

# AGES OF THE CLAY-UNIT AT MAWRTH

Oyama  
crater

Mawrth Vallis

**D. Loizeau (ESA, Netherlands)**  
**S. Werner (Oslo University, Norway)**  
**N. Mangold (LPGN, France)**  
**J.-P. Bibring (IAS, France)**

North

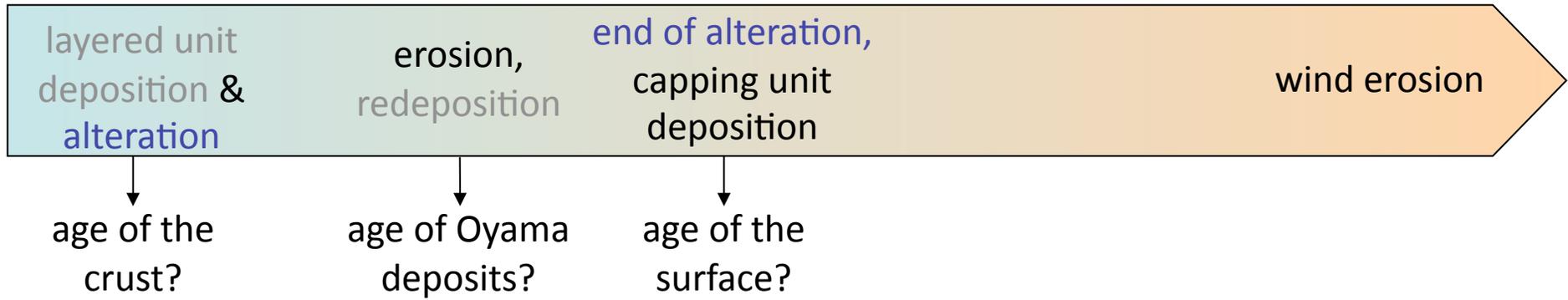


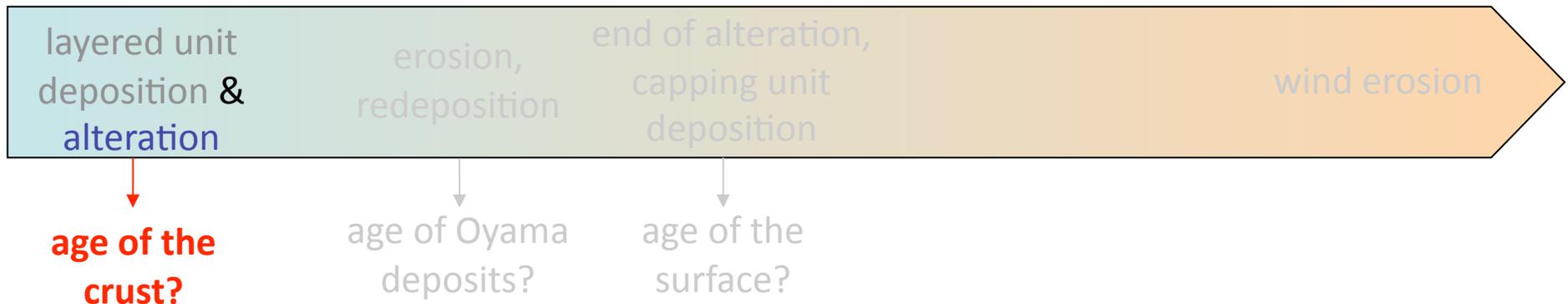
5th MSL landing site workshop, May 16-18, 2011



