
The present topography of the Crisium Basin and its mare fill may provide clues to the response of the lunar lithosphere to mare loading, to the related topography history of the basin, and to the sequence and style of mare filling. Topographic information for Crisium comes from three major sources: 1) a series of Lunar Topographic Orthophotomaps derived from Apollo metric camera data and produced by NASA and the Defense Mapping Agency (these maps are available from NASA HQ, Code SL, Washington, D.C. 20546). At present, maps of the eastern and southern parts of the basin (those areas under Apollo 15 vertical photography) are available at a scale of 1:250,000. 2) Earthbased Radar Topography - Radar interferometer measurements have yielded topographic data for 60% of the earthside hemisphere including the Crisium Basin (Fig. 1). 3) Apollo Laser Altimeter data are available for a portion of the area under the Apollo groundtracks.

Present Topography - The present basin rim locally rises up to four km above adjacent maria. The present topographic configuration of Mare Crisium is distinctly annular (Fig. 1). There is an outer shelf about 50 km wide, which is distinctive around almost the entire circumference of the basin except in the southwest. The inner margin of the shelf is marked by a series of scarps and mare ridges. Inside the shelf is an annular topographic depression of 80 to 120 km in width. Finally, the central part of the basin is a broad topographic high over 150 km in diameter, whose peak is offset about 60 km to the northwest. From this prominence linear ridges extend toward the south and approximately west (Fig. 1). The elevation difference between the shelf and the adjacent depression is about 400 m. The southwest border of the mare is a distinctly straight edge about 250 km in length (NW-SE trending), and is also the only part of the border where the outer shelf is completely absent; the floor extends at its lower elevation directly to the mare edge. This distinctive linear feature, likely related to a pre-Crisium Basin fault or line of weakness, appears to have facilitated subsidence of the outer shelf area in the southwest. The central elevation slopes away to either side from a central, 150 km long north-south ridge of generally the same elevation as the shelf. The region of highest elevation is about 40 km in diameter, rises to about 300 m higher than the rest of the ridge, and is displaced about 60 km northwest of the center of the mare. There appears to be no evidence of a lava source or of extensive down-slope flows, hence the ridge is probably a positive feature related to the subsidence of other parts of the floor. There are additional low-lying areas outside the shelf to the east and in a narrow band to the southeast. These are possibly the remains of another basin or other earlier feature with which the Crisium impact event interacted.

Discussion: Relation to other maria - Crisium is the lowest circular maria yet measured, relative to a 1738 km radius spherical moon about the lunar center of mass. Relationship to Basin Rim - Rim elevations above the maria are high relative to other basins with the exception of portions of the
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Apennines around Imbrium and the Cordillera (Orientale). Basin Rim Symmetry - The basin enlargement towards the east suggests control by preexisting structure and topography (perhaps an ancient basin). Topography of Mare Floor - Lack of any basin peak ring remnants preserved in the mare suggests that at their expected position, basalt thicknesses are sufficient to cover them (perhaps 2-4 km if peaks were fresh, correspondingly less if degraded). Relation to Structure - Correlation of rim lineaments with changes in bench topography suggest that subsidence was in part controlled by preexisting structure. Correlation of the position of the circular mare ridges, edge of outer shelf, and position of inner Crisium basin ring strongly suggest that this basin feature controlled accumulation and subsidence. Relation to Stratigraphy - Three major units have been defined in Mare Crisium. The oldest mare unit is exposed in the ejecta of the craters Picard and Peirce and along the outer edge of the southeastern part of the basin. The next younger unit includes the Luna 24 site and generally follows a topographic annulus along the basin margin. The youngest mare unit occupies the central part of the basin. The topographic evolution of the basin has clearly played a role in the emplacement and present exposure of these units and the general sequence and style of emplacement is comparable to that seen in other mare regions. Subsidence occurred throughout the emplacement of mare units including extensive warping and downfaulting of the inner part of the Crisium basin. Present topography - Deformation of the latest mare units indicates that subsidence continued past their emplacement.

Fig. 2. Map of geologic units in Mare Crisium. Oldest unit dotted, youngest unit ruled. Two craters in western Crisium (Peirce, W central; Picard SW) may expose highlands in centers. Other white areas within Crisium have not been mapped.
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Fig. 1. Radar Topographic Map of Mare Crisium. Grey scale interval is 200 m.