The Characteristic of Lunar Rilles Around Mare Imbrium

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Lunar rilles are a common feature on the lunar surface. Rilles are believed to have been created by volcanism and tectonism.

There have been two explanations of the formation of lunar rilles. One is the effect of volcanism. In geological period, lava flow caused by the extensive volcanic eruption activities created a channel through the process of heat erosion on the lunar surface, forming parallel banks on both sides. The other is lunar crust geometric deformation generated by endogenetic and exogenetic force, producing surface stress fields that led to the development of grabens. The stress of such tectonic activities has two components, the internal force coming from dike intrusion and the external one from the Earth-Moon tidal force. Three structural belts may form under the action of these two kinds of tectonic stress (1)Polar fault belt; (2)mid-latitude strike-slip fault belt; (3)equatorial regions thrust fault belt. The strike of linear structures in mid-latitude is mainly NW-SE, NE-SW, forming the special cancellated structure. So the lunar rilles originated from structural function were generated in the stress field of cancellated structure.

We have studied the rilles around the mare Imbrium and believe that the formation of the rilles was not caused solely by either volcanism or tectonism, but a combination of both. The various morphology characteristics of the rilles Only because of the different proportion between volcanic activities and structural function for forming a rille led to the different appearance characteristics. For example, Rima Sharp and Rima Mairan which primary cause of formation was volcanism, as their morphology characteristics is very similar to rivers on earth. Gornitz (1972) compared the parameters of rivers with lunar rilles and analyzed the impossibility of existing the liquid water. He ruled out the water erosion hypothesis. The solely result was volcanism. The high temperature and low viscosity basaltic lava flows with hot liquefied volcanic gas from the volcanic eruption eroded the plane of the surface and changed to channels. Also a lava flow model

has been simulated through the observation of various geometrical characteristics.

Another forming mechanism of the rilles is tectonics which plays a dominant role in formation process. The Rimae Maupertuis is located at the mare-highland border area on north-west of the Mare Imbrium. The distribution of the arrangement of the rilles has three segments. The two sections in west have wide-angle excursion. The statistics of the every part of rilles' strike show that the main directions are roughly northwest and northeast. Especially, the east section channel only has the strike of northeast. Therefore the characteristics are similar to grid structure mentioned above. Both the strikes are perfectly coincident. So that we estimate that the Rimae Maupertuis is the fault zone which was generated by the X-conjugated joint on the surface of lunar crust. Then the lava flow caused by the action of the magma intrusion along the fault formed the rilles observed on the moon.

Together with the position of the rilles stratigraphic units and other typical structures (e.g. crater, ejecta and superposition and transection relations), Rimae Maupertuis is located at 'Iirr' stratigraphic units, the west part of the rilles cross through the 'Ip' units, one of end originate from unit of 'ch', which explains the formation age is at least in Imbrium age. Rima Sharp and Rima Mairan are clearly seen passing through stratigraphic units labelled 'Im' and 'Em', which are interpreted to be basalt flows from the eruption of probable Eratosthenian age. This may be used to identify the ancient geological events.

We hope to understand how the rilles were formed by using the Chang-e and other observational . From these studies, we hope to understand the mechanism of the relationship between volcanism and tectonism that have influenced the lunar rilles.

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