The Choice of The Lunar Landing Sites and Preliminary Analysis of Several Sites. Xiong S. Q.[1] , Yan B. K.[1], Gan F. P.[1], and Wang Z. C.[2] 1. The Earth Obervation Thenology Center, China Aero Geophysical Survey and Remote Sensing Center for Land and Resources. 2. China University of Geosciences(Beijing)

Introduction: The China lunar exploration is divided into three stages: (1) exploring by satellite remote sensing technique, (2) landing site exploration, (3) sample return exploration. Nowadays, The first stage has been completed and a lot of data been collected. The landing sites exploration is being undertaken, and the landing sites must been choosed firstly. In this paper, three sites are choosed based on the lunar exploration achievements and problems, and are anaylized using LIDAR and CCD data of ChangE-1 satellite as well as Clementine UV-VIS data.

Choice of The Landing Sites: The landing sites should be choosed synthesizing the science goal and engineer possibility. KREEP rock is one of the hot spots of the lunar exploration in recent years, which is important to study the heat evolution of the Moon[1]. The engineer possibility is studied from the aspect and gradient of the landing sites.

It has great meanings for studying origin and evolution of the Moon to study the distribution and composition of the KREEP rock on the surface of the Moon. The abundances of the radiant elements such as Th and U et al. are the basic data of studying the heat evolution of the Moon. Now, these data is from the samples collected by Apollo 12, 14, and 15 lunar rover. However, the above collected KREEP rock samples are all melted glass[2], indicating that these samples are probobly sputtered from Copernicus crater located on North of the three Apollo landing sites. In orther words, we have not direct data and informations about KREEP rock until now, which will probably affect the research on the heat evolution of the Moon. Therefore, collection and study of KREEP rock is one of science goals of the lunar landing exploration.

In the landing exploration in the past, the lunar rover all was landed on the plain of the lunar surface, which has been covered by the lunar soil, and it is difficult to study the rock underlied the soil. If the lunar rover could be landed in the bottom of some important crater, some important features of the lunar rock could probably be discoverd. In the formation of crater, the lunar surface soil will be sputtered to surround area, and the lunar rock underlied on the lunar soil will probably be exposed on side wall of the crater.

The ring distribution model (Fig.1) of element Th of the Aristarchus crater mapped by the Lunar Prospetor gamma ray spectrometer[3] probably indicates that, the KREEP rock of Oceanus Procellarum is covered by basalt. Th is enriched on the souroundings of Mare Imbrium(Fig.2)[4], which also show that the KREEP rock is coverd by basalt in Mare Imbrium. The above distribution features show that, there is a little part of KREEP rock is distributed on the surface of the Moon, and most part of it is still covered by the basalt.

we advice Kepler, Copernicus and Aristarchus in the Th enrich area as the prior landing sites for studying KREEP rock.

Comparison of The Three Landing Sites: We studied TiO_2 and FeO distribution model of the three craters using Clementine UV-VIS data, and topography feature of the three craters using CCD and LIDAR data of ChangE-1 satellite. The TiO_2 and FeO abundance is retrieved using Lucey method[5].It was discovered that, TiO_2 and FeO distribution model of the three craters are same. The distribution model is that the TiO2 abundance in the crater is higher than the crater sourounding, and the FeO abundance in the crater is lower than the crater sourounding(Fig.3). we probably deduced that the basalt rock with higher abundance FeO and lower abundance of TiO_2 is covered by the basalt rock with lower abundance FeO and higher abundance basalt rock.

The CCD and LIDAR data of ChangE-1 show that, there exists a plat area of about 20 km^2 on the bottom of Aristarchus crater, which is probably could be used as a landing candidate site(Fig.4).

Conclusions: 1) The KREEP rock of Oceanus Procellarum is covered by basalt rock, which hinder the exploration by satellite remote sensing technique, 2) the landing exploration on the bottom of Atistarchus will contribute to study the composition of KREEP rock, structure feature of crater and vertical inhomogeneity of the Oceanus Procellarum rock, 3) there is not a flat area on the bottom of Kepler and Copernicus, 4) there is a flat area on the bottom of Aristarchus, and should study it using high spatial CCD data.

