

The Imbrium impact event and the thorium distribution at the lunar highlands surface

Larry A. Haskin, Department of Earth and Planetary Sciences and McDonnell Center for the Space Sciences, Washington University, St. Louis, Missouri

Abstract. Late in the Moon's heavy bombardment period, the impact that formed the Imbrium Basin excavated and melted a tremendous volume of material that was subsequently distributed over most of the Moon's surface. The Apollo orbiting γ ray experiments [Metzger *et al.*, 1977] show that the Imbrium projectile struck in a Th-rich area, called the High-Th Oval Region here and regarded as a unique lunar geochemical province. Imbrium primary ejecta were thus probably rich in Th. It is shown here using ejecta deposit modeling that the distribution of Th in the highlands surface along the ground tracks of the γ ray spectrometers is consistent with the distribution expected for Imbrium ejecta deposits. Deep basins other than Imbrium appear to have excavated regions of lower crust that were mafic and Fe-bearing but not Th-rich. The possibility that the surface Th distribution arises mainly from Imbrium ejecta has implications for the nature of the Moon's igneous differentiation and the nature of the proposed "cataclysm" or late bombardment with large meteoroids.