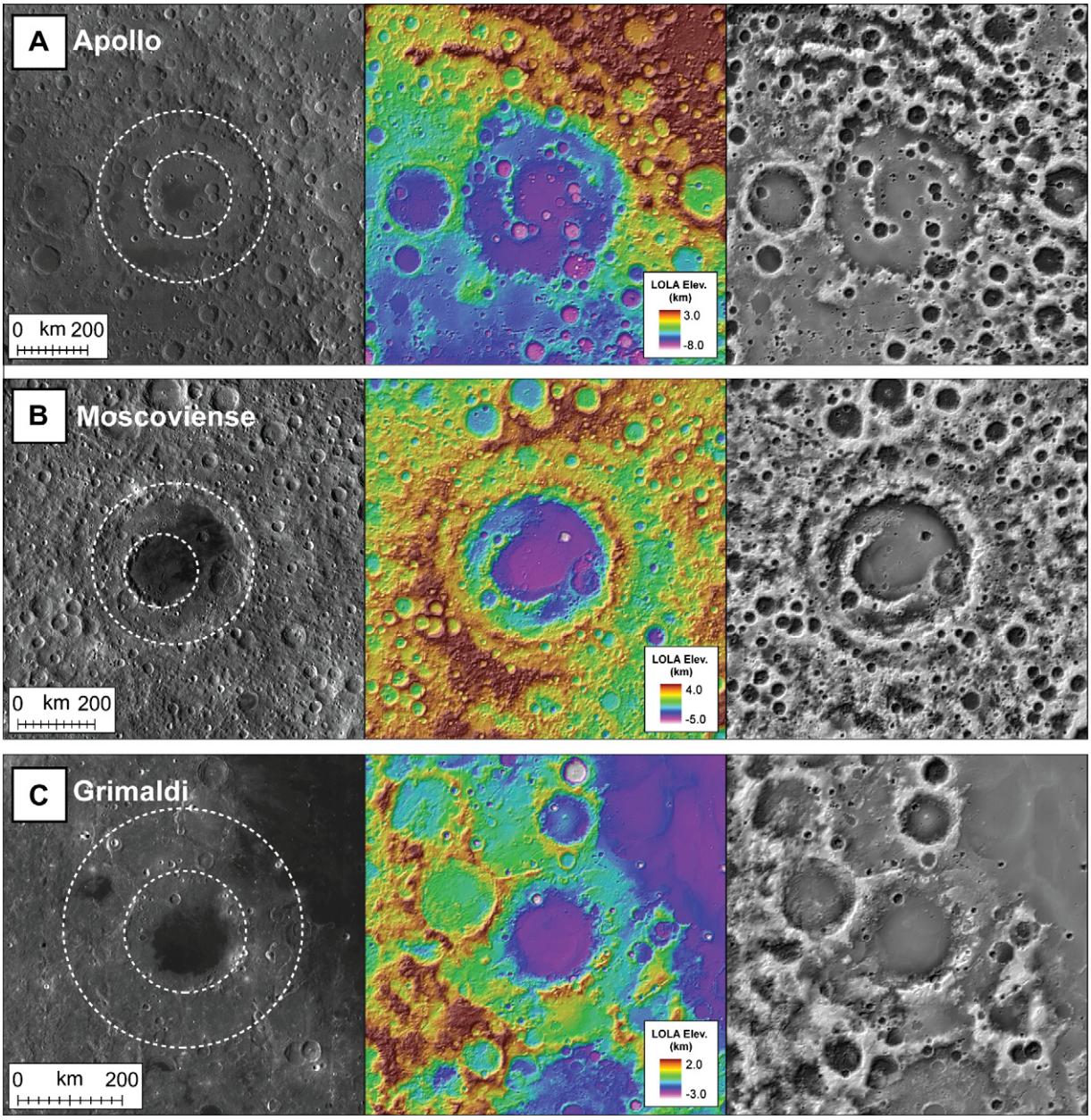

Fig. 3. Large peak-ring basins on the Moon previously inferred to be multi-ring basins (Wilhelms et al., 1987; Pike and Spudis, 1987; Spudis, 1993). Left panels show dashed outlines of the observed basin rim crest and ring on a Lunar Reconnaissance Orbiter Camera (LROC) Wide Angle Camera (WAC) image mosaic. Middle panels show LOLA colored gridded topography at 128 pixel/degree on LOLA hillshade gridded topography. Right panels show detrended LOLA topography maps. (A) Apollo (492 km; 208.28°E, 36.07°S). (B) Moscoviense (421 km; 147.36°E, 26.34°N). (C) Grimaldi (460 km; 291.31°E, 5.01°S). (D) Freundlich–Sharonov (582 km; 175.00°E, 18.35°N). (E) Coulomb–Sarton (316 km; 237.47°E, 51.35°N). (F) Korolev (417 km; 202.53°E, 4.44°S). See text (Section 4) for a discussion of the ring designations of the basins.

prominent interior ring and no observable central peak. While it is still possible that small central peaks within these structures have been erased by resurfacing processes, the absence of a central peak precludes them from being classified as a protobasin in our catalog. We do not observe interior rings or central peaks for the remaining possible protobasins classified by Pike and Spudis (1987).

Ringed peak-cluster basins have not been included in previous basin catalogs of the Moon. From analyses of recent flyby images of Mercury, Schon et al. (2011) and Baker et al. (2011) interpret at least some ringed peak-cluster craters to be transitional types between complex craters possessing central peaks and peak-ring basins. Support for such a transitional morphology included overlap between the rim-crest diameters of ringed peak-cluster basins with rim-crest diameters of protobasins and small peak-ring basins, the clear ring-like morphology of the peak elements (ringed peak clusters), and similar trends between the diameters of ringed peak clusters and central peak diameters in complex craters. These trends, as well as geological mapping, led the authors to suggest that ringed peak clusters are the product of early development of a melt cavity that directly modifies the centers of central uplift structures. While at least 23 craters >50 km in diameter on the Moon exhibit interior morphologies with ring-like central peaks (Table A3), the diameter range for these craters is large (50–205 km, with all but one between 50 and 114 km) and only one, Humboldt, has a rim-crest diameter (205 km) that overlaps with the rim-crest diameters of protobasins. It is therefore likely that most ring-like central peak structures do not represent unique transitional types in the size-morphology progression from complex craters to peak-ring basins. The association of ring-like central peaks with floor-fractured craters has led to the interpretation that