*Journal of Geophysical Research: Planets*

Supporting Information for

# Structural architecture and deformation history of Tempe Terra, Mars

Claire J. Orlov[1], Emma K. Bramham[1], Mark Thomas[1], Paul K. Byrne[2], Sandra Piazolo[1], and Estelle Mortimer[1]

[1]School of Earth and Environment, University of Leeds.

[2]Department of Earth and Planetary Sciences, Washington University in St. Louis.

## Contents of this file

Figure S1
Caption for Movie S1

## Additional Supporting Information (Files uploaded separately)

Movie S1

## Introduction

Our supporting information includes images (Figure S1) and animation (Movie S1) to provide further context to the interpretations of age and structural evolution presented in the paper. Figure S1 provides the full suite of crater count plots (two for every fault set) which were the basis of the ages presented in Table 1. Movie S1 is an animation of fault evolution which pairs the timeline of Figure 9 with maps of each fault set to provide a dynamic representation of the information provided in the main text.

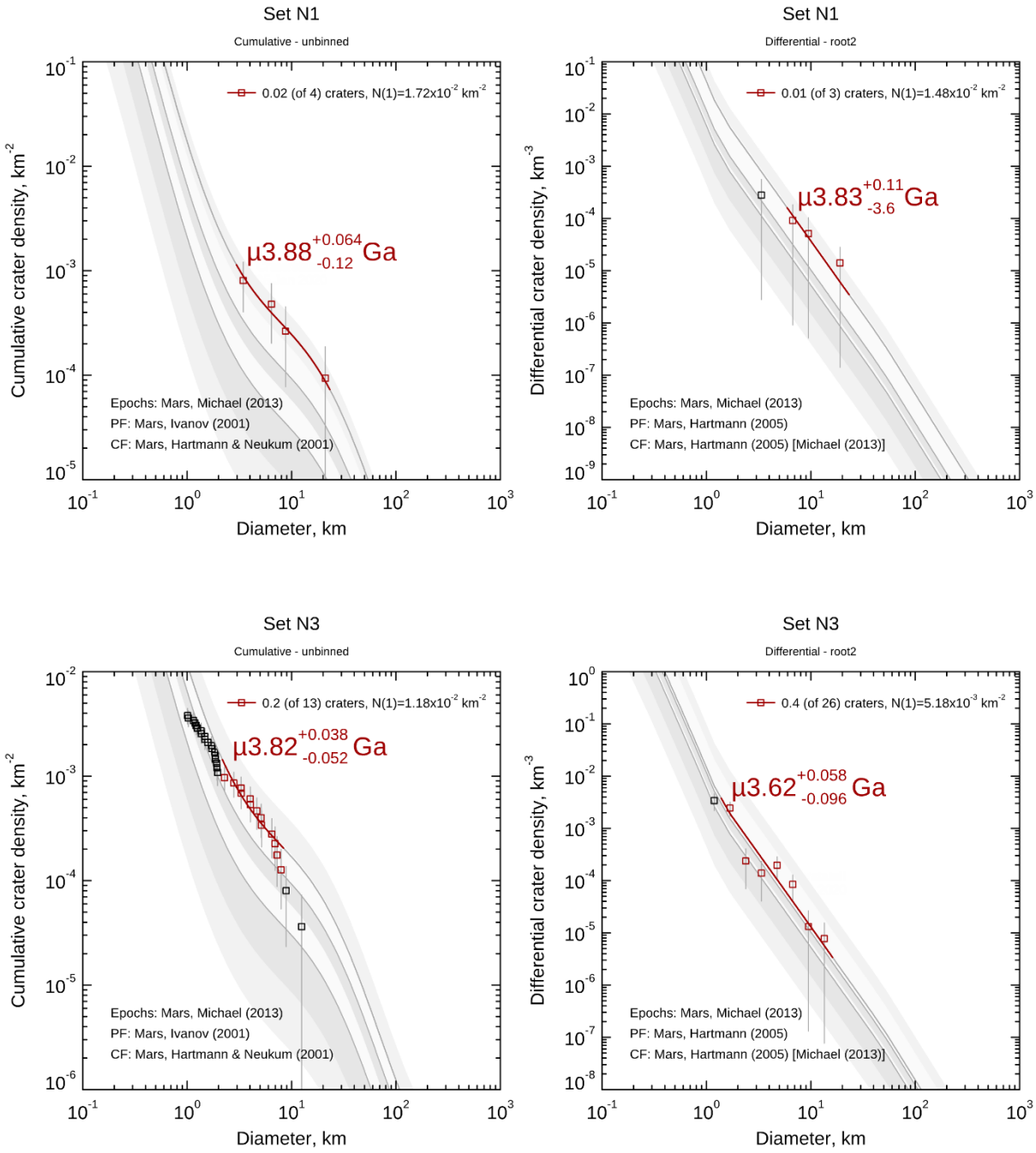
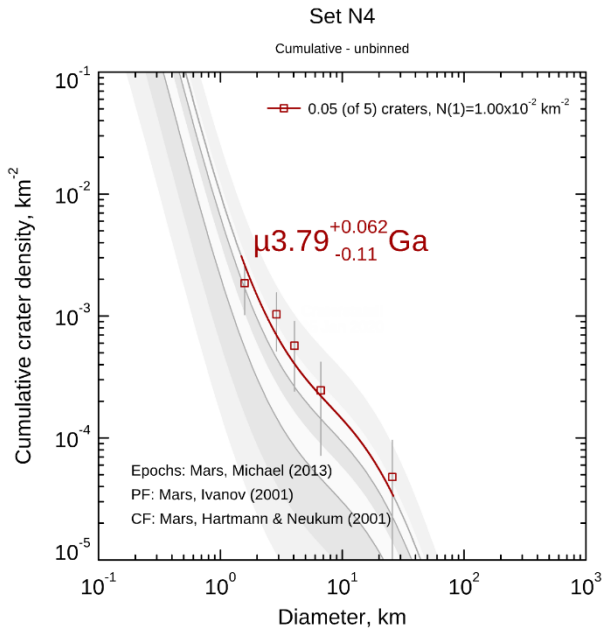
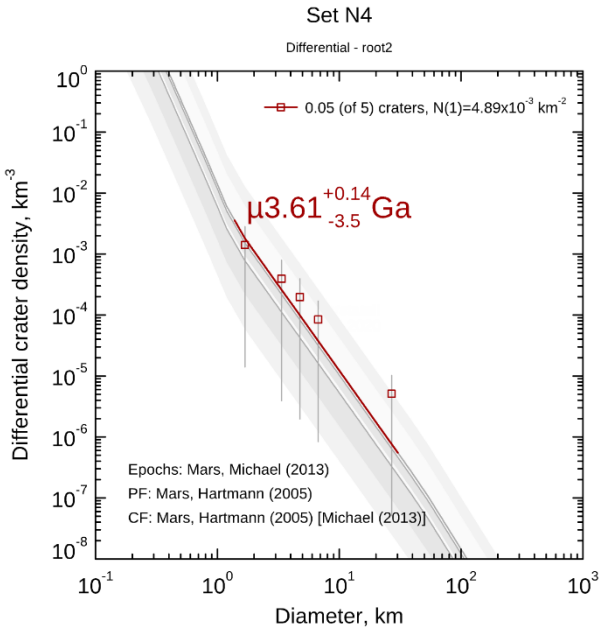
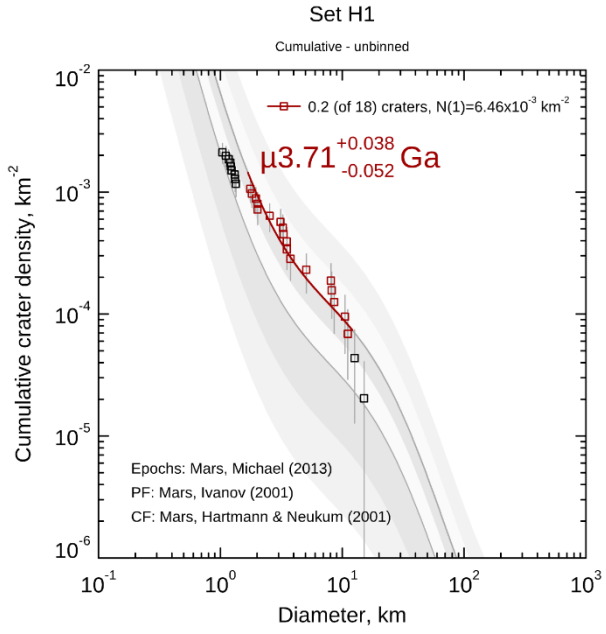
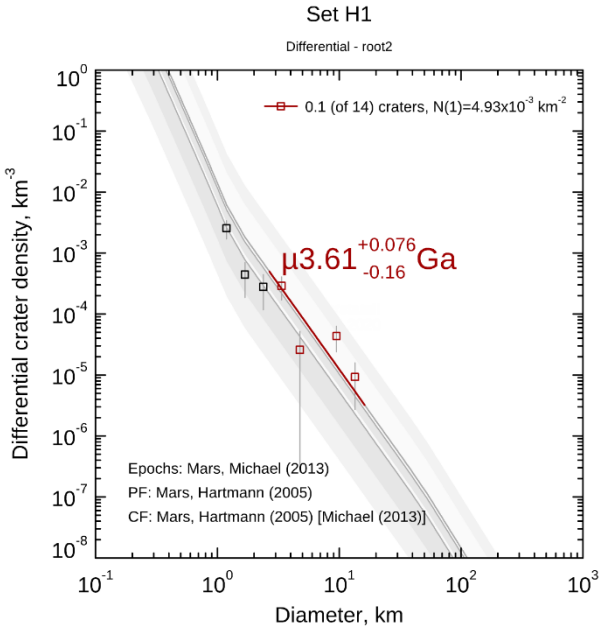


