CHINA'S CHANG'E-5 LANDING SITE: AN OVERVIEW. Yuqi Qian[1,2], Long Xiao[1*], James W. Head[2*], Carolyn H. van der Bogert[3], Harald Hiesinger[3], Lionel Wilson[4], and Yuefeng Yuan[5], [1]Planetary Science Institute, School of Earth Sciences, China University of Geosciences, Wuhan 430074, China (longxiao@cug.edu.cn), [2]Department of Earth, Environmental, and Planetary Sciences, Brown University, Providence 02912, USA (James_Head@brown.edu), [3]Institut für Planetologie, Westfälische Wilhelms-Universität Münster, Münster 48149, Germany, [4]Lancaster Environment Centre, Lancaster University, Lancaster LA1 4YQ, UK, [5]Institute of Geophysics and Geomatics, China University of Geosciences, Wuhan 430074, China

Introduction: The Chang'e-5 (CE-5) mission is China's first lunar sample return mission and the first sample return mission since Luna-24 in 1976. CE-5 landed on December 1, 2020 at 43.1°N, 51.8°W in Northern Oceanus Procellarum (**Fig. 1**), collected 1731 g of lunar samples, including a ~1 m of drilling core, and returned to the Earth on December 17, 2020. The CE-5 landing site is ~170 km ENE of Mons Rümker [1], and is characterized by some of the youngest mare basalts (Em4/P58) on the Moon [2,3] – materials not sampled by the Apollo or Luna missions [4]. Young mare basalts have enormous potential for improving our understanding of the recent thermal evolution and impact history of the Moon [3]. This study describes the geologic background and setting of the CE-5 site in order to provide context for ongoing sample analysis.

Northern Oceanus Procellarum: Northern Oceanus Procellarum is in the northwest lunar nearside, to the west of the Imbrium basin, and in the center of the Procellarum KREEP Terrane [5], which is 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 (**Fig. 2**) [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 young 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]; different AMAs may be due to the different counting areas [3]), and there are minor age variations across Em4/P58 [3]. Em4/P58 mare basalts have high-Ti, relatively high-olivine and high-Th abundances (at least in the overlying regolith), 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 (e.g., fissures, cones, domes) were found within the unit, and Rima Sharp is the most likely source region for the Em4/P58 mare basalts [3,10].

Scientific Significance of the Returned Samples: The scientific significance of the young mare basalts is summarized in our previous studies [2,3] and by other authors [e.g., 4,11]. 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 and significance.

Provenance of Materials: The returned CE-5 samples consist of two types of materials based on remote sensing analysis, i.e., local mare basalts and distal ejecta [2,12]. Local materials dominate the overall regolith composition (~90%) of the CE-5 landing site according to the ballistic sediment model [12]. An ~4-7 m thick regolith layer [13], developed by post-mare impact bombardment, overlies the Em4/P58 basalts and contains admixed impact ejecta from distant sources, especially Aristarchus, Copernicus, Sharp B, and Harding craters [12]. The identification of foreign materials is crucial to lunar chronology studies [14,15].