References:

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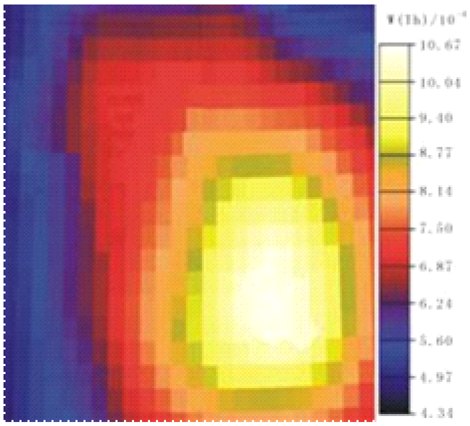


Fig.1 Th distrigbution of Aristarchus crater (From Hagerty,2009[3])

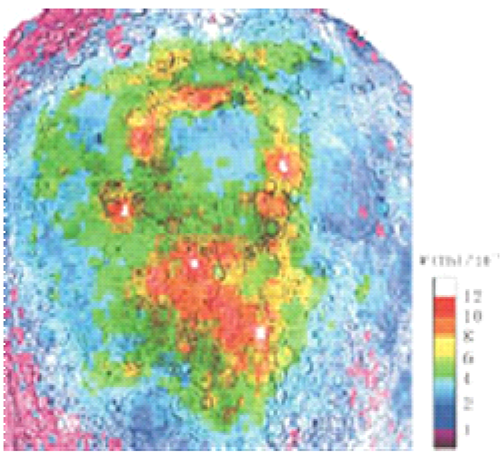
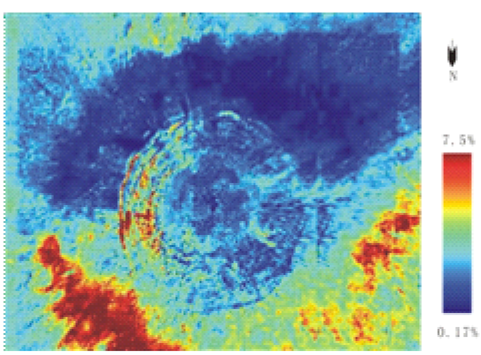
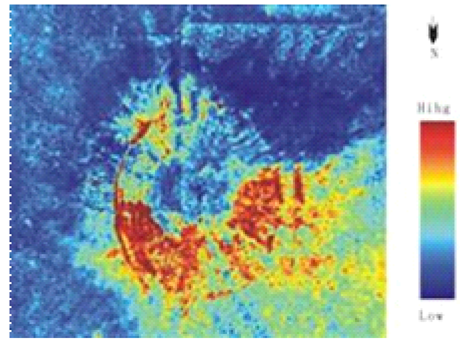


Fig.2 Th distribution of Oceanus Procellarum (From Haskin, 2000[4])



A **TiO_2**



B FeO

Fig. 3 TiO_2 and FeO distribution of Aristarchus crater

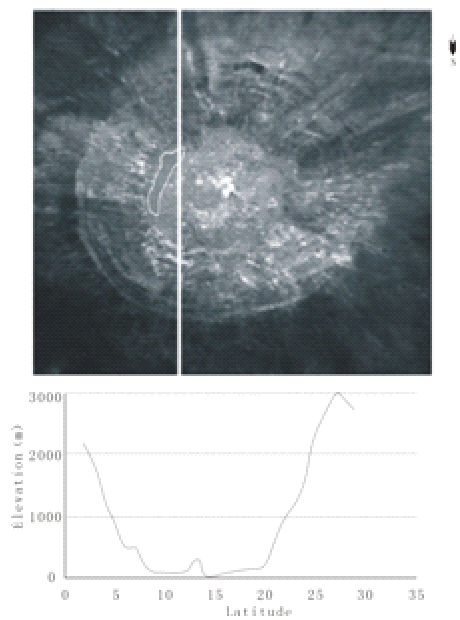


Fig.4 The CCD data of Aristarchus crater (the white line is LIDAR data profile)