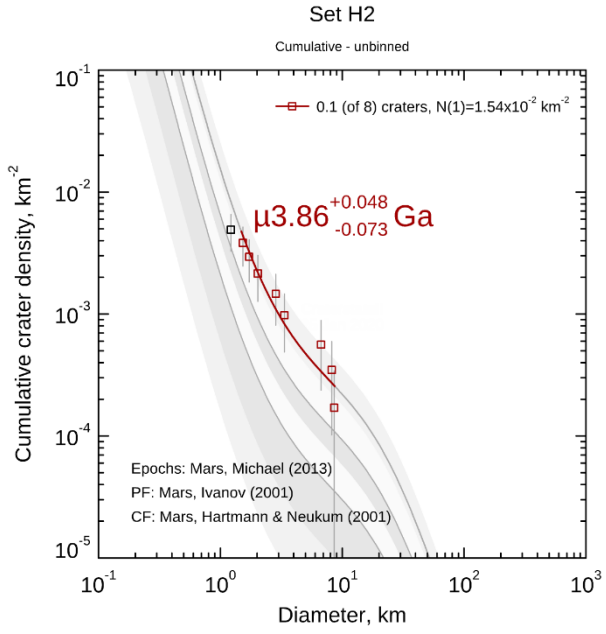

**Figure S1.** Crater count plots created in Craterstats showing age for each fault set in two different chronology systems. On the left is the cumulative crater-size frequency distribution using the Neukum–Ivanov chronology [Hartmann and Neukum, 2001; Ivanov, 2001] on unbinned data. On the right is the differential crater-size frequency distribution using the Hartmann chronology [Hartmann, 2005] where data is binned using the √2 method. There were not enough craters to analyse sets N2 and A1. PF = production function, CF = chronology function.

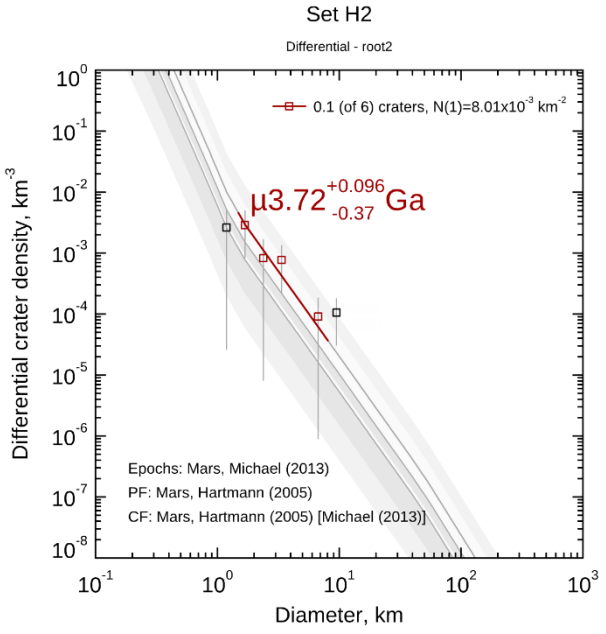

Set N4
Cumulative - unbinned
0.05 (of 5) craters, N(1)=1.00x10^-2 km^-2
μ3.79 +0.062 -0.11 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Cumulative crater density, km^-2
Diameter, km

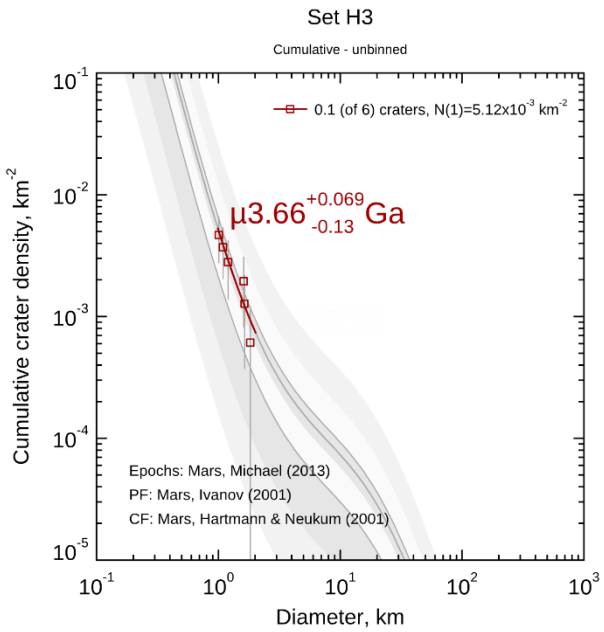

Set N4
Differential - root2
0.05 (of 5) craters, N(1)=4.89x10^-3 km^-2
μ3.61 +0.14 -3.5 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Hartmann (2005)
CF: Mars, Hartmann (2005) [Michael (2013)]
Differential crater density, km^-3
Diameter, km

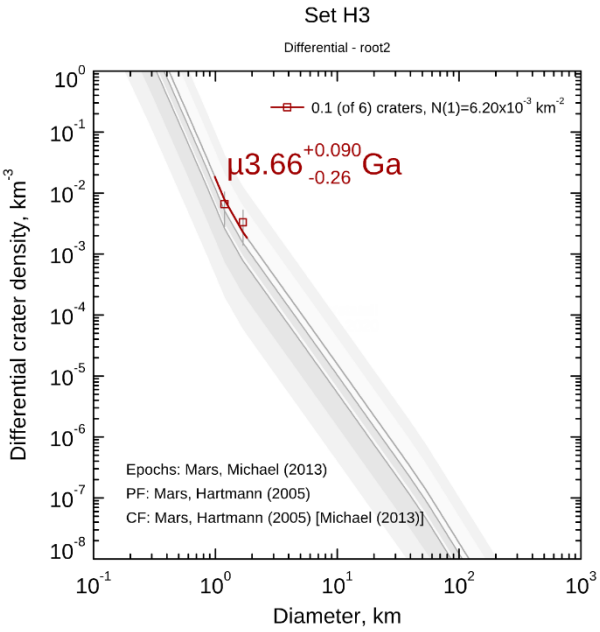

Set H1
Cumulative - unbinned
0.2 (of 18) craters, N(1)=6.46x10^-3 km^-2
μ3.71 +0.038 -0.052 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Cumulative crater density, km^-2
Diameter, km

