deepening of the cavity in the up-range direction also predicts there to be an enhancement in rim-crest elevation in the up-range or offset direction. We evaluate these predictions by examining if any correlation exists between the peak-ring offset and elevation of the peak ring and rim crest in this direction (Figure 12). We evaluated the elevation of the peak ring and rim crest in direction of offset as percentiles of the entire set of peak-ring and rim-crest elevation measurements. Unfortunately, the peak-ring elevation for only four basins could be evaluated due to the overlap in offset direction with peak-ring exclusion zones. We see that while enhancement of the peak ring in the direction of offset is clear for Moscoviense (the peak-ring elevation is at the 92nd percentile in the offset direction), this is not obvious for the other three basins (peak-ring elevation percentiles are between 22 and 60 in the offset direction). It is possible that smaller 5–10 km offsets may reflect more vertical impacts, and differences in the asymmetry of excavation may not be sufficient at these impact angles to record signification trajectory-dependent variation in peak-ring topography. This is consistent with an apparent dependence on peak-ring enhancement with magnitude of the peak-ring offset (Figure 12). Furthermore, we see no correlation between magnitude of the peak-ring offset and rim-crest elevation. In particular, Moscoviense, which has the largest peak-ring offset and is the best candidate for being produced by an oblique impact [*Schultz and Stickle*, 2011], has a rim-crest elevation at about the 30th percentile in the offset direction. This observation is in contrast to the predicted deepening of the crater in the up-range direction [*Schultz*, 1992a, 1992b]. As suggested by *McDonald et al.* [2008] for peak-ring basins on Venus, target properties may have a more dominant control on the offset in peak rings. For Moscoviense, offset in the peak ring could have been influenced by impact into an older basin with already thinned crust, as supported by geophysical observations [*Ishihara et al.*, 2011].

5.7. Basin Volume (V_1 and V_2)

[54] As expected from the strong control that rim diameter has in determining the basin volume (equation (1)), the volumes of peak-ring basins and protobasins are observed to increase in a well-defined manner with increasing rim-crest diameter (Figure 13). The volumes calculated using both the double frustum method and the surface-to-TIN method (section 4.4) yield very similar results, with an average percent difference of about 3% (Table 4); there was also no systematic difference between the two methods. These results suggest that the double frustum method is a reliable method for calculating the volumes of peak-ring basins and

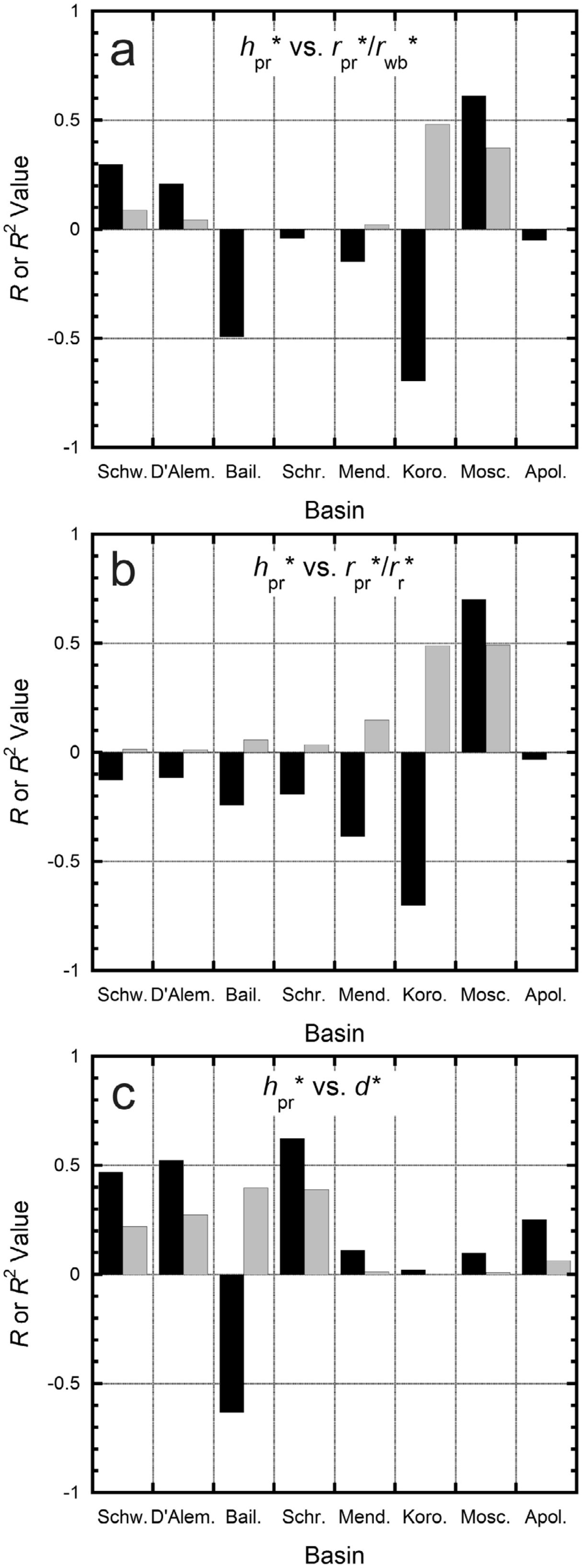

Figure 11. Correlation coefficient (R, black bars) and coefficient of determination (R^2, light gray bars) determined for each basin from linear fits to all azimuthal calculations of the height of the peak ring versus the (a) ratio of the peak-ring radius to the wall-base radius, (b) ratio of the peak-ring radius to the rim-crest radius, and (c) basin depth. The ratio of the peak-ring radius to the wall-base radius is used as a proxy for proximity to rim-wall slump material. No general correlation is found between peak-ring heights and this ratio (Figure 11a). No correlation is found between peak-ring heights and proximity to the rim crest (Figure 11b). Slightly greater correlation is found between peak-ring height and rim-crest height (Figure 11c), which may suggest that pre-impact topography is important in determining peak-ring topography.