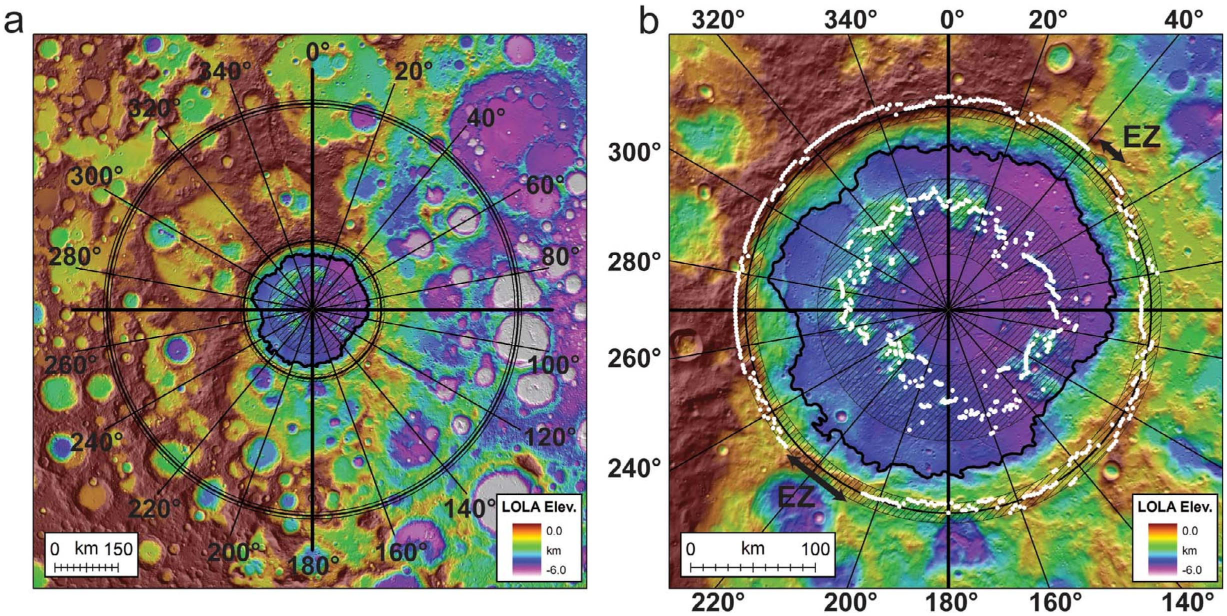

Figure 3. LOLA colored topography of Schrödinger basin (326 km, 74.90°S, 133.09°E) illustrating how reference points (Figure 2b) are located within pre-defined buffer zones. (a) Outlines of the four buffer zones (dashed areas; see also Figure 2e) and locations of the radial profiles given in Figure 4, which are separated by 20° of azimuth. The azimuth for due north is defined as 0°, with increasing azimuth occurring in the clockwise direction. (b) Close-up of Schrödinger basin showing the locations of the rim-crest and peak-ring reference points determined for each profile (1° azimuthal interval, white points) within each buffer zone. Azimuthal gaps in the reference points are due to pre-defined exclusion zones ("EZ"), where superposed impactor craters are disrupting the topography of Schrödinger basin. The irregular thick black outline defines the locations of the wall-base reference points.

affected by post-impact processes, and be robust with respect to the statistical techniques used for the calculation. With the current availability of high-resolution DEMs and the current level of computing power available for most personal computer workstations, it is now possible to meet these criteria with substantially higher fidelity. Considering these criteria, we now outline a new semi-automated procedure for extracting the geometric properties of impact basins on the Moon.

4. Improved Techniques for Calculating Geometric Properties of Impact Basins

[13] To improve the techniques for calculating impact basin geometries, we have automated the extraction of topographic information from DEMs along a set of radial topographic profiles extending from the center of a basin of interest outward to a specified range (Figures 2, 3, and 4). Each radial profile tracks a great circle path, which most accurately accounts for the curvature of the planetary surface at large basin sizes. Radial profiles are offset by a specified azimuth interval, which we set to 1° in all calculations to achieve statistically significant results. Thus, for a complete azimuthal range, 360 radial profiles for each basin are used for topographic calculations. However, superposed impact craters and other post-impact processes can significantly skew these calculations toward inaccurate values. We resolve this issue by defining "exclusion zones" (e.g., Figure 3) over azimuth ranges whereby no topographic information is to be extracted. These exclusion zones are mostly over areas substantially modified by superposed impact craters. Azimuth exclusion zones are defined for three "buffer zones" within the basin, including the rim-crest buffer, peak-ring buffer, and center buffer (see Figure 2 and section 4.2). The number of exclusion zones range from zero to nine over azimuthal intervals of typically between 5° to 70° of arc. As a result, the number of radial profiles for each basin may be reduced from a complete set of 360 to as few as 82 (average number of profiles within the rim buffer is 230; see Table 1).

[14] While high-resolution global LOLA DEMs down to 1024 ppd are now publically available to use, we chose to use 128 ppd (~236 m/pixel) gridded LOLA data for our topographic analysis, including all filtered shot data up to June 2011. The 128 ppd gridded data is sufficient for the scale of the features we are analyzing, while being computationally efficient for the software we used for our analysis. Our profile extraction program is written for MATLAB and uses the suite of tools provided in its Mapping Toolbox. Topographic profiles are extracted from the gridded DEM using bilinear interpolation at a point spacing set to mimic the resolution of the DEM (i.e., 128 ppd, or 236 m/pixel). While interpolating between the grid cells introduces some uncertainty in the topographic calculations, it is negligible given the basin's inherent topographic variation at the scales of the features we wish to characterize. More detailed, decameter-scale topographic characterization of a single basin should utilize higher-resolution DEMs or individual shot data to avoid inaccurate portrayal of topographic features.