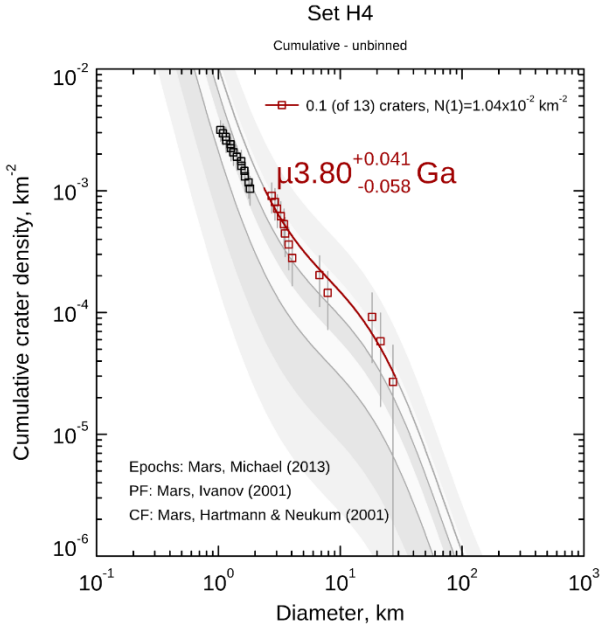

Set H1
Differential - root2
0.1 (of 14) craters, N(1)=4.93x10^-3 km^-2
μ3.61 +0.076 -0.16 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Hartmann (2005)
CF: Mars, Hartmann (2005) [Michael (2013)]
Differential crater density, km^-3
Diameter, km

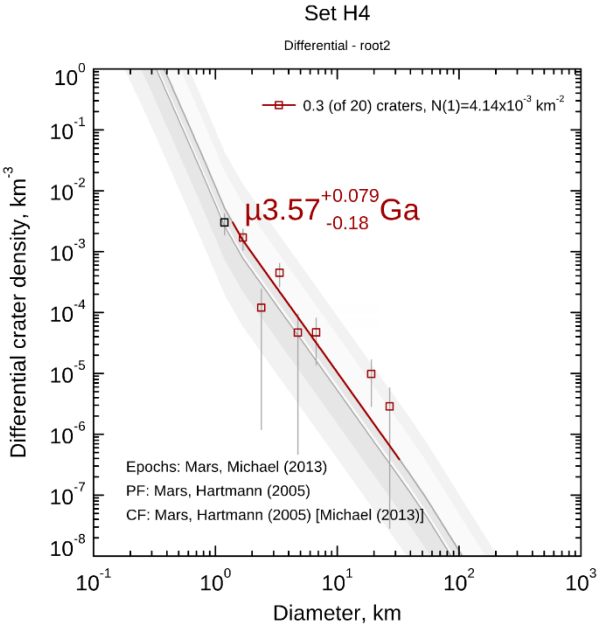

Set H2
Cumulative - unbinned
0.1 (of 8) craters, N(1)=1.54x10^-2 km^-2
μ3.86 +0.048 -0.073 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Cumulative crater density, km^-2
Diameter, km

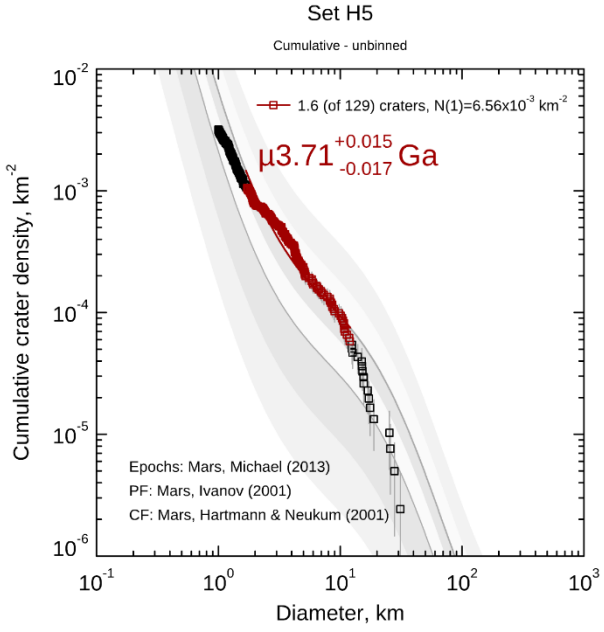

Set H2
Differential - root2
0.1 (of 6) craters, N(1)=8.01x10^-3 km^-2
μ3.72 +0.096 -0.37 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Hartmann (2005)
CF: Mars, Hartmann (2005) [Michael (2013)]
Differential crater density, km^-3
Diameter, km

