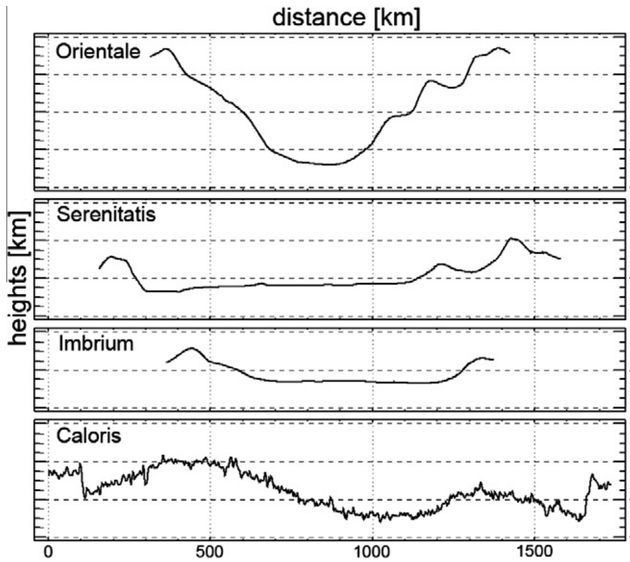

Fig. 8. Topographic profiles across selected lunar impact basins and Caloris. Lunar basin topography was taken from Clementine lidar data (Smith et al., 1997). Profiles pass through the basin centers and are in the north–south direction for the lunar basins; the profile for Caloris extends from northwest to southeast.

obtain an additional check, we investigated MESSENGER WAC images that were obtained during the same flyby. Though the wide-angle data are limited by low resolution, the data (with images taken through a different optical system and differently arranged footprints) hint at similar topographic patterns and trends. However, given the problems faced by physical mechanisms to account for the model's long-wavelength undulations across the Caloris basin floor, we suggest that this topic should await the acquisition of laser altimeter data from the Caloris area during MESSENGER's orbital mission phase.

The terrain model derived from MESSENGER stereo images gives us a fresh look at the morphology of Caloris and sets the stage for the observations of this largest impact basin on Mercury during MESSENGER's orbital mission phase. For the orbital phase of the mission, stereo sequences with global coverage from closer range and under appropriate lighting and viewing conditions are being planned. These observations will result in topographic models that improve the spatial resolution of the current Caloris model by a factor of two. With a more favorable viewing geometry, the noise in the terrain models will be substantially reduced and visibility into model details will be improved. Moreover, laser topographic profiles with their superior height precision will provide "ground truth" and calibration to reduce remaining ambiguities regarding absolute elevations and trends in long-wavelength topography.

Once data from the orbital mission phase are in hand, it will be worthwhile to study in detail the morphologies of other impact basins on Mercury to place Caloris into a global context. Comparisons of long-wavelength topography and gravitational anomaly observations obtained from MESSENGER radio tracking, together with high-resolution imaging and spectroscopy of geological units and tectonic features, will permit the large-scale structure and associated geological evolution of each of the larger basins to be discerned and compared.

Acknowledgments

We wish to thank two anonymous reviewers whose thoughtful comments improved this manuscript. The MESSENGER project is supported by the NASA Discovery Program under contracts NASW-00002 to the Carnegie Institution of Washington and NAS5-97271 to the Johns Hopkins University Applied Physics Laboratory.

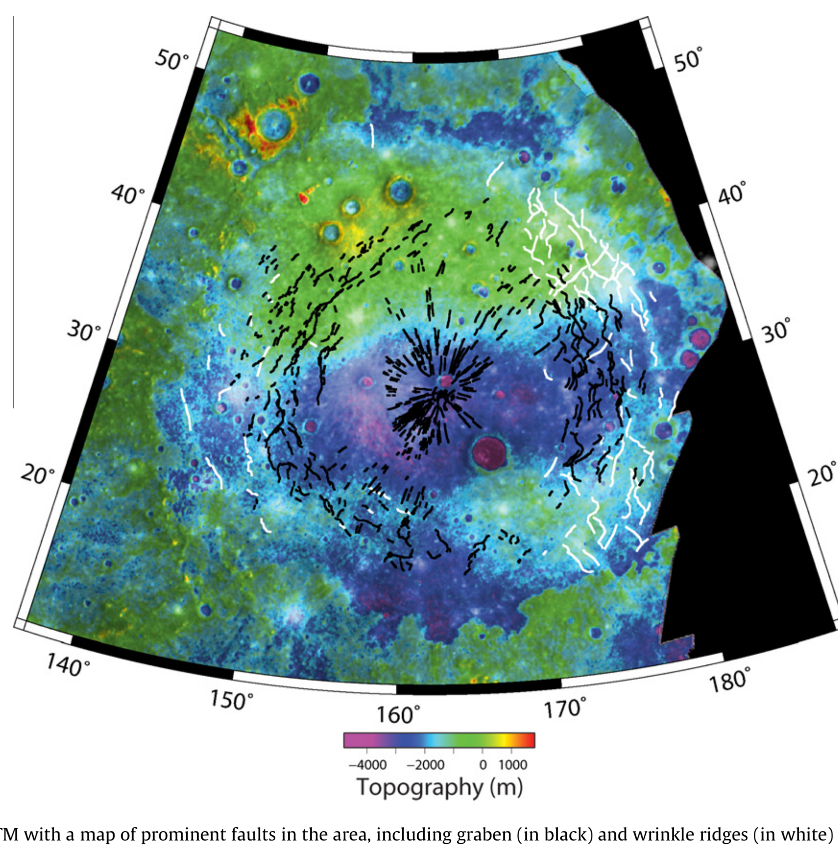

Fig. 9. Comparison of Caloris DTM with a map of prominent faults in the area, including graben (in black) and wrinkle ridges (in white) (Murchie et al., 2008; Watters et al., 2009).