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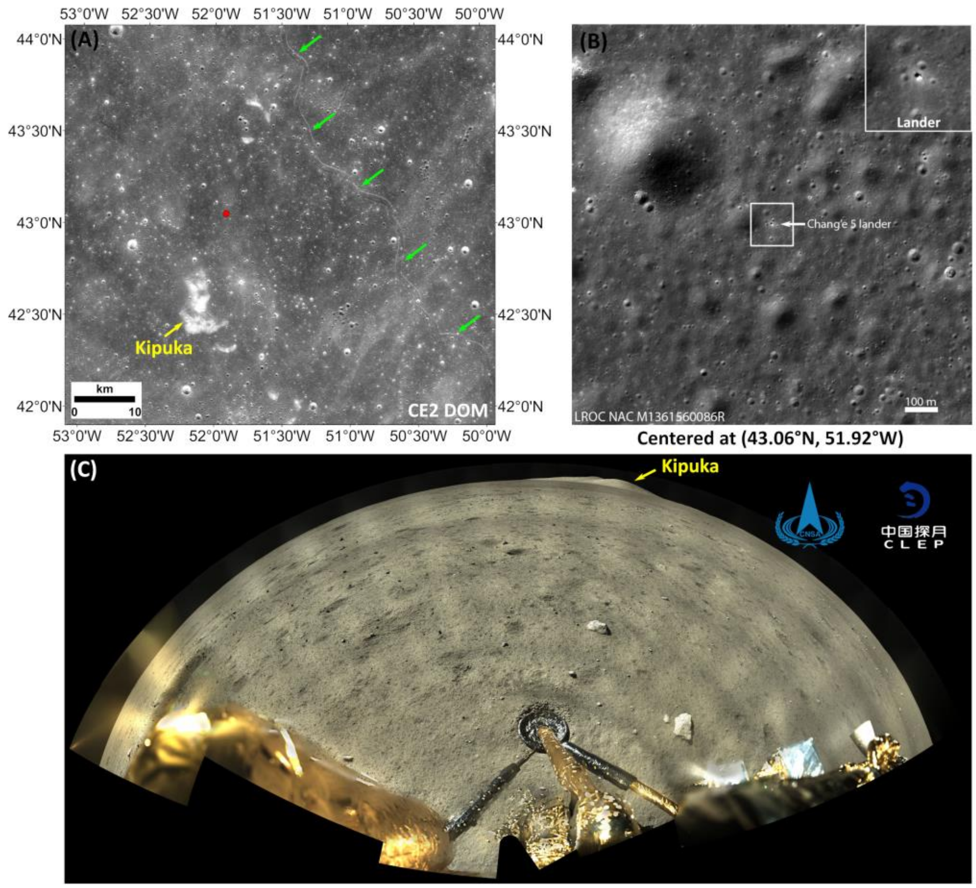

Figure 1. (A, B) CE-5 landing site at 43.1°N, 51.8°W shown in CE-2 DOM (red dot, CNSA/CLEP) and LROC NAC datasets (white arrow, NASA/GSFC/ASU), respectively. Green arrows indicate Rima Sharp. **(C)** Panoramic image of the landing site (CNSA/CLEP). Yellow arrow indicates the largest kipuka in the region.

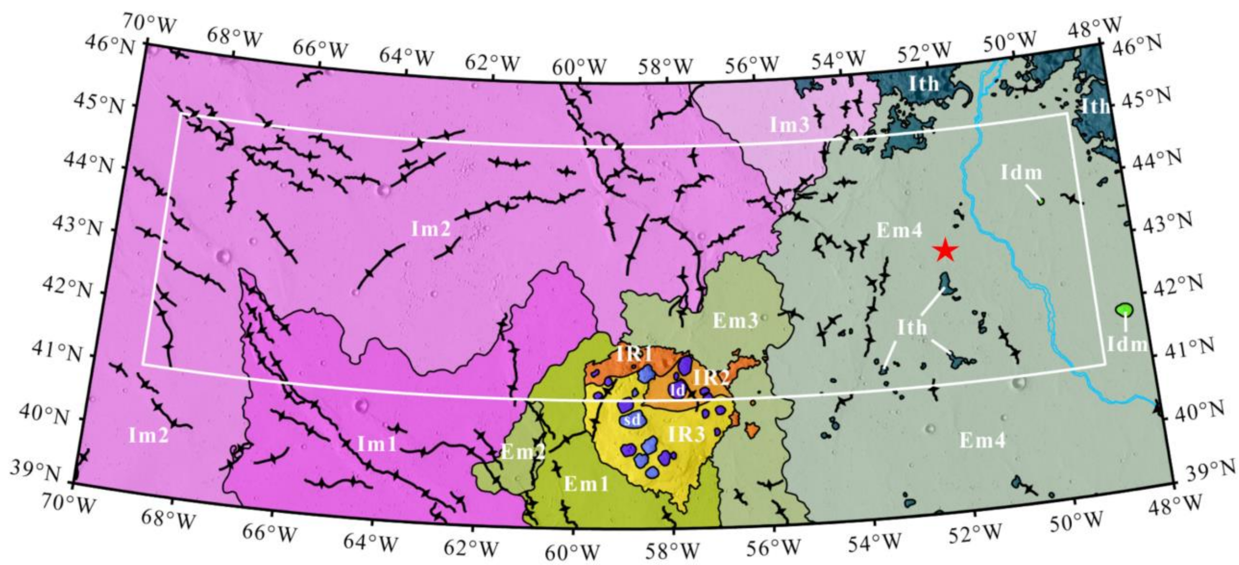

Figure 2. Geological map of the Chang'e-5 landing site, modified from [2]. The red star indicates the CE-5 landing site. The blue lines indicate Rima Sharp. More detailed definition of other symbols at [2].