UiO





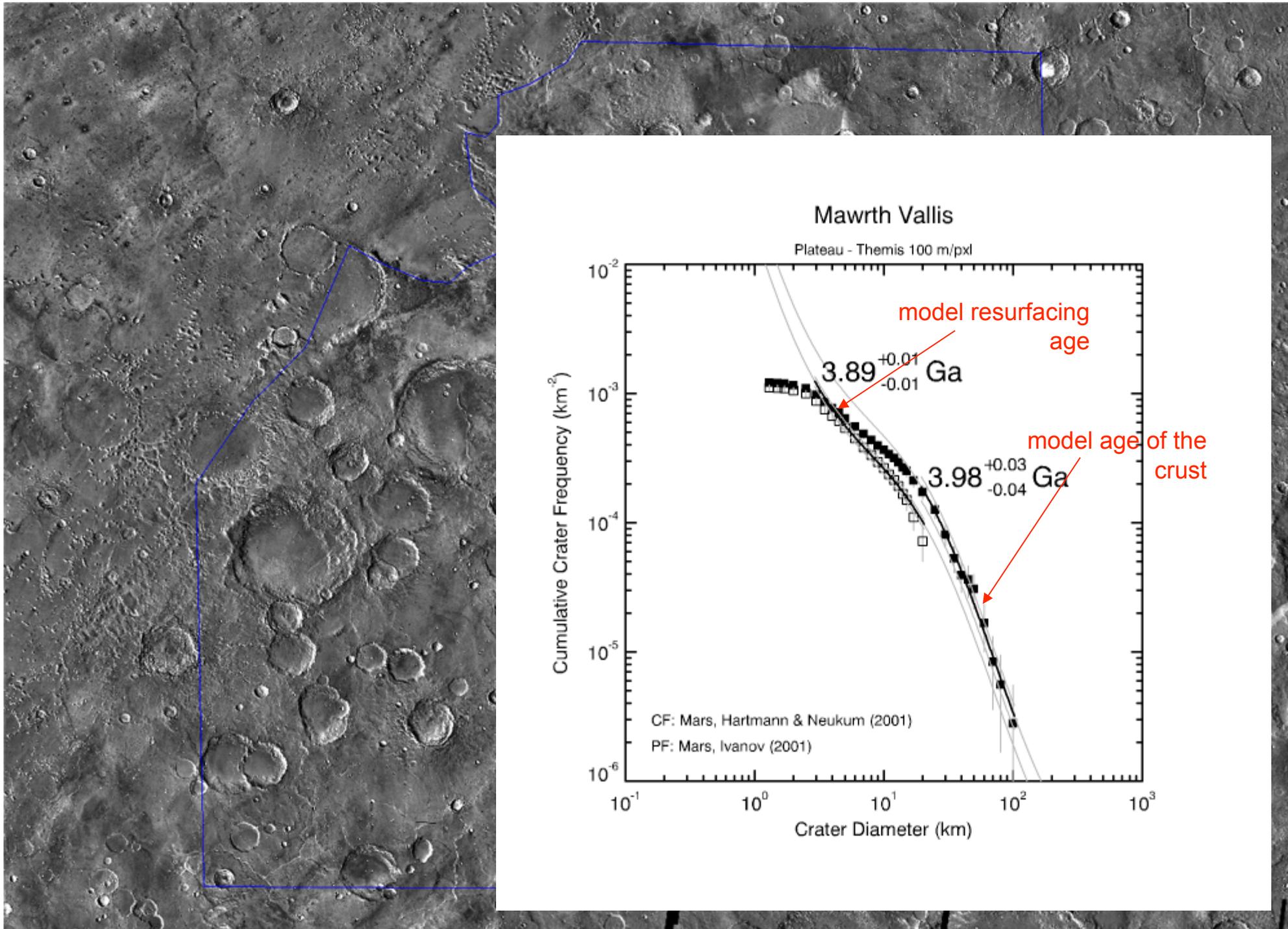


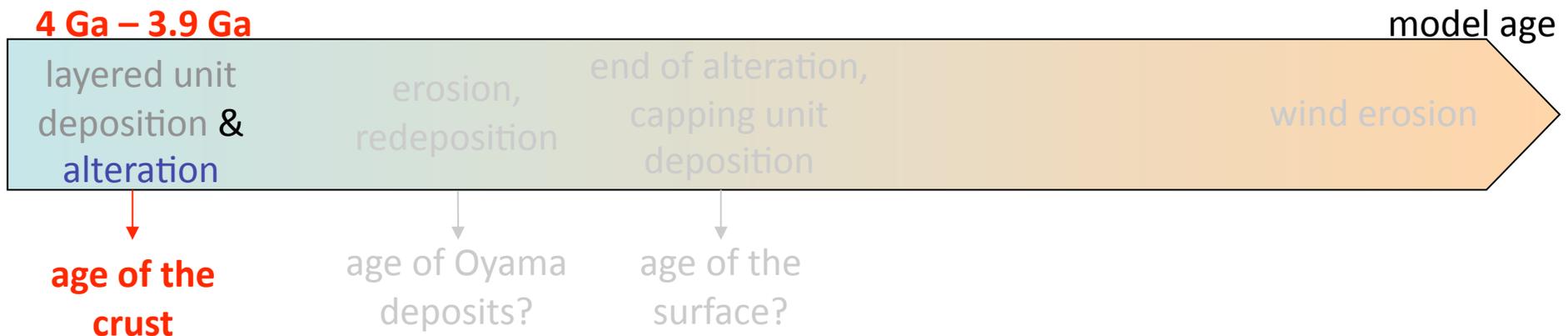
**=> counting large craters (> 10 km) of the whole region, not erased by later deposits and erosion**

Some of the layered-unit may have formed before that age.

Later layers are also possible.

NB: all ages given in the following are MODEL AGES, depending on the model of the isochrons.





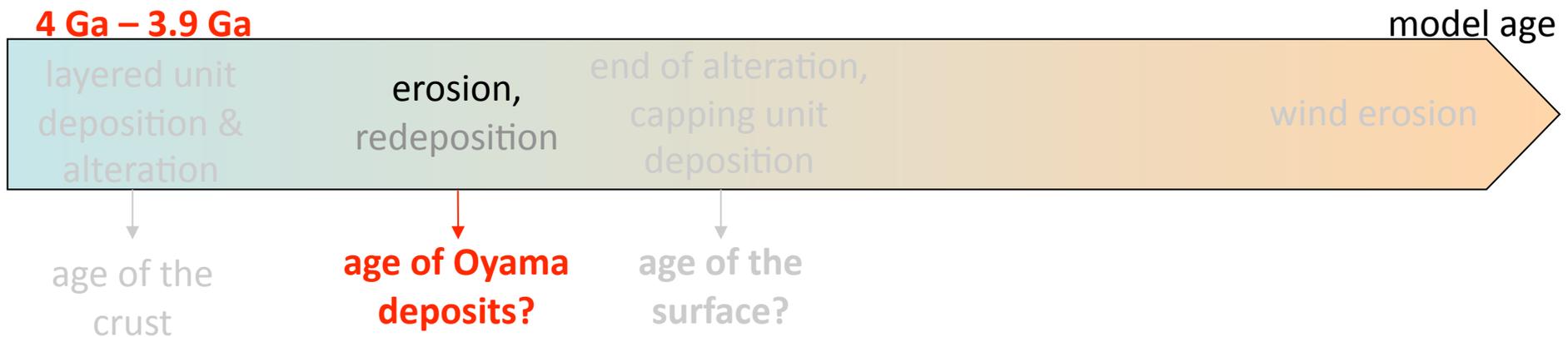
**=> counting large craters (> 1km) of the whole region, not erased by later deposits and erosion**

Some of the layered-unit may have formed before that age.

Later layers are also possible.

**=> 4.0 Ga ago, the overall crust was already formed**

**the resurfacing model age at 3.9 Ga could indicate that a significant part of the layered-unit was deposited at that time**