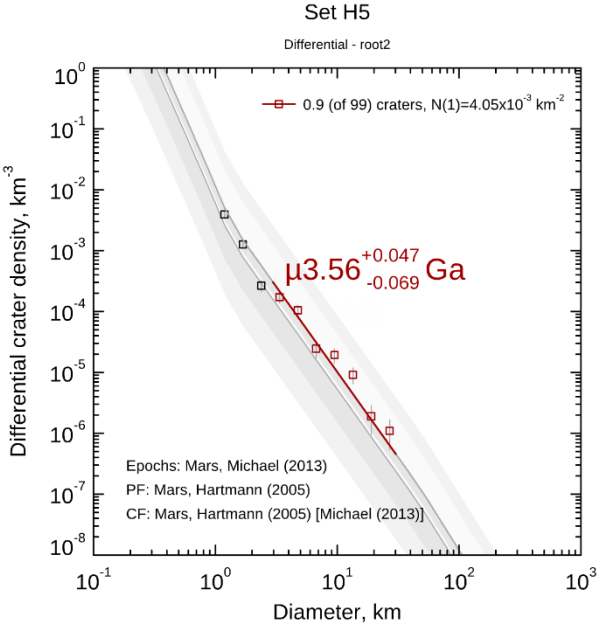

Set H3
Cumulative - unbinned
0.1 (of 6) craters, N(1)=5.12x10^-3 km^-2
μ3.66 +0.069 -0.13 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Cumulative crater density, km^-2
Diameter, km

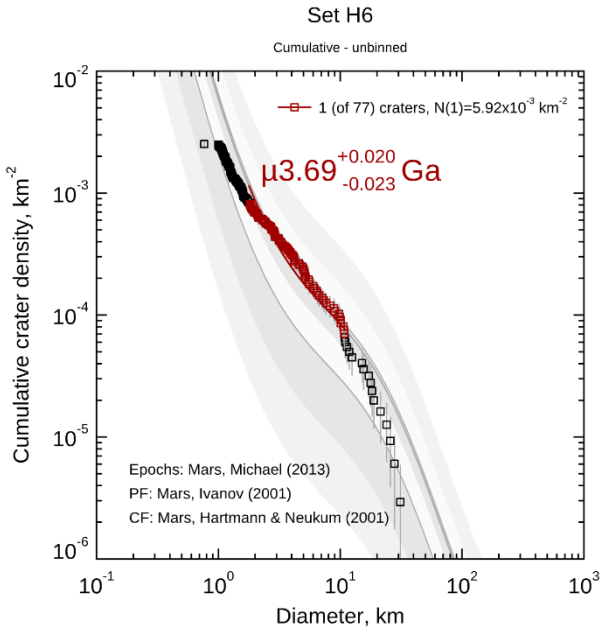

Set H3
Differential - root2
0.1 (of 6) craters, N(1)=6.20x10^-3 km^-2
μ3.66 +0.090 -0.26 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Hartmann (2005)
CF: Mars, Hartmann (2005) [Michael (2013)]
Differential crater density, km^-3
Diameter, km

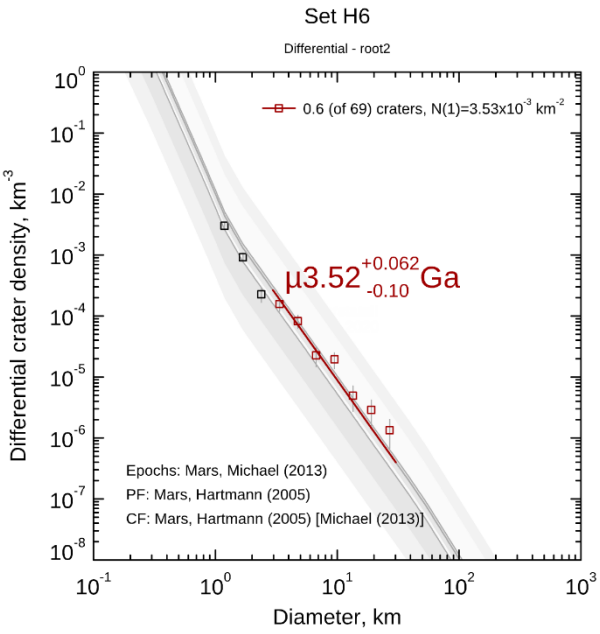

Set H4
Cumulative - unbinned
0.1 (of 13) craters, N(1)=1.04x10^-2 km^-2
μ3.80 +0.041 -0.058 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Cumulative crater density, km^-2
Diameter, km

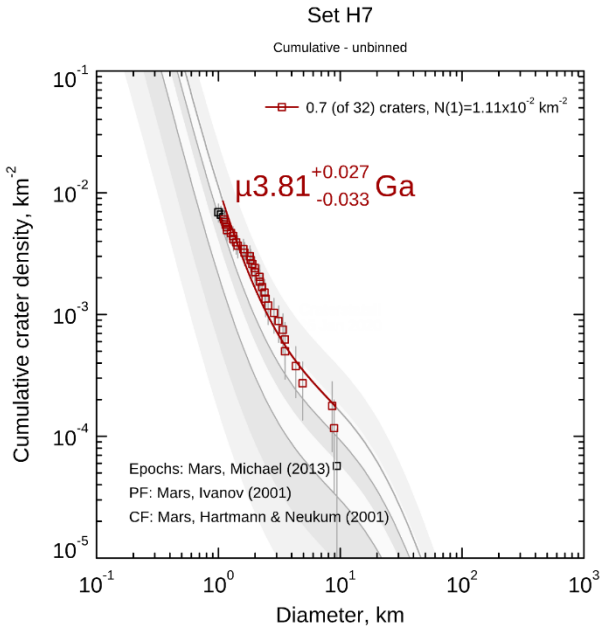

Set H4
Differential - root2
0.3 (of 20) craters, N(1)=4.14x10^-3 km^-2
μ3.57 +0.079 -0.18 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Hartmann (2005)
CF: Mars, Hartmann (2005) [Michael (2013)]
Differential crater density, km^-3
Diameter, km

