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An Extended Global Inventory of Mars Surface Faults

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Introduction

We have enlarged our previous catalog [1] of thrust and normal faults on Mars. The existing fault traces were revised, and new faults were added. The catalog now comprises 5143 thrust and 9675 normal faults with a cumulative length of about 941000km. The faults were mapped on a global shaded relief derived from MOLA, illuminated from two directions 90° apart, and aided by a global 3D anaglyphic map (Knapmeyer et al., EGU2008-A-03567, this conference). A digitized version of the USGS geological map of Mars [2, 3, 4] was manually registered to the MOLA map and absolute ages were assigned based on crater statistics. All faults were gathered into groups and sub-groups corresponding to common tectonic origin, thus allowing to determine relative ages of entire fault populations. These relative ages allow inferring a sequence of tectonic events independent of the crater statistical ages.

Conclusion

The previous version of the fault catalog has already proven useful for various studies [1, 5, 6], since it is one of the few existing uniform global mappings of martian faults. The new catalog improves accuracy and completeness and offers new information such as common tectonic origin of groups, and age information independent of crater statistics.

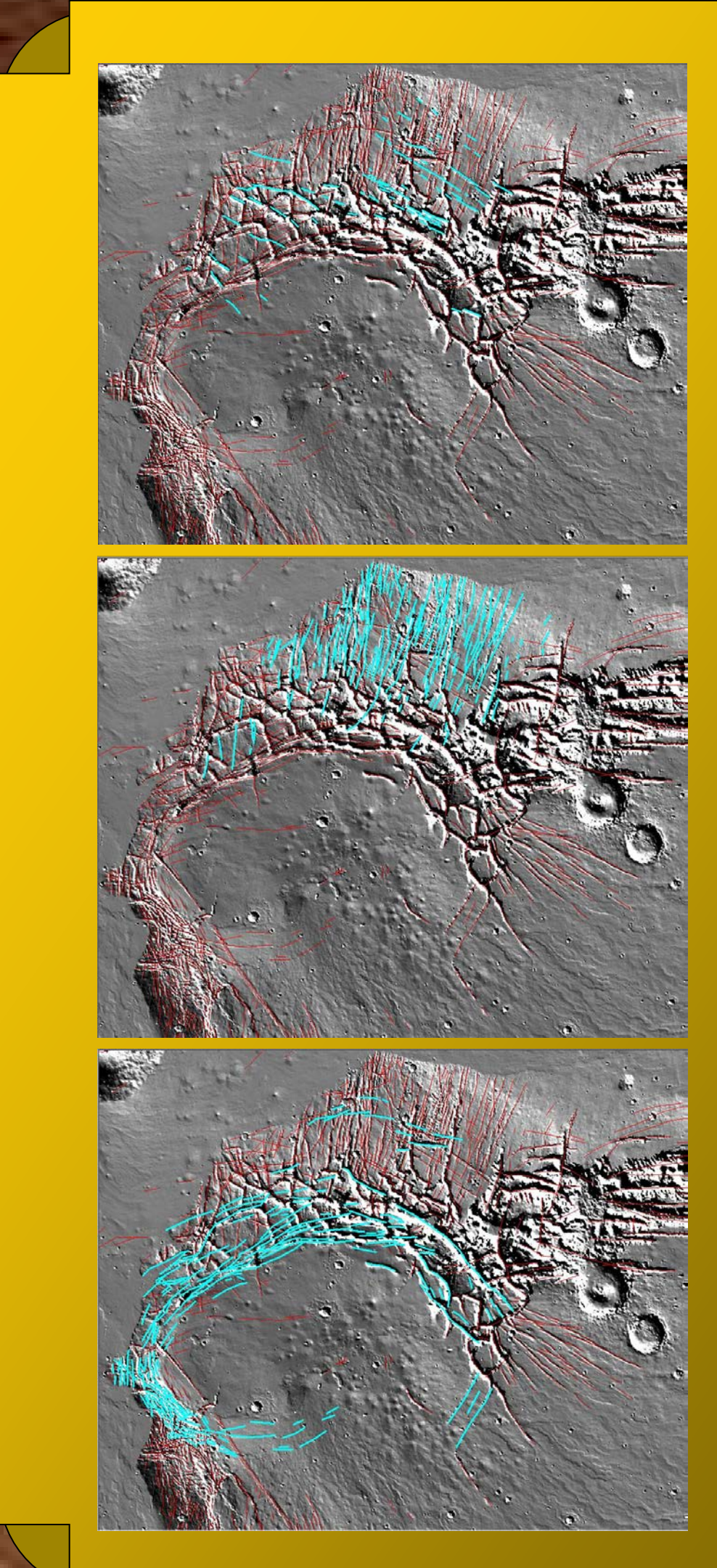
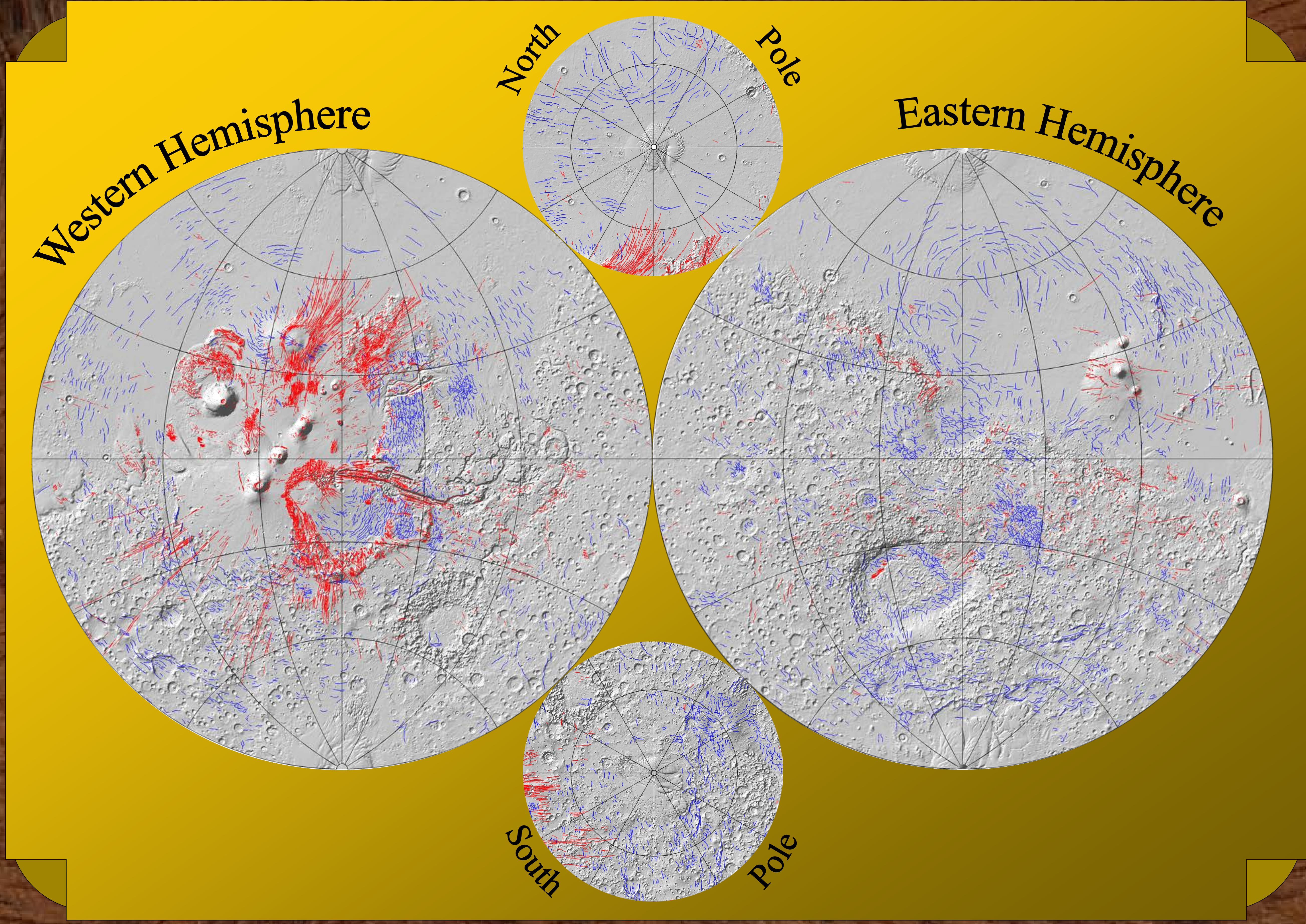
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**Fault Activity
through time:**