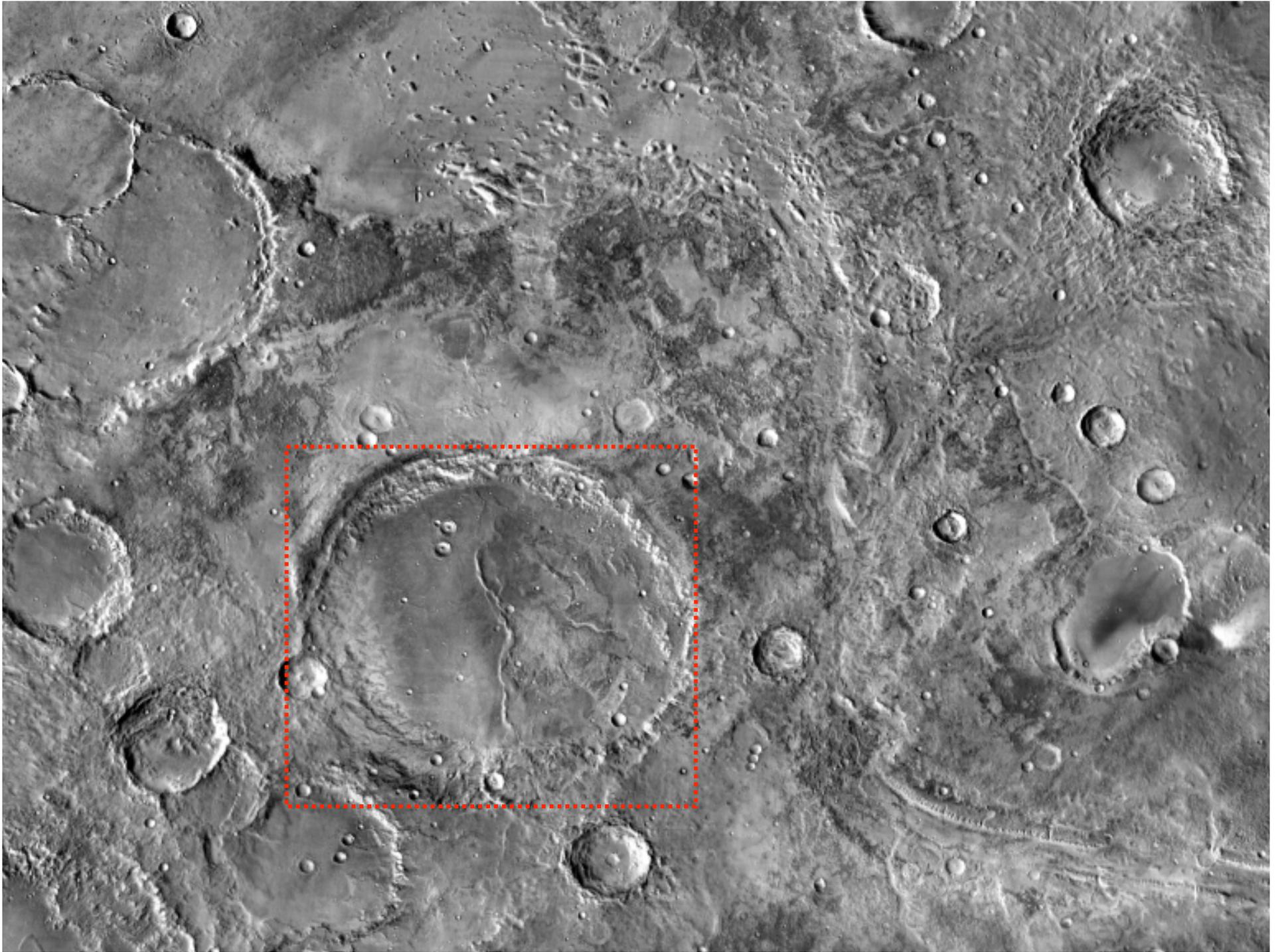


**=> counting the large craters on the floor of Oyama, not erased by later dark sand deposits**

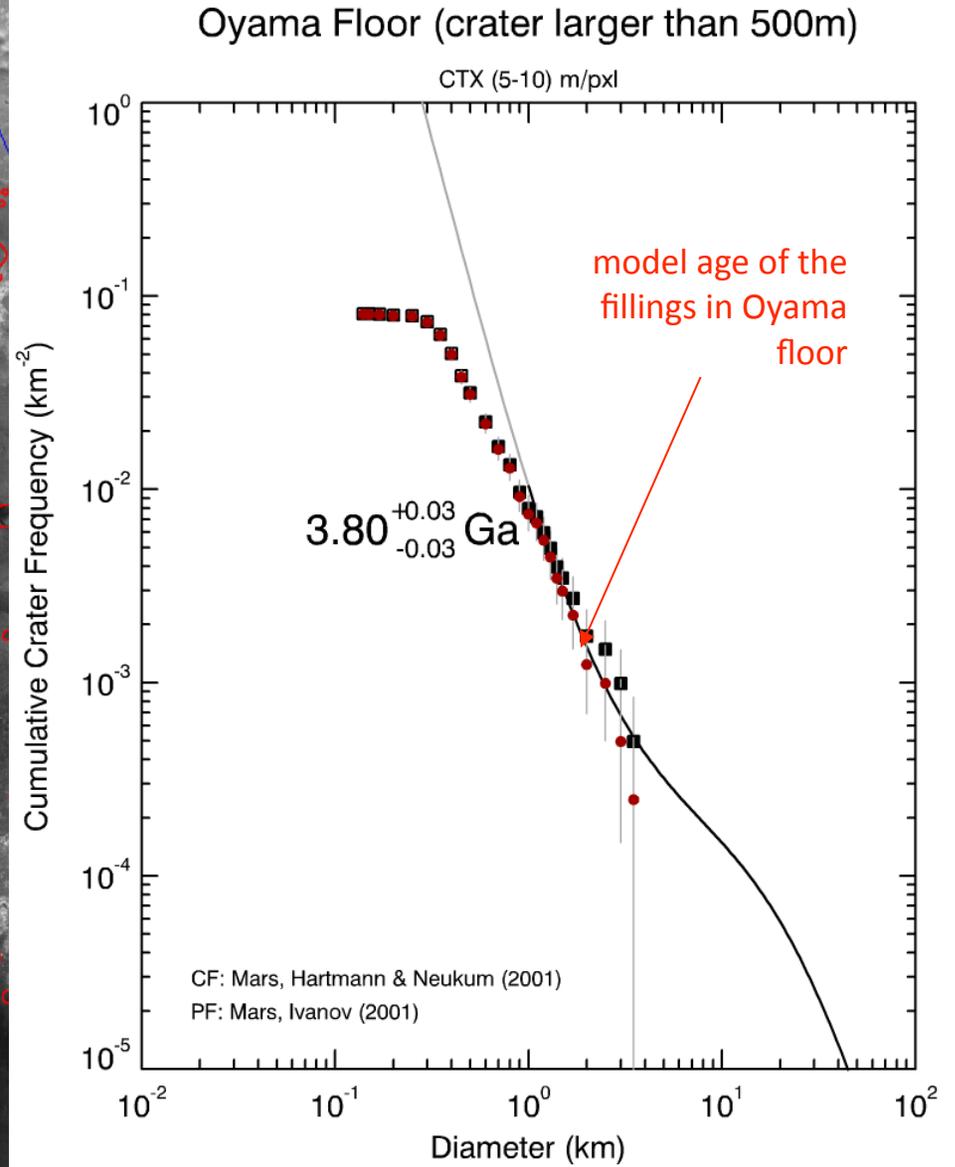
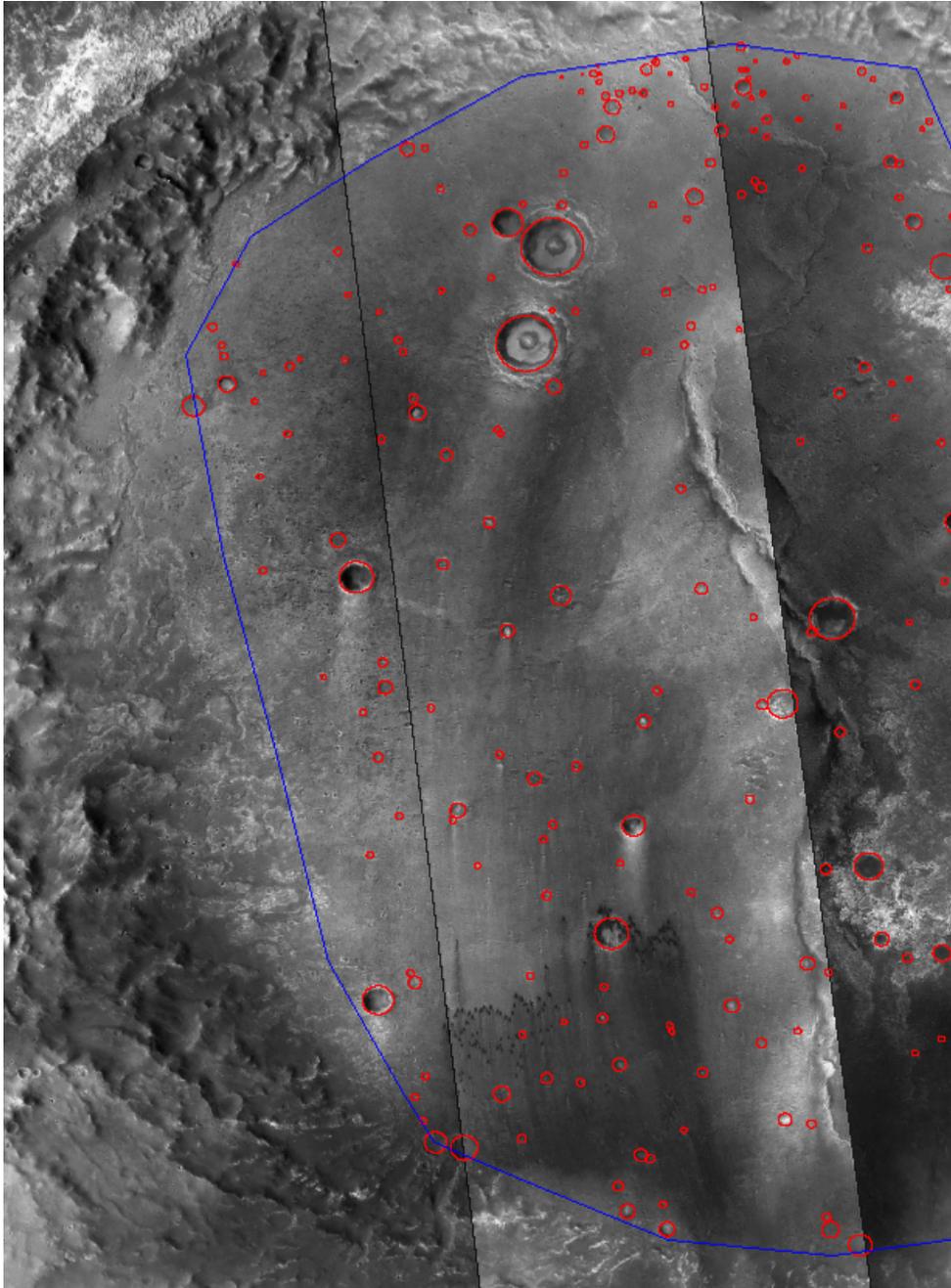
End of the formation of layered unit

