



**Fig. 7.** Identification of Caloris basin rings (white) and tentative locations of large impact craters and basins (black) that predated the formation of Caloris, as inferred from the DTM. The two identified Caloris rings have radii of 690 and 850 km.

Two other possible mechanisms for the formation of highs within the Caloris basin floor are volcanic construction and uplift, but observations do not provide support for either. The high areas in the DTM lack evident volcanic source regions, and physical volcanological models for eruptions on Mercury favor high-effusion-rate eruptions that tend to produce broad plains rather than distinct edifices (Wilson and Head, 2008). Extensional fault structures, widespread within the interior of Caloris, provide ample evidence for floor uplift (Murchie et al., 2008; Watters et al., 2009), but the mapped distribution of extensional faults in the area does not show any correlation with the topographic highs in the DTM (Fig. 9). Notably, the large complex of radially oriented graben in the Pantheon Fossae area (see profile bb' in Fig. 5 or marked point D in Fig. 3) are located within a central low in the DTM, opposite to the expectation if these structures formed in response to uplift by tectonic or magmatic processes (Murchie et al., 2008; Head et al., 2008; Watters et al., 2009).

## 5. Discussion

The DTM presented in this paper was determined solely on the basis of geometric (image disparity) effects and does not rely on

assumptions regarding surface photometric properties. Owing to small stereo and oblique viewing angles for the available images, small errors in pointing angles and in the image matching will introduce comparatively large height errors, which we expect to correlate to some extent with the viewing geometry.

With some remaining errors in spacecraft navigation and camera calibration information, we cannot rule out offsets in absolute height and errors in long-wavelength trends in the model. It may be worthwhile to carry out a full study of the propagation of errors from navigation and camera parameters to the point accuracies for this particular imaging geometry with Monte Carlo techniques, but such an analysis is beyond the scope of this paper to perform. Owing to the large number of interlinked images, we nonetheless expect that the relative orientations of the images within the block are comparably stable. In addition, the analysis of residuals of control point coordinates does not show evidence of any "stresses" in the image block, i.e., displacements or vertical offsets of the individual DTM pieces. Consequently, any systematic errors within the model should be small.

It is important to assess whether the unusual long-wavelength topographic undulations within the floor of Caloris may be associated with errors in the long-wavelength stereo topography. To