DATING THE ACTIVITY OF TECTONIC SYSTEMS ON MERCURY. L.Giacomini[1] , M. Massironi[1] , V. Galluzzi[2] and S. Ferrari[3], [1] Department of Geosciences, University of Padua, via Gradenigo 6, 35131, Padua, Italy (lorenza.giacomini@gmail.com), [2] INAF, Istituto di Astrofisica e Planetologia Spaziali, via Fosso del Cavaliere 100, 00133, Rome, Italy, [3] CISAS, via Venezia15, 35131, Padua, Italy.

Introduction: The global tectonic scenario of Mercury is dominated by contractional features mainly represented by lobate scarps. These structures are the expression of surface-breaking thrust faults and are linear or arcuate features widely distributed on Mercury. Since they display a broad distribution of orientations, they are thought to be related to a global contractional strain due to the planet's interior cooling [1]. The age determination of these features will permit to estimate the rate of global contraction and whether limits could be placed on when the contraction occurred. This will give us new clues to better understand the thermal evolution of Mercury.

Mercury's thrust systems: We identified several thrust systems widely distributed on the planet's surface. We classified as "thrust system" a series of clustered thrust segments characterized by a coherent trend.

For the dating, we selected considerable long systems, extending for thousands of kilometers in length, in order to obtain a solid statistic that allows a better estimation of the system's ages (Fig.1).

In this work we dated four of the identified thrust systems that were named after main features encompassed in the system. In particular, we took into account the Thakur, Santa Maria, Villa Lobos, and Enterprise system (Fig.1).

Dating the thrust system activity: We dated the systems through the buffered crater counting technique [2,3,4], which can be used to derive absolute model ages of linear landforms such as faults, ridges and channels. We included in the counting all the craters whose rim directly cut the thrusts. A fault buffer distance ≤ 1.5D has been considered (where D is the diameter of the crater). Subsequently, the results of the crater counting have been arranged as a crater size–frequency distribution (CSFD), which describes the frequency of craters of specified size per unit area. Finally, the CSFD have been compared with the Neukum Production Function (NPF) [5], and the more recent Le Feuvre and Wieczorek Production Function [6], to gain the absolute age for the end of activity of the systems.

Preliminary results: The age obtained suggested that the activity of the four thrust systems considered in this work ended between a time span ranging from 3.6 to 3.8 Ga, according to NPF (Fig.2). We obtained comparable results considering the Le Feuvre and Wieczorek Production Function (Fig.2), taking into account the porous scaling law, which has been thought to be the more appropriate due to the charac