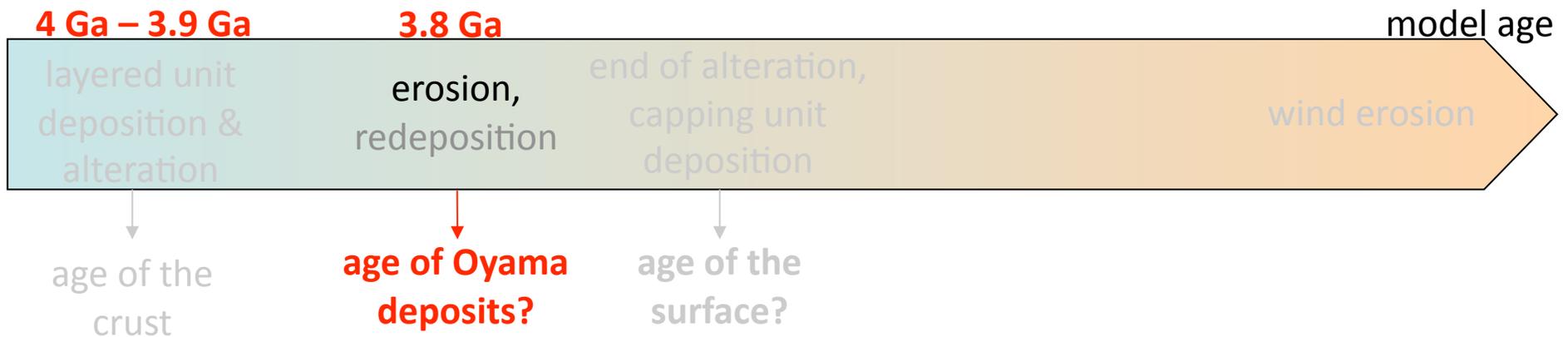
Alteration possible after this age.

Also, could date the fluvial activity in this region (small channels ending in Oyama)



# Oyama floor





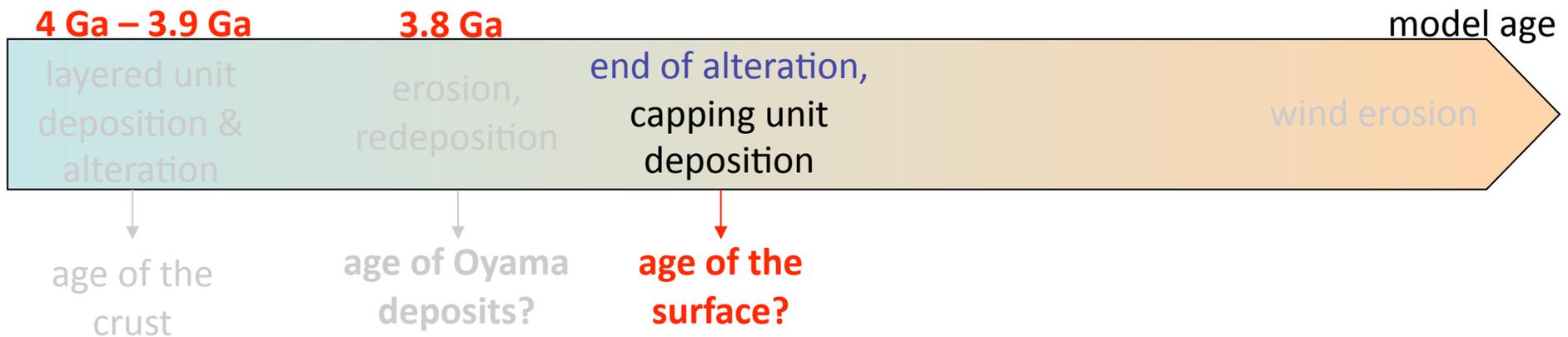
**=> counting the large craters on the floor of Oyama, not erased by later dark sand deposits**

End of the formation of layered unit

Alteration possible after this age.

Also, could date the fluvial activity in this region (small channels ending in Oyama)

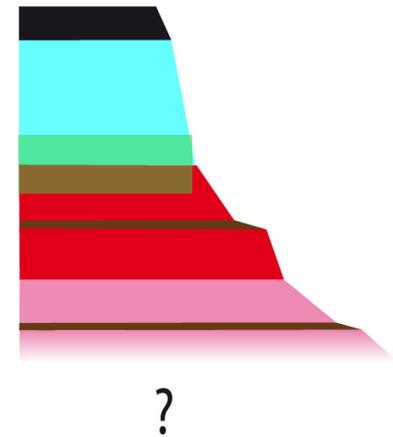
**=> 3.8 Ga ago, the sediments in Oyama floor were deposited, the layered unit of the plateau should have ceased deposition.**