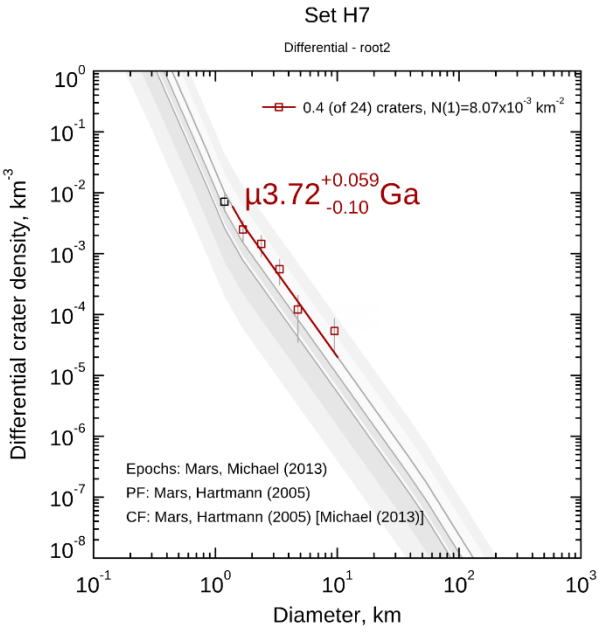

Set H5
Cumulative - unbinned
1.6 (of 129) craters, N(1)=6.56x10^-3 km^-2
μ3.71 +0.015 -0.017 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Cumulative crater density, km^-2
Diameter, km

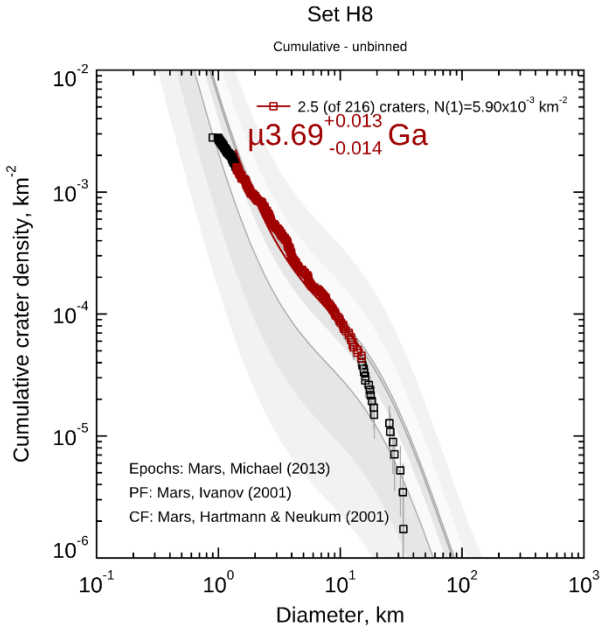

Set H5
Differential - root2
0.9 (of 99) craters, N(1)=4.05x10^-3 km^-2
μ3.56 +0.047 -0.069 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Hartmann (2005)
CF: Mars, Hartmann (2005) [Michael (2013)]
Differential crater density, km^-3
Diameter, km

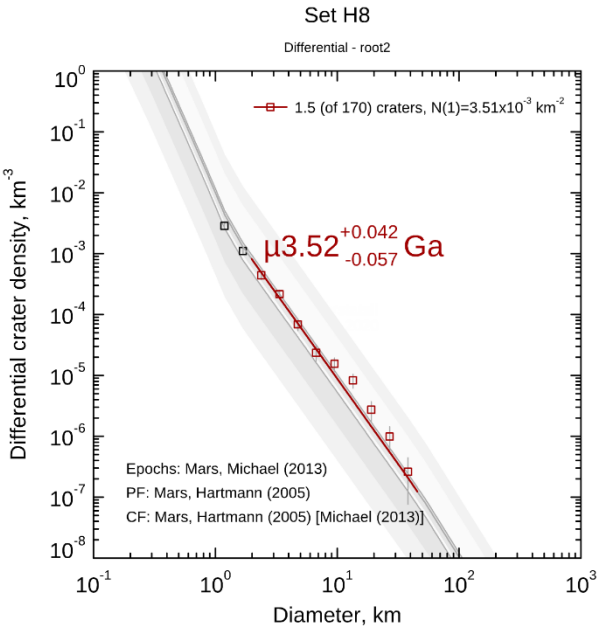

Set H6
Cumulative - unbinned
1 (of 77) craters, N(1)=5.92x10-3 km-2
μ3.69 +0.020 -0.023 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Cumulative crater density, km-2
Diameter, km

