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China's Chang'e-5 Landing Site: An Overview

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Introduction

The Chang'e-5 (CE-5) mission is China's first lunar sample return mission. CE-5 landed at Northern Oceanus Procellarum (43.1°N, 51.8°W) on December 1, 2020, collected 1731 g of lunar samples, and returned to the Earth on December 17, 2020. The CE-5 landing site is ~170 km ENE of Mons Rümker [1], characterized by some of the youngest mare basalts (Em4/P58) on the Moon [2,3], which are never sampled by the Apollo or Luna missions [4]. This study describes the geologic background of the CE-5 landing site in order to provide context for the ongoing sample analysis.

Northern Oceanus Procellarum

Northern Oceanus Procellarum is in the northwest lunar nearside, and the center of the Procellarum-KREEP-Terrane [5], characterized by elevated heat-producing elements and prolonged volcanism. This region exhibits a huge volcanic complex, i.e., Mons Rümker [1], and two episodes of mare eruptions, i.e., Imbrian-aged low-Ti mare basalts in the west and Eratosthenian-aged high-Ti mare basalts (Em3 and Em4/P58) in the east [2]. The longest sinuous rille on the Moon [6], Rima Sharp, extends across Em4/P58. Both the Imbrian-aged (NW-SE) and Eratosthenian-aged (NE-SW) basalts display wrinkle ridges, indicating underlying structures, with different dominant orientations [2].

Young Mare Basalts

The Em4/P58 mare basaltic unit, on which CE-5 landed, is one of the youngest mare basalts on the Moon. Various researchers found different CSFD results; however, all of them point to an Eratosthenian age for Em4/P85 (1.21 Ga [2], 1.33 Ga [7,8], 1.53 Ga [3], 1.91 Ga [9]), and there are minor age variations across Em4/P58 [3]. Em4/P58 mare basalts have high-Ti, relatively high-olivine and high-Th abundances, while clinopyroxene is the most abundant mineral type [2,3]. Em4/P58 mare basalts cover an area of ~37,000 km^2, with a mean thickness of ~51 m and volume of ~1450-2350 km^3 [3]. No specific source vents were found within the unit, and Rima Sharp is the most likely source region for the Em4/P58 mare basalts [3].

Scientific Significance of the Returned Samples

The scientific significance of the young mare basalts is summarized in our previous studies [2,3]. In [3], we first summarized the 27 fundamental questions that may be answered by the returned CE-5 samples, including questions about chronology, petrogenesis, regional setting, geodynamic & thermal evolution, and regolith formation (**Tab. 1** in [3]), especially calibrating the lunar chronology function, constraining the lunar dynamo status, unraveling the deep mantle properties, and assessing the Procellarum-KREEP-Terrain structures.

References

[1] Zhao J. et al. (2017) JGR, 122, 1419–1442. [2] Qian Y. et al (2018) JGR, 123, 1407–1430. [3] Qian Y. et al. (2021) EPSL, 555, 116702. [4] Tartèse R. et al. (2019) Space Sci. Rev., 215, 54. [5] Jolliff B. L. et al. (2000) JGR, 105, 4197–4216. [6] Hurwitz D. M. et al. (2013) Planet. Space Sci., 79–80, 1–38. [7] Hiesinger H. et al. (2003) JGR, 108, 1–1 (2003). [8] Hiesinger H. et al. (2011) Geol. Soc. Am., 477, 1–51. [9] Morota T. et al. (2011) EPSL, 302, 255–266.