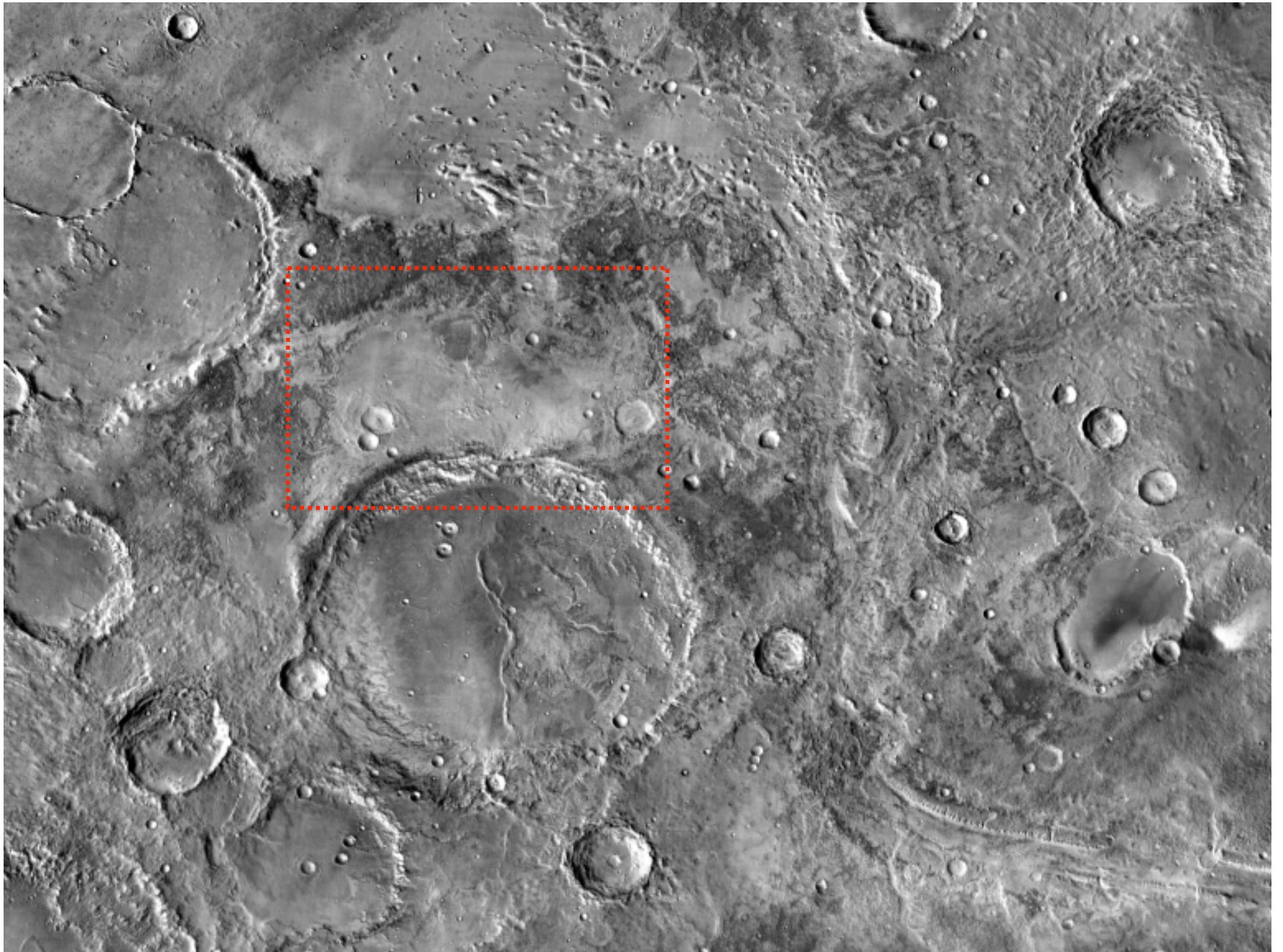


**=> counting surfaces at the top of the plateaus with as limited erosion as possible**

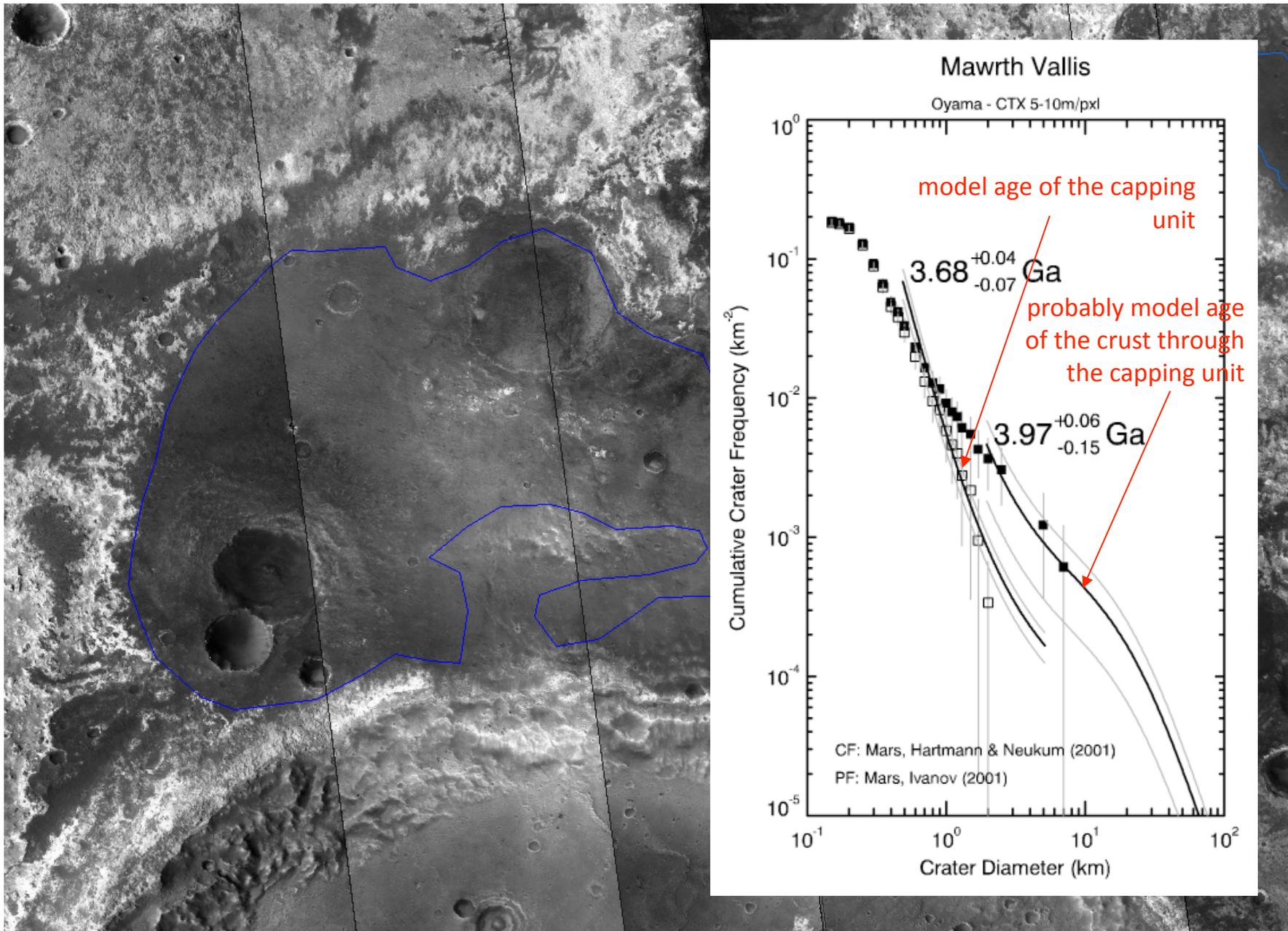
Technically: crater counts on the dark capping unit.

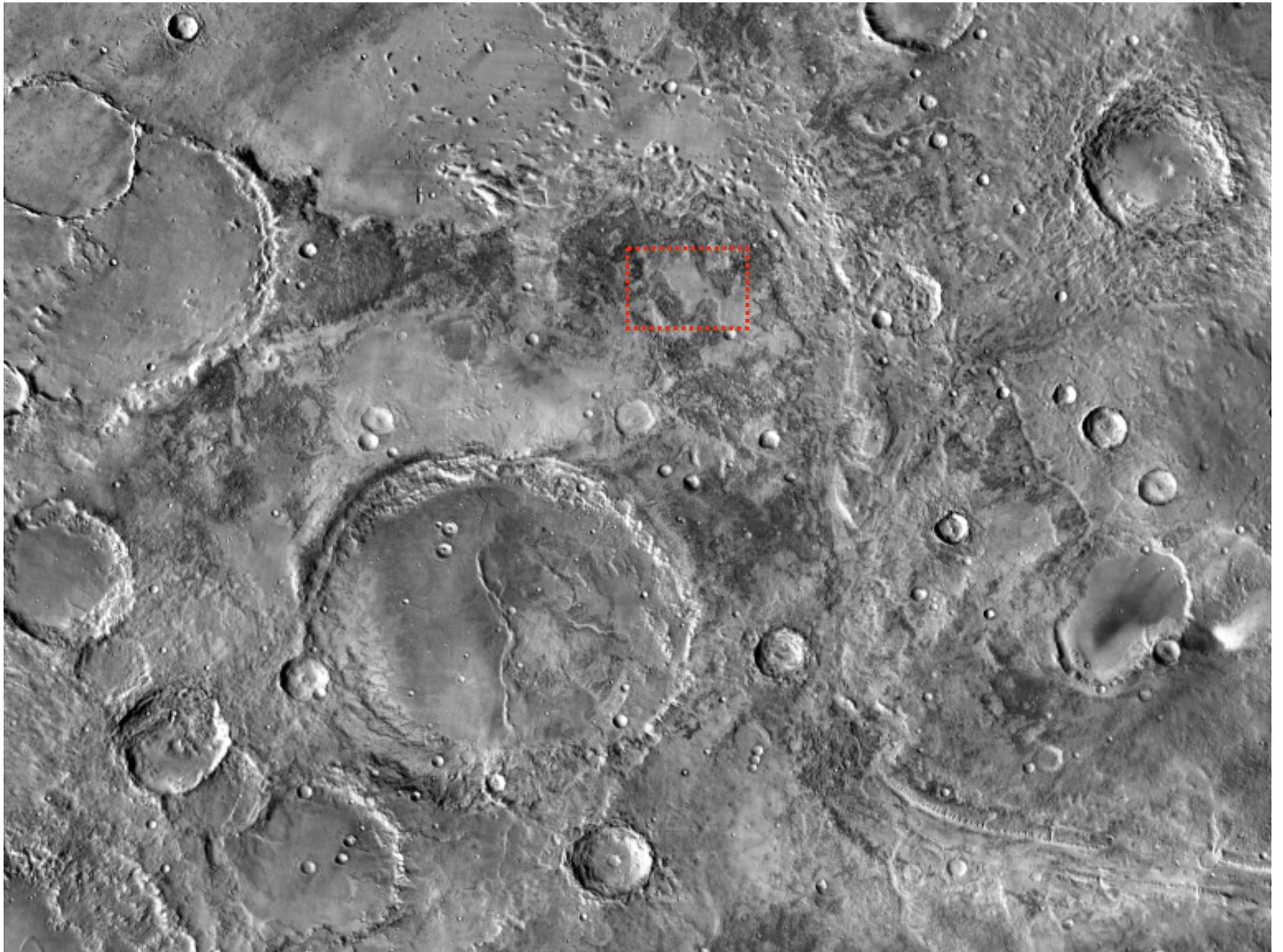
No alteration happened after this age.