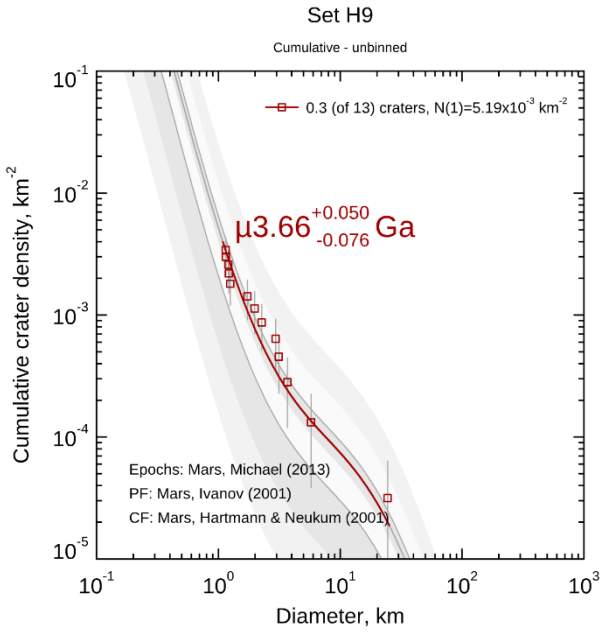

Set H6
Differential - root2
0.6 (of 69) craters, N(1)=3.53x10-3 km-2
μ3.52 +0.062 -0.10 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Hartmann (2005)
CF: Mars, Hartmann (2005) [Michael (2013)]
Differential crater density, km-3
Diameter, km

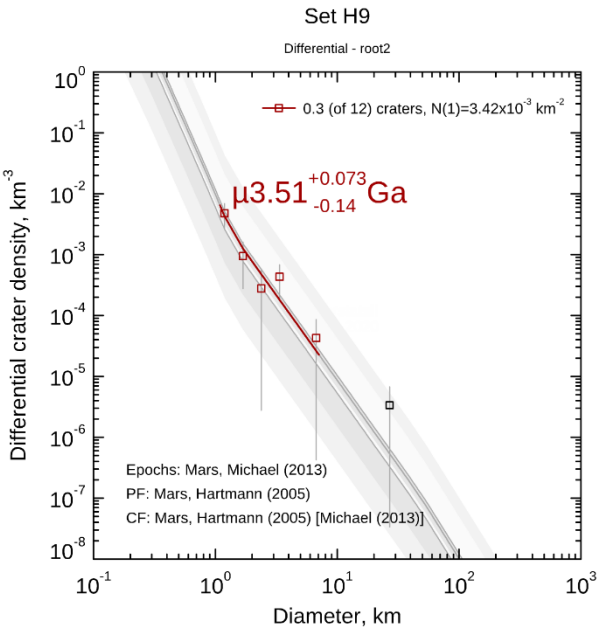

Set H7
Cumulative - unbinned
0.7 (of 32) craters, N(1)=1.11x10-2 km-2
μ3.81 +0.027 -0.033 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Cumulative crater density, km-2
Diameter, km

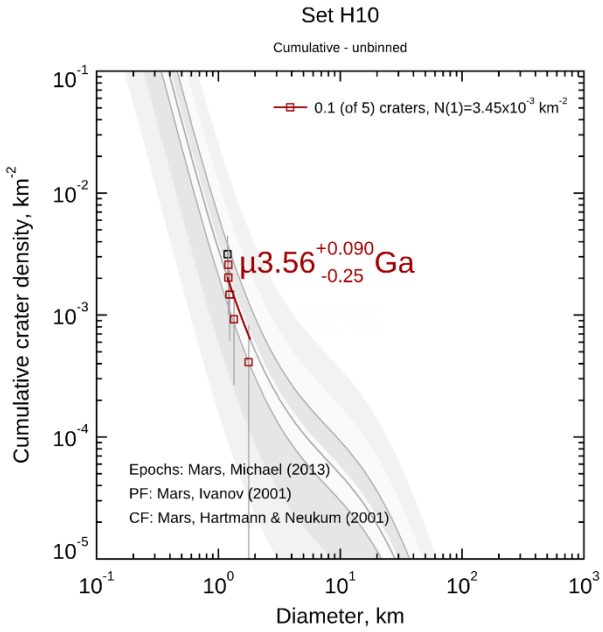

Set H7
Differential - root2
0.4 (of 24) craters, N(1)=8.07x10-3 km-2
μ3.72 +0.059 -0.10 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Hartmann (2005)
CF: Mars, Hartmann (2005) [Michael (2013)]
Differential crater density, km-3
Diameter, km

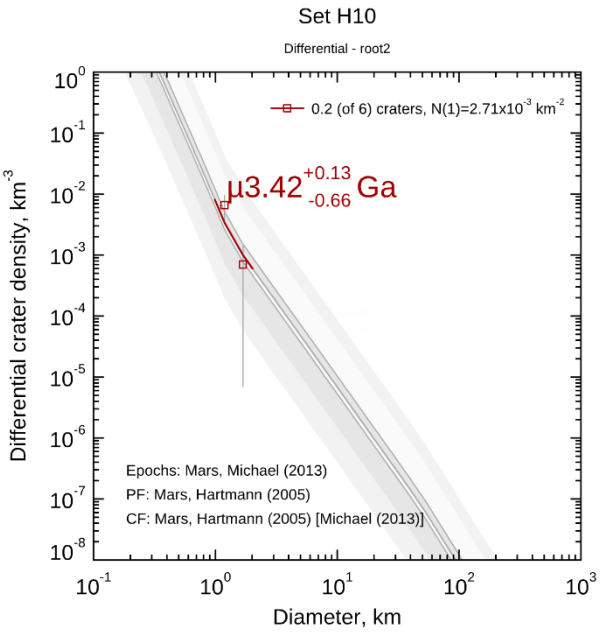

Set H8
Cumulative - unbinned
2.5 (of 216) craters, N(1)=5.90x10-3 km-2
μ3.69 +0.013 -0.014 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Cumulative crater density, km-2
Diameter, km

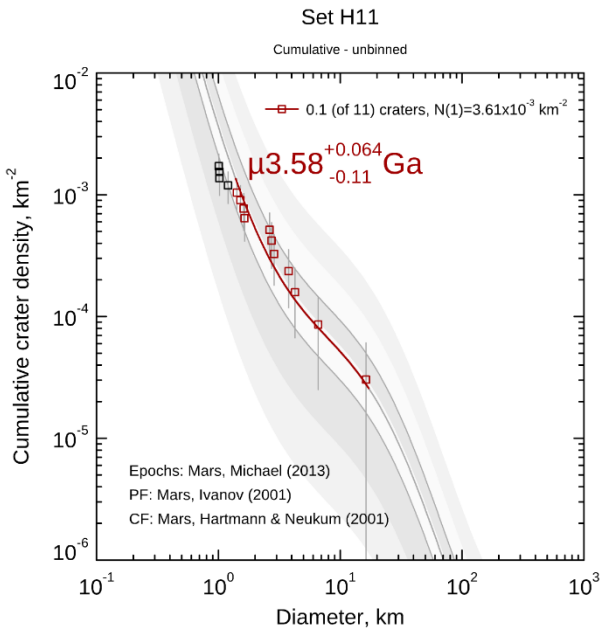

Set H8
Differential - root2
1.5 (of 170) craters, N(1)=3.51x10-3 km-2
μ3.52 +0.042 -0.057 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Hartmann (2005)
CF: Mars, Hartmann (2005) [Michael (2013)]
Differential crater density, km-3
Diameter, km

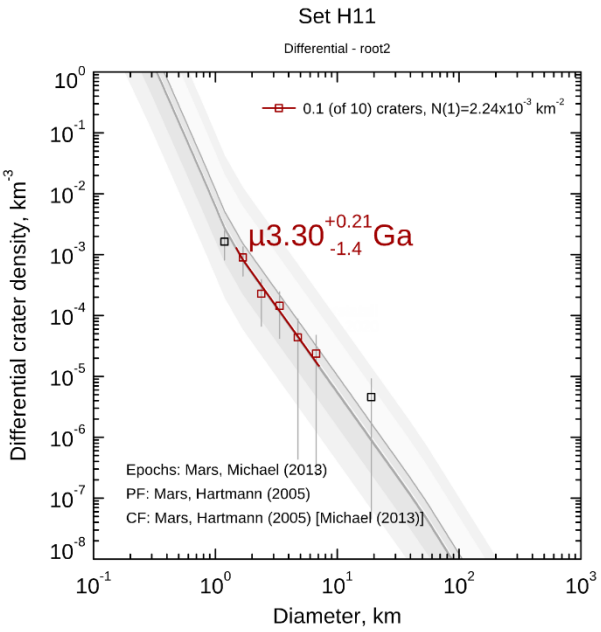

Set H9
Cumulative - unbinned
0.3 (of 13) craters, N(1)=5.19x10-3 km-2
μ3.66 +0.050 -0.076 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Cumulative crater density, km-2
Diameter, km


Set H9
Differential - root2
0.3 (of 12) craters, N(1)=3.42x10-3 km-2
μ3.51 +0.073 -0.14 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Hartmann (2005)
CF: Mars, Hartmann (2005) [Michael (2013)]
Differential crater density, km-3
Diameter, km


Set H10
Cumulative - unbinned
0.1 (of 5) craters, N(1)=3.45x10-3 km-2
μ3.56 +0.090 -0.25 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Cumulative crater density, km-2
Diameter, km


Set H10
Differential - root2
0.2 (of 6) craters, N(1)=2.71x10-3 km-2
μ3.42 +0.13 -0.66 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Hartmann (2005)
CF: Mars, Hartmann (2005) [Michael (2013)]
Differential crater density, km-3
Diameter, km


Set H11
Cumulative - unbinned
0.1 (of 11) craters, N(1)=3.61x10-3 km-2
μ3.58 +0.064 -0.11 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Cumulative crater density, km-2
Diameter, km


Set H11
Differential - root2
0.1 (of 10) craters, N(1)=2.24x10-3 km-2
μ3.30 +0.21 -1.4 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Hartmann (2005)
CF: Mars, Hartmann (2005) [Michael (2013)]
Differential crater density, km-3
Diameter, km

**Movie S1.** Animation of Tempe Terra's structural evolution with a combined map and timeline that shows fault sets and wrinkle ridges in relative time order. This animation provides a dynamic representation of how structures evolved across Tempe Terra in space and time.