East Procellarum Basin Revisited. R. A. De Hon, Department of Geography, Texas State University, San Marcos, Texas, 78666. <dehon@txstate.edu>

Summary: Lavas filling Oceanus Procellarum mantle a large area of pre-Imbrian topography. Isopach mapping reveals several thickened lenses of basalt that probably occupy flooded impact basins. The buried East Procellarum basin is responsible for the large gap in the western rim of Imbrium basin.

Introduction: The pre-mare lunar surface was saturated with craters. Basin excavation and rim emplacement destroyed earlier formed craters and established a new, highly uneven surface that recorded further impacts. Mare basalt emplacement again reset the counting surface by burying many craters. Pre-Imbrian craters and basins are recognizable where lavas are absent; sufficiently thin as to allow crater and basin rims to project through the lavas; or as thickening lenses of basalt within buried craters or basins. The deepest portion of the large, circular mare generally are too deep to allow any craters on the basin floor to be detected. It might be inferred that large mare regions devoid of partially buried craters may, in fact, be a region of thick basalt and therefore possible locations of completely buried basins.

A reasonable, albeit low resolution, estimate of mare-material thickness and sub-basalt topography is possible by using crater diameter to rim height trends of partially buried craters (1). By plotting thickness estimates throughout Oceanus Procellarum it is possible to identify thick lenses of basalt that may occupy basin-sized structures (2). Oceanus Procellarum consists of wide-spread mare basalt. Mare basalt mantles several intermediate sized basins. Buried basins are recognized by scattered massifs representing remnants of rim materials and by roughly circular, thick lenses of basalt fill the basins. One such basin is the East Procellarum Basin adjacent to the Mare Imbrium (3).

East Procellarum Basin: The most prominent raised rim of Imbrium basin is broken and discontinuous. The 260 km diameter Sinus Iridum basin is superposed on the northwest Mare Imbrium shelf. Large discontinuities in the Imbrium rim mark the location of interaction between Imbrium basin excavation and pre-existing basins. In the east, a small gap between Montes Apennines and Montes Caucasus is formed where the Mare Imbrium basin impinges on the Mare Serenitatis basin. In the south a break between Montes Apennius and Montes Carpatus marks the overlap with the older Stadius-Aestrum basin. The largest break in the Imbrium basin rim occurs in the southwest and west between Montes Carpatus and Montes Jura. A full one-fifth of the rim is missing. The absence of such a large segment of an otherwise prominent ring of mountains requires an explanation.

Missing portions of crater and basin rims can usually be explained by impact into a highly uneven surface or overlap with another crater or basin. The large gap in the Imbrium rim corresponds in location to a thickened lense of basalt approximately 600 km in diameter. Paleotopography obtained by

subtracting the basalt thickness from surface topography reveals a roughly circular basin in eastern Oceanus Procellarum that is overlapped by the Imbrium Basin excavation (Fig. 1).

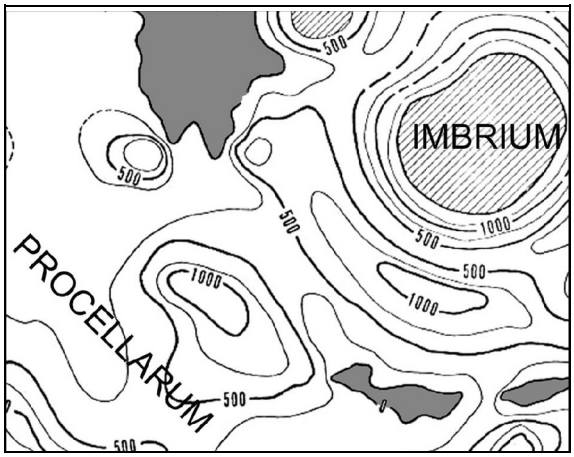

Figure 1. Isopach map of the Imbrium basin and adjacent Oceanus Procellarum. Gap in the Imbrium basin rim and thick basalt lens in Procellarum are evidence of a buried pre-Imbrian basin.

Discussion. The surface beneath Oceanus Procellarum is likely saturated with craters. In all probability, if the basalts were not present, it would appear similar to the cratered surface of the South Pole-Aitken basin (4). As with all older basins, the gravity measurements from Lunar Prospector do not show a discernable anomaly over the East Procellarum basin (5). Buried beneath basalt, there are very few surface features that are directly related to the basin. The Clementine titanium distribution map does exhibit a rather distinct low over the East Procellarum basin (6).

At 600 km diameter, the East Procellarum Basin is probably a multi-ring basin. Montes Hamburger may represent a remnant of a inner ring projecting through the Oceanus Procellarum lavas. Post-basin igneous activity may be localized by faulting produced by the impact or by later isostatic adjustments. The Aristarchus Plateau volcanic complex is situated on the northeast flank and inner shelf of the basin. A large cluster of domes (Milichius Domes) is situated over the basin rim in the south.

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