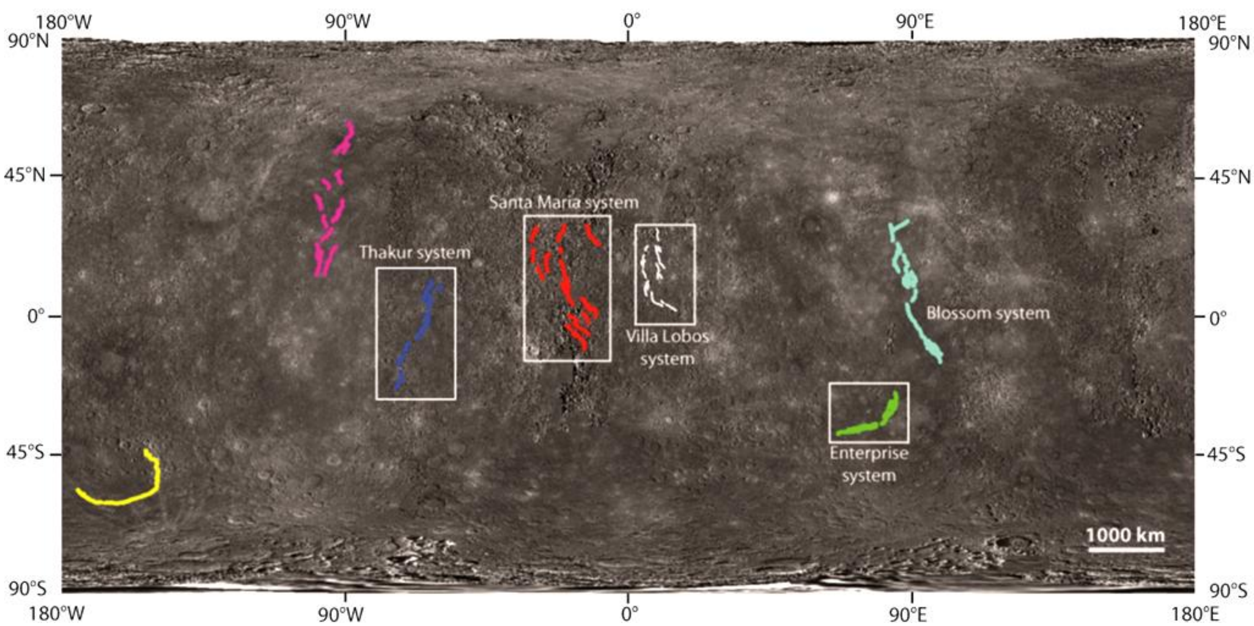

Fig.1 Thrust systems detected all around Mercury's surface suitable for the dating. White squares enhance the systems considered in this work. Also Blossom system, previously dated by [4], is shown. The basemap is a MESSENGER MDIS global mosaic in equirectangular projection. Scale is true at the equator.

teristics of the surrounding terrain. Moreover, by considering the non-porous scaling law we obtained very young ages (< 1 Ga) which do not fit with the geomorphologic evidences.

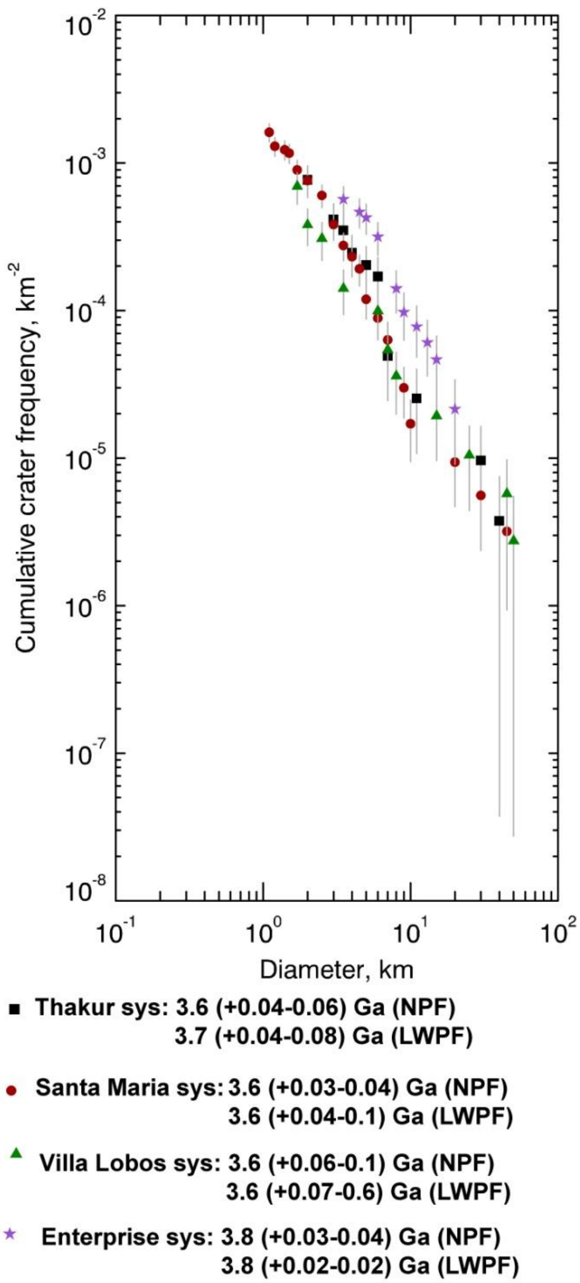

Fig.2 CSFDs of the thrust systems shown on Fig.1. and relative absolute ages estimated according to Neukum Production Function (NPF) and Le Feuvre and Wieczorek Production Function (LWPF).

The results are comparable to that estimated for the Blossom Rupes system (Fig. 1), dated at about 3.5-3.7 Ga [4]. All these data suggest that the activity along major rupes all around planet Mercury have most probably begun before 3.5 Ga. This would imply a revision of the most recent Mercury thermal evolution models which instead estimate the beginning of the global contraction at about 3.0 Ga, well after the end of the Late Heavy Bombardment (LHB) [e.g. 7,8].

Moreover, these preliminary results could suggest that other processes, like tidal despinning and mantle convection, could have contributed to Mercury's evolution, although yet within the global framework of cooling and contraction.

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