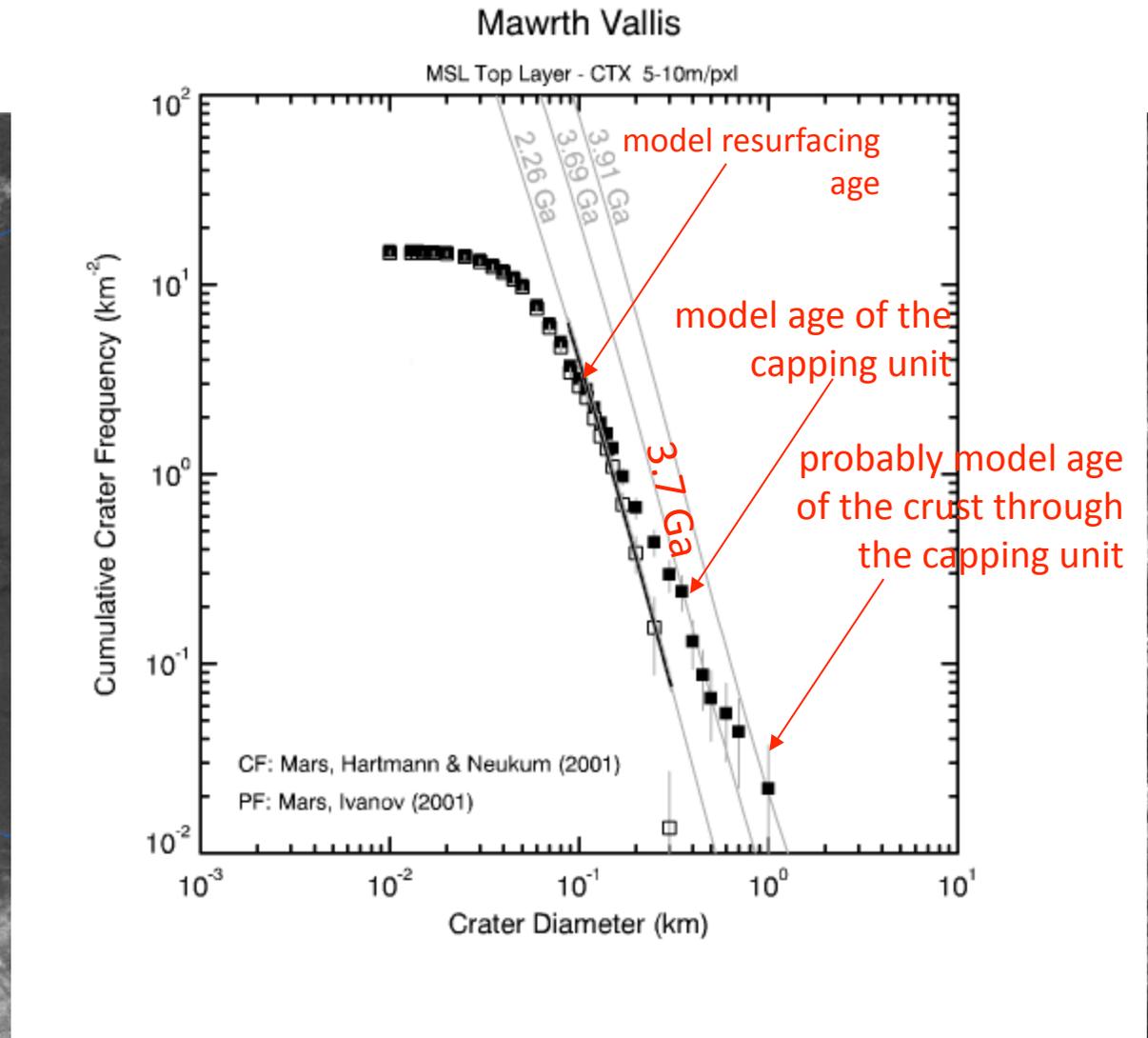
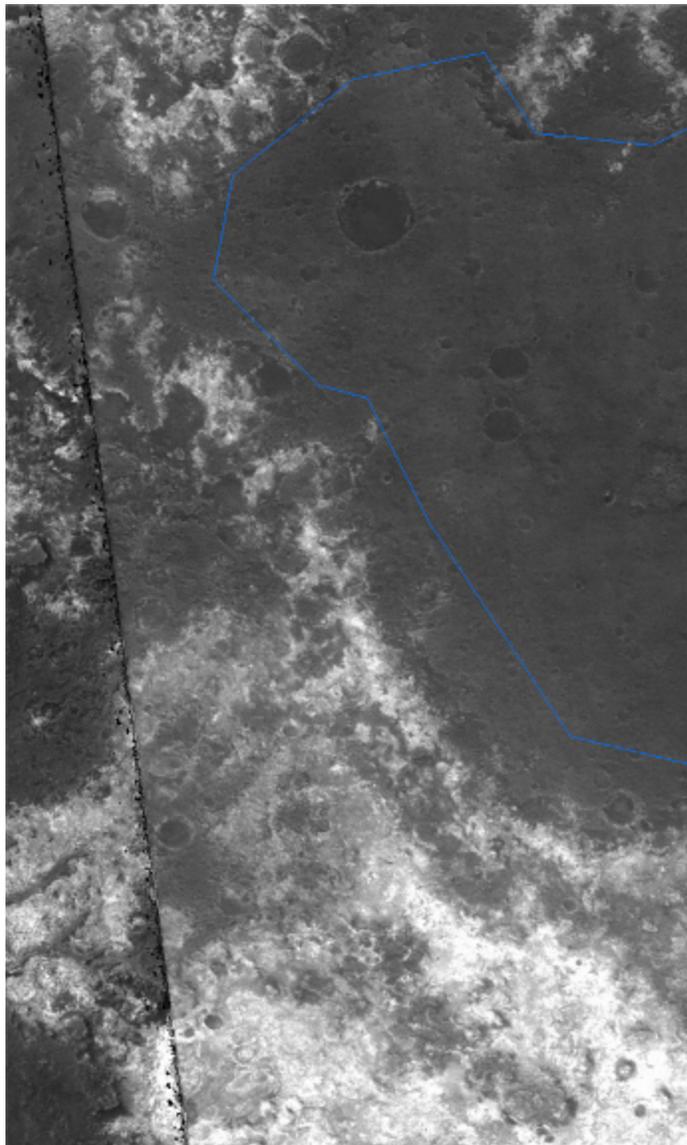


