

GEOLOGICAL MAP OF THE HUMBOLDTIANUM BASIN AND ITS DEPOSITS



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Introduction

Humboldtianum is a Nectarian-age multi-ring basin centered at approximately 57° N, 82° E. The inner ring is roughly 275 km in diameter and the outer (main) ring is estimated at around 650 km in diameter [1].

Although the basin has been previously studied and mapped [1,2], new image data from Lunar Reconnaissance Orbiter (LRO) and chemical and mineral concentration data from Clementine and Lunar Prospector provide improved image resolution and information on the composition of basin deposits, allowing updated geological maps to be compiled and new inferences made about the composition of basin ejecta and its crustal target.

Data Sources

The image data for this map comes from narrow-angle and wide-angle Lunar Reconnaissance Orbiter Cameras (LROC), the LRO GLD-100 topographic map [3], along with data on TiO₂ and FeO content from Clementine images [4] and thorium concentration data from Lunar Prospector [5]. Standard lunar geological mapping techniques were used [1]. ArcGIS 10.1 was used to map the units on top of the shaded-relief basin-centered projection.

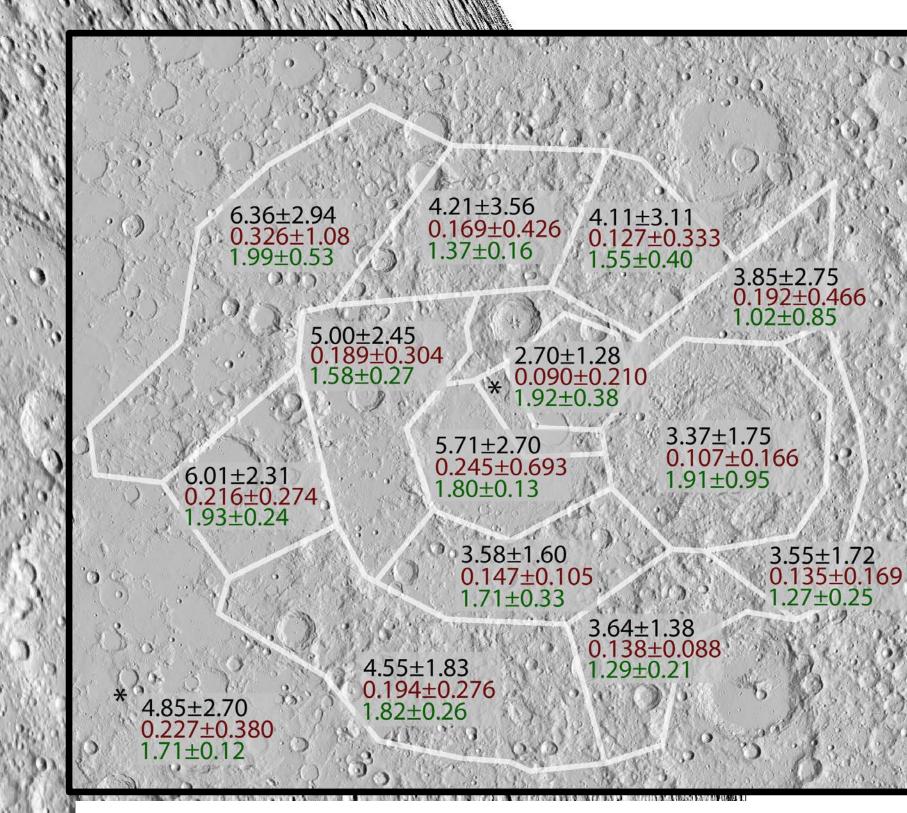
Notable Features

Massifs: Massifs principally located on the north and east sides of basin. Asymmetry of massif distribution and scour features in north indicates an oblique basin-forming impact, traveling south-to-north.

Compton-Bel'kovich anomaly: Imbrian-aged highland silicic volcano superposed on ejecta blanket of Compton. High Th content indicates KREEP-rich magma at depth, but was not excavated by basin impact (ejecta is very low in Th). KREEP came later or basin excavation was very shallow.