Minimum age:
presumed last activation,
based on youngest
fractured geologic unit

Maximum age:
earliest possible activity of
fault group or subgroup,
from oldest fractured unit

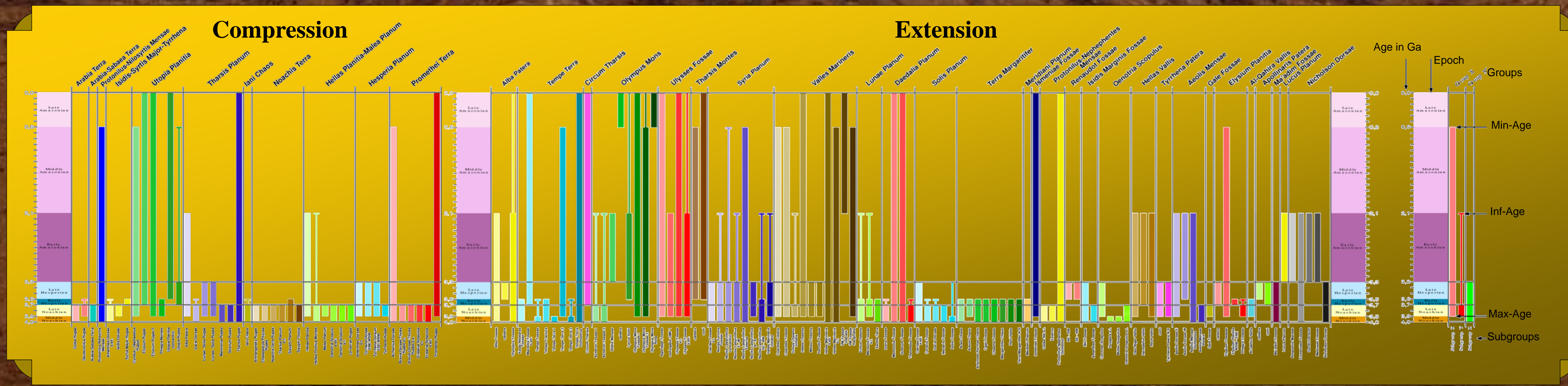
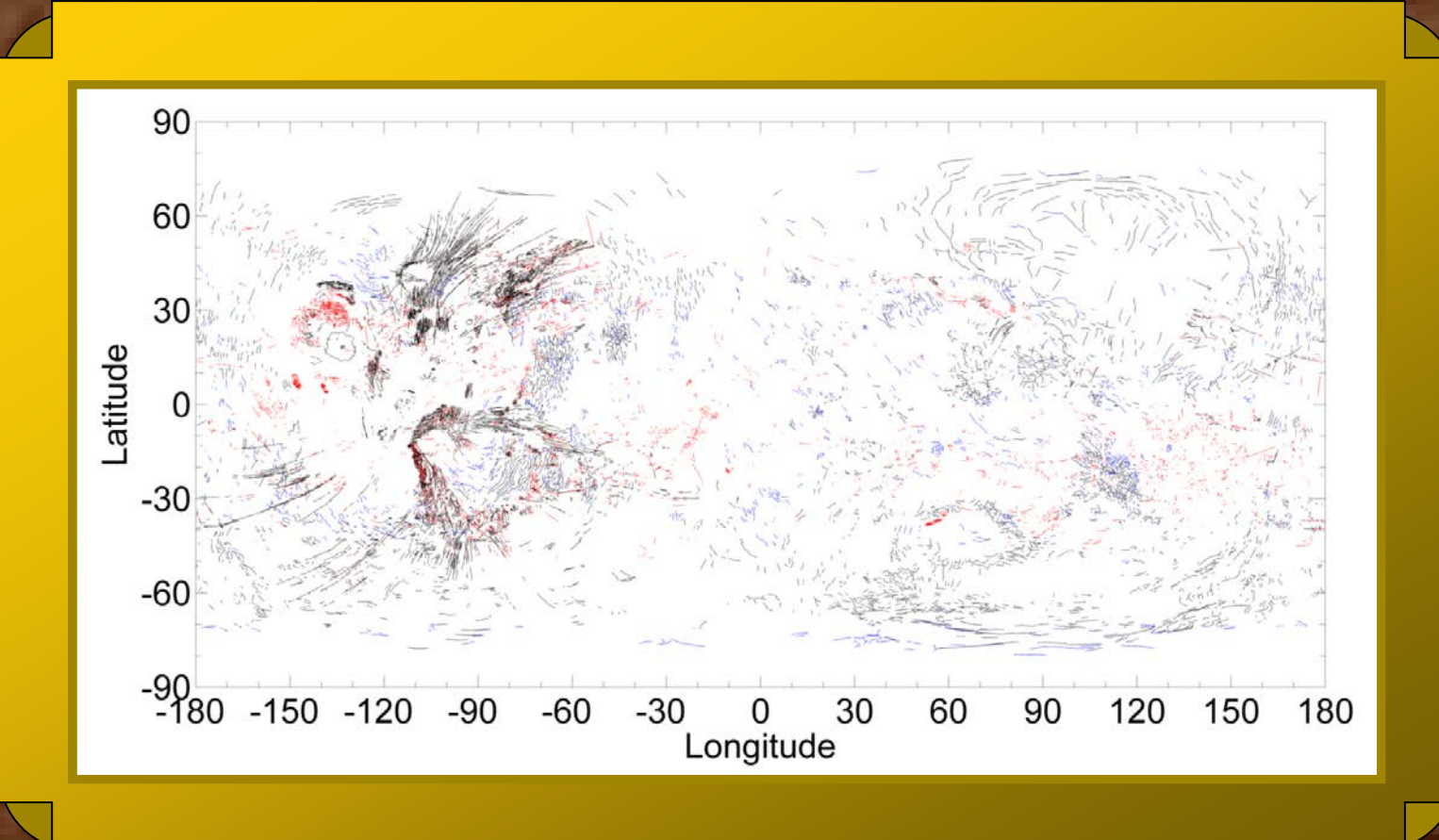
Infimum Age:
inactivation age, from age
of covering geological
units (e.g. lava flows)



Faulting Sequence

Grouping

Depending e.g. on dominant fault-trend directions, average length, or fault density, faults were gathered into groups and sub-groups. Cross-cutting relations reveal the relative ages of these groups.



Classification of dislocations

Comparison of old and new fault catalog:

- Black: all old faults,
- Red: new extensional faults (1409),
- Blue: new compressional faults (4925)

The new catalog contains all three.

Reference:

- References:**
- [1] Knapmeyer M. et al. JGR, 111, E11006, doi:10.1029/2006JE002708, 2006.
 - [2] Scott & Tanaka, Map I-1802-A, USGS, 1986
 - [3] Greeley & Guest, Map I-1802-B, USGS, 1987
 - [4] Tanaka & Scott, Map I-1802-C, USGS, 1987
 - [5] Dimitrova et al., 39th LPSC, 2008 [6] Nahm & Schultz, EOS Trans. AGU, 88, 52, P13D-1552, 2007

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