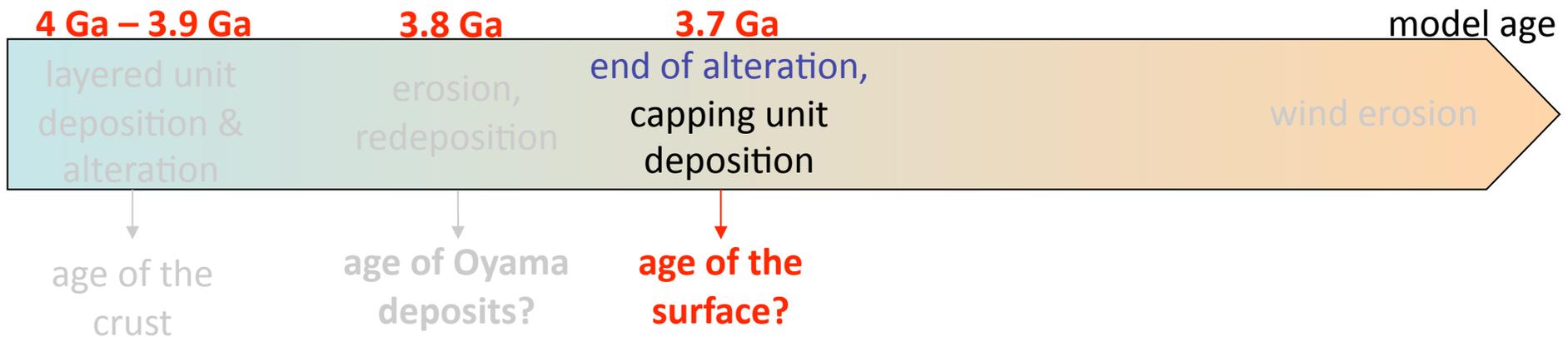
# Dark cap on top of plateau





# Dark cap on top of plateau



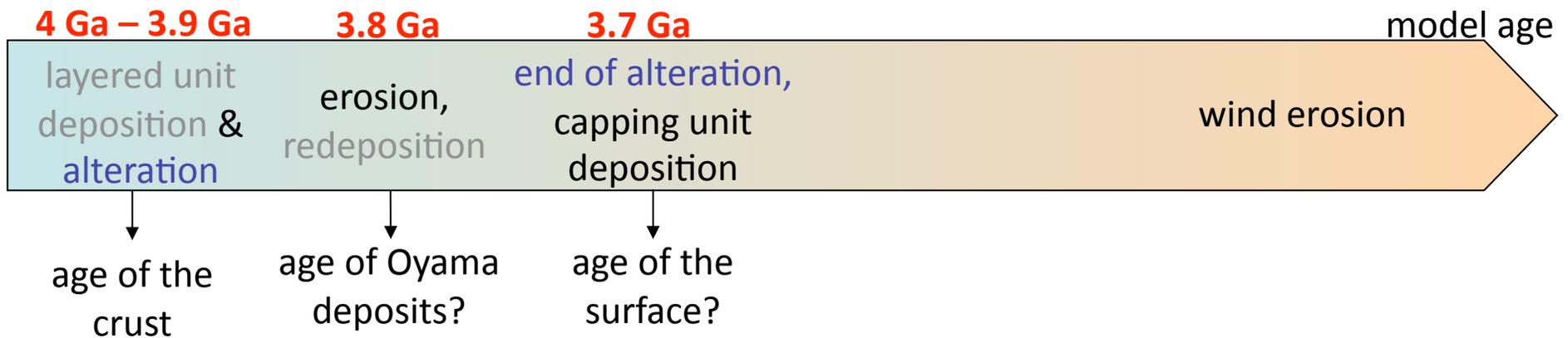


**=> counting surfaces at the top of the plateaus with as limited erosion as possible**

Technically: crater counts on the dark capping unit.

No alteration happened after this age.

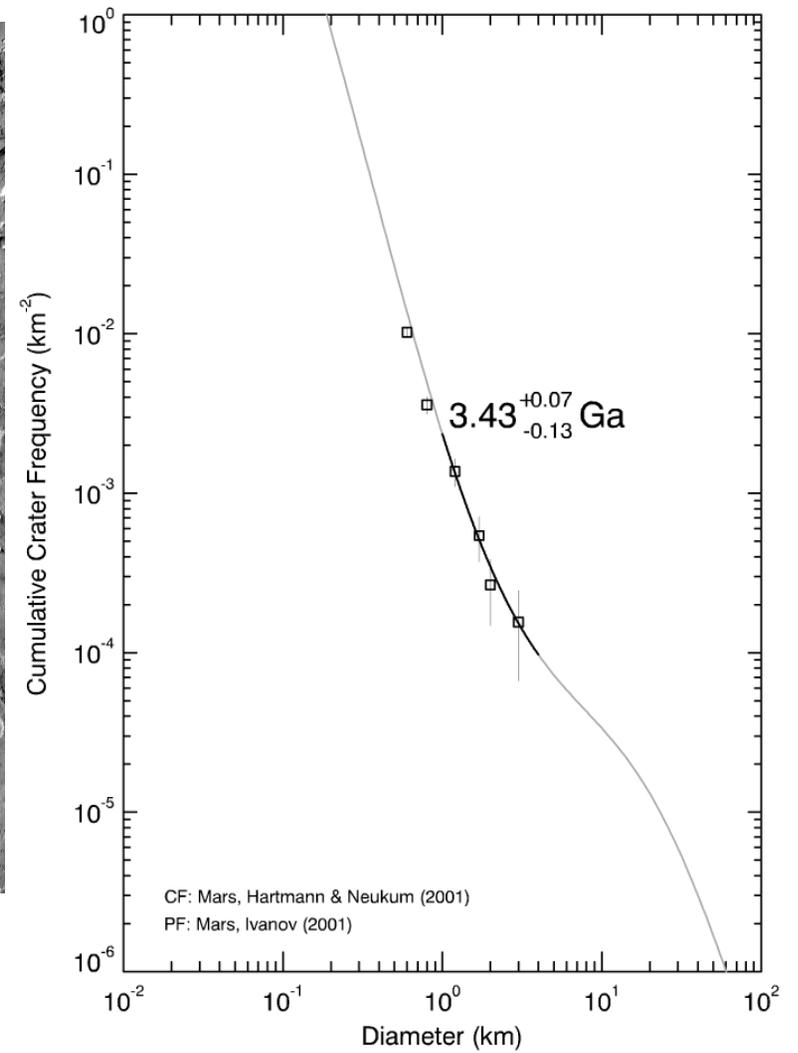
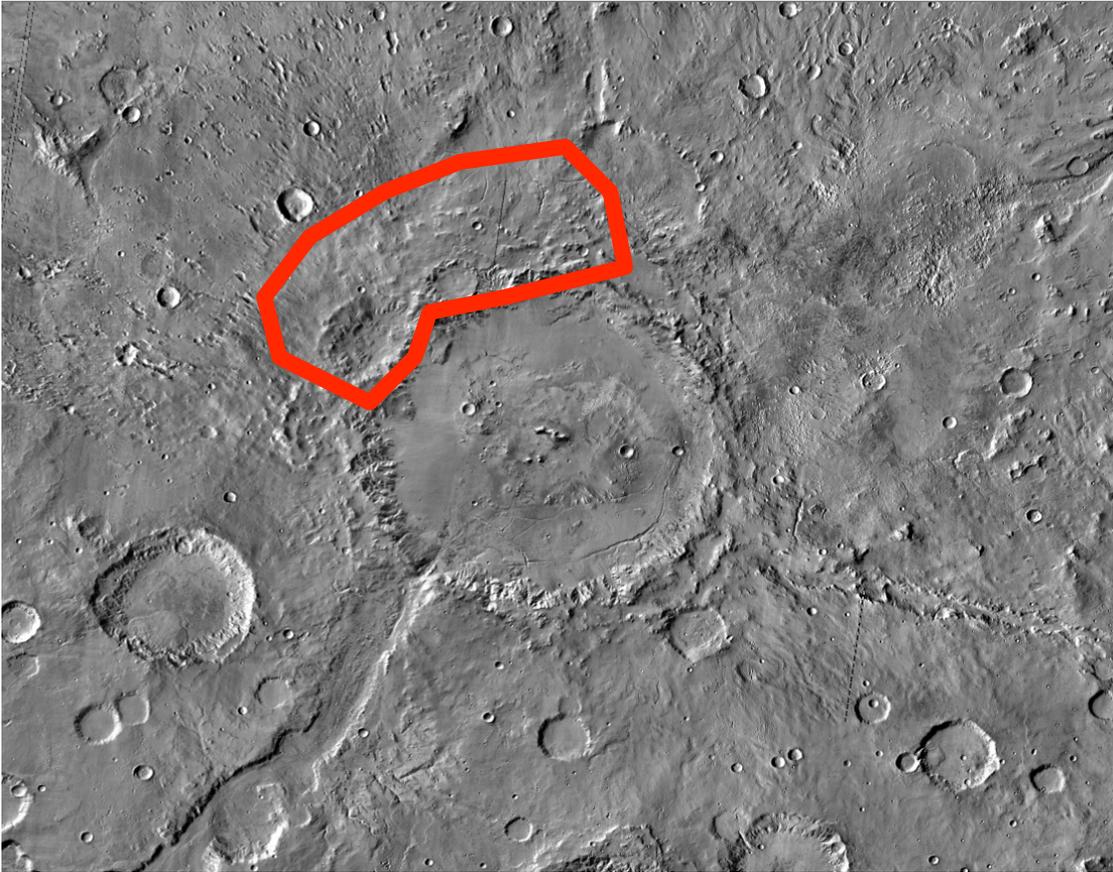
**=> 3.7 Ga ago (LN-EH boundary) the capping unit was formed, the layered unit and the alteration were achieved**



