Sinus Iridum is a plain of mare-filled materials that superposes the northwest Mare Imbrium on the nearside of the Moon. With its flat topography and good condition of light, Sinus Iridum is selected as one of important candidate landing sites for Chang’E-3 and other lunar rovers, which make Sinus Iridum to be a new hot research area on the moon. Additionally, abundant geological features, such as winkle ridges and mare rilles, has made it attractive as a region for lunar geology research.

Sinus Iridum was formed by a discrete impact event after the giant Imbrium impact event, which formed the Imbrium Basin. The impact event created the initial Iridum crater, significant quantity of impact ejecta materials accumulated around the crater and formed the rim crest which is the present-day Montes Jura. Rim and pre-creating materials slumped inward to the crater and accumulated as the crater wall. The mare basalt filling of Sinus Iridum and Imbrium Basin was another significant event during Sinus Iridum’s geologic history after the deposition of Iridum impact ejecta. Large amount of basalt flow not only covered the initial crater floor, but also southeast part of Montes Jura and the inner ring of Imbrium Basin (Schaber, 1969). The thickness mare basalt in Sinus Iridum was calculated to above 500 meters based on the relationship between crater’s diameter and depth. The forming of these mare basalt spend a rather long time, indicating several times magma filling event. The ages of these magma activities are determined to 3.39 Ga to 2.96 Ga (Hiesinger et al., 2000). However, due to the limitation of spectral data and methods, very few previous studies has addressed the composition variations of basalt filled during different period, which is very important for constraints on properties of magmation in different geological period. Other than the complex of geology progress, Sinus Iridum is also prominent for abundant geological features, such as winkle ridges, mare rilles and crater chains. But because of the low spatial resolution of earlier images, quantitative descriptions of these features were unable to be conducted. While there exists huge disputes about the origin of these features.

This paper makes a systematic interpretation and analysis of topography, composition and landforms in Sinus Iridum. We concluded: (1)The elevation of Sinus Iridum and southeast Mare Imbrium is very close, