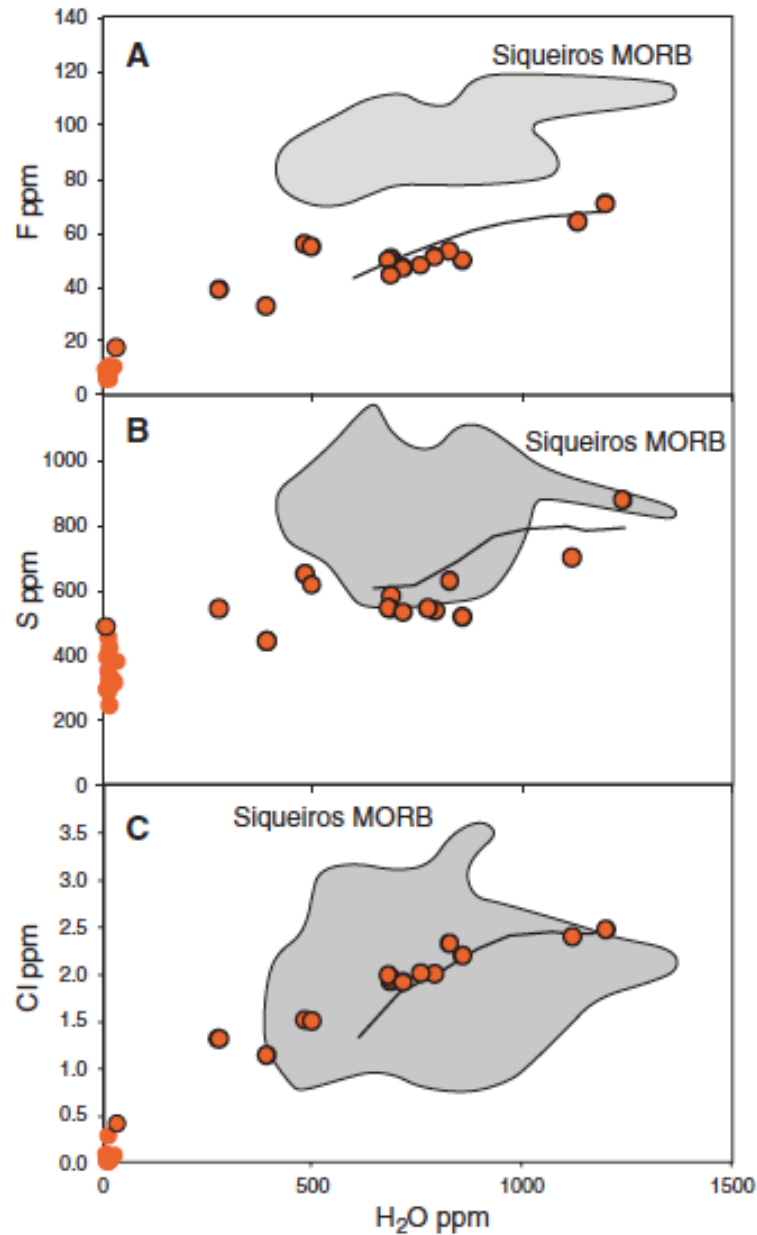


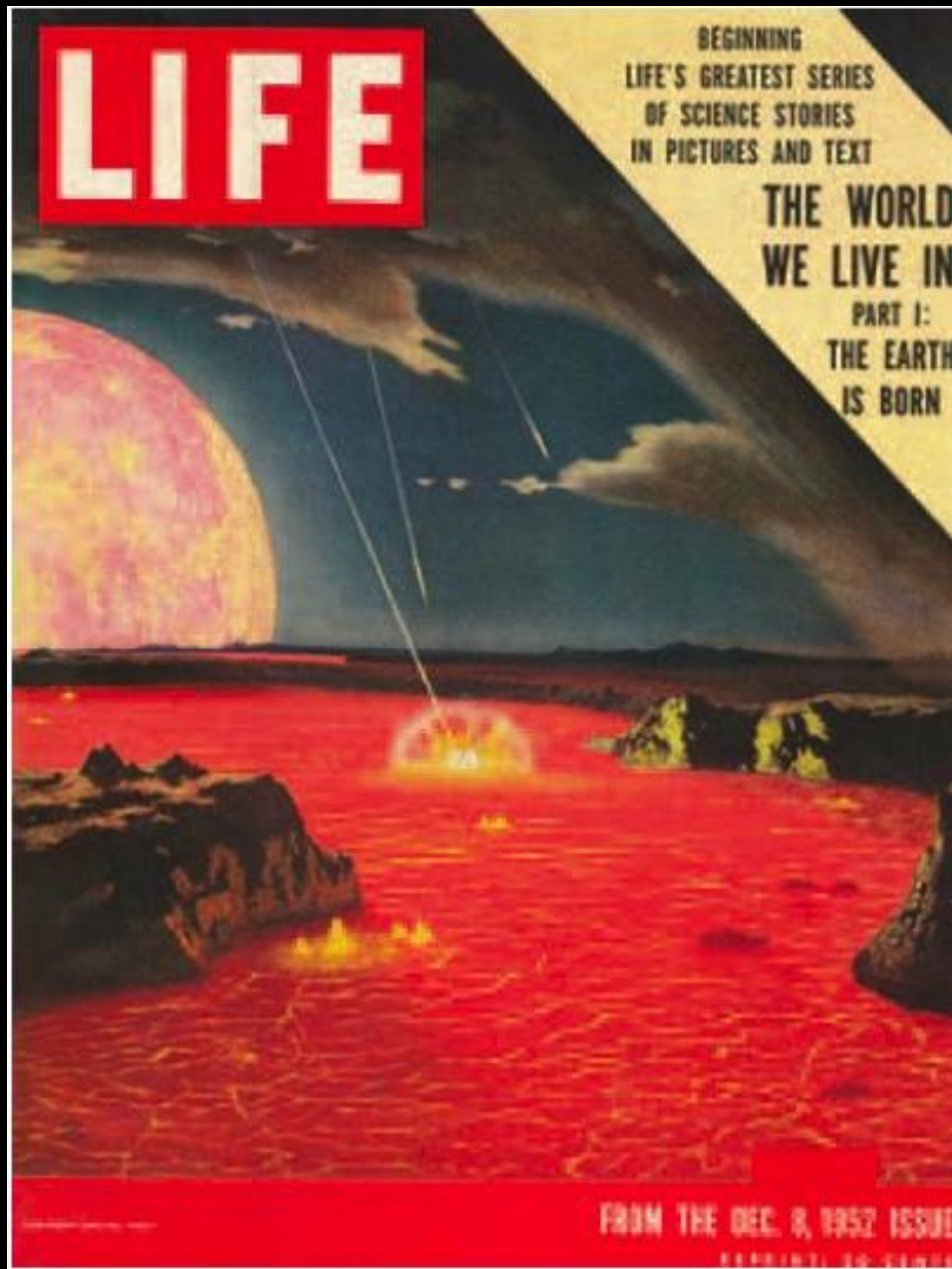




NASA

# Giant impacts do not completely devolatilize the planet: The Moon



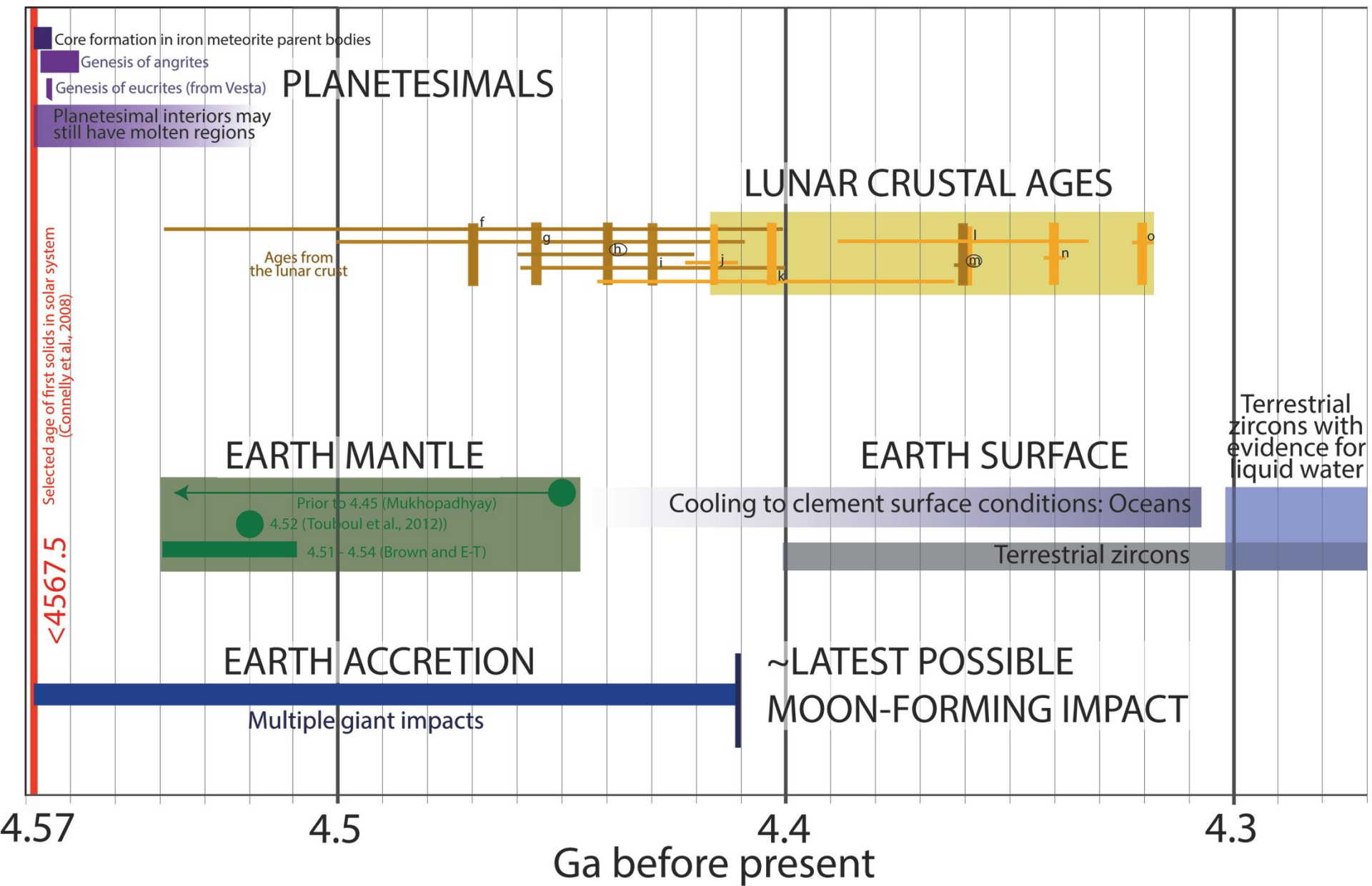


*Life* (1952)



*New York Times (2008)*





After Elkins-Tanton (2012)