- beginning of deposition and alteration is unknown
- part of the layered unit could have deposited 4 Ga ago
- the layered unit was probably entirely deposited 3.8 Ga ago
- alteration was finished 3.7 Ga ago

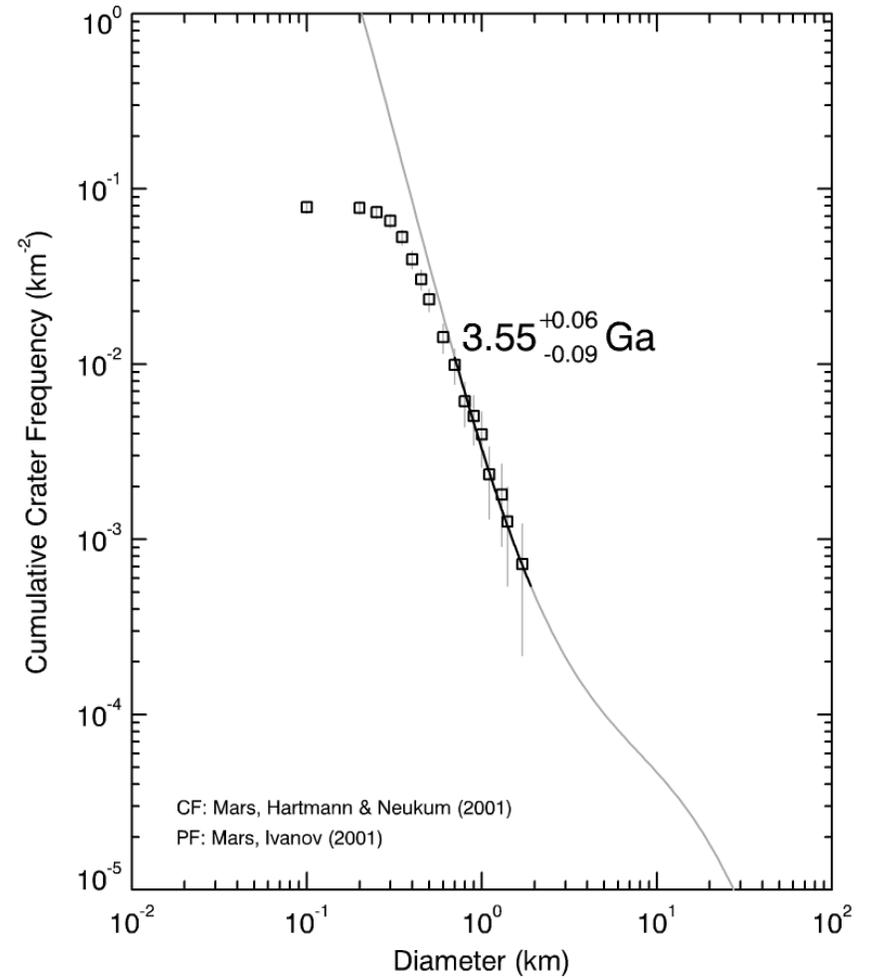
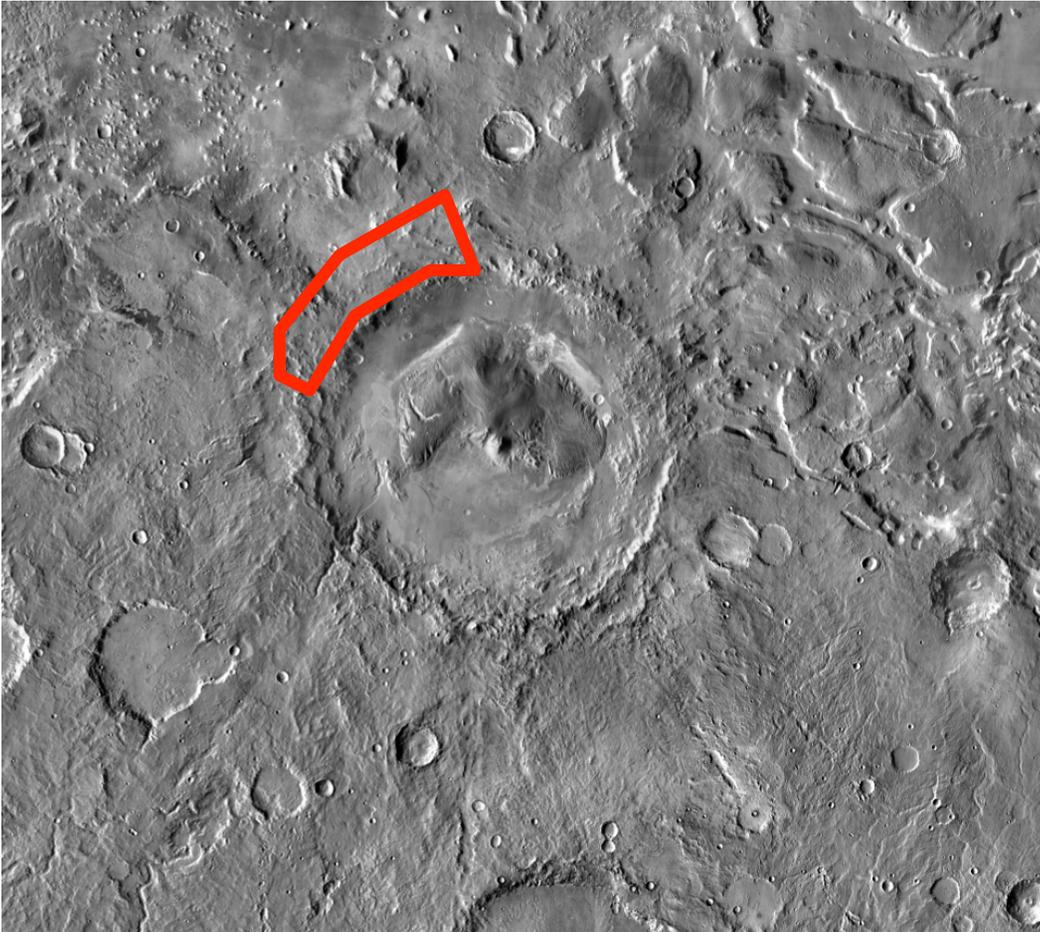
**=> the plateau of Mawrth Vallis at the landing ellipse records the first 100's Ma of the Martian history**

# Holden ejecta



3.4 Ga is in LH (with uncertainties) in Neukum scale

# Gale ejecta



3.55 Ga is in EH-LH (with uncertainties) in Neukum scale

- at Mawrth, alteration was finished 3.7 Ga ago
- Gale and Holden impacts are younger than 3.7 Ga

**=> if we consider a global climate favoring alteration only before the model age of 3.7 Ga, then alteration by surface processes was limited at the time of Gale and Holden impacts**

**=> the clays at Gale and Holden would be excavated/remobilized from the altered crust, or of hydrothermal origin, and/or local processes rather than global ones**