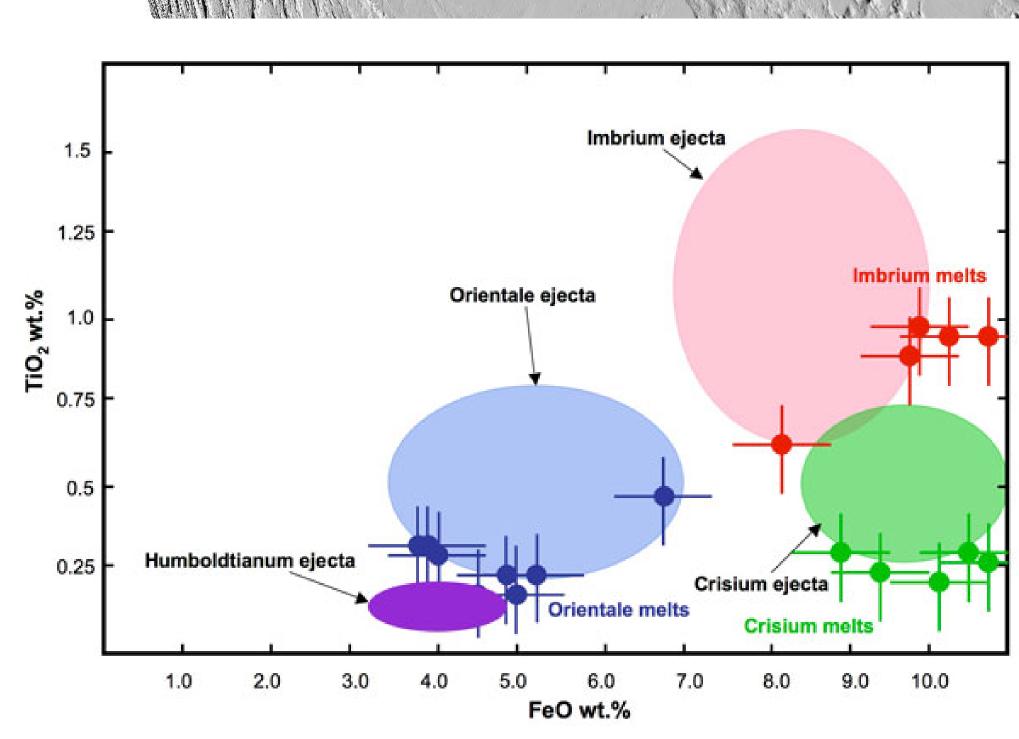
Imbrium influence: Negative FeO gradient from northwest to southeast may indicate more Imbrium ejecta overlay than seen visually.

Crisium influence: Slightly higher FeO in southern regions possibly caused by Crisium ejecta.



Black: FeO (wt %), Red: TiO₂ (wt %), Green: Thorium (ppm).

Structural map of the Humboldtianum basin.
Polygonal rim missing in north; downrange scour to north evident. Imbrium overprint in west.
LOLA topographic map.



Humboldtianum ejecta (purple) is chemically distinct from both Orientale and Imbrium basin ejecta.

Conclusions

The basin formed in a transitional crustal zone between the far side feldspathic and near side basaltic terrain.

Felsic, KREEP-rich material was present at depth, but not excavated by basin. Basin ejecta is more feldspathic than Orientale and Imbrium basins. Humboldtianum is mid-Nectarian age, slightly older than Crisium.

Compton-Bel'kovich anomoly

Crater floor crack

Fault

Fractured crater floor

References [1] Wilhelms, D. E. (1987) The Geologic History of the Moon. USGS Prof. Paper 1348, 302 pp. [2] Lucchitta, B. K. USGS map I-1062. [3] Scholten, F. et al. (2012) doi:10.1029/2011je003926 [4] Lucey P.G. et al. (2000) JGR 105, 20297. [5] Lawrence D. et al. (2007) GRL 34, L03201, doi:10.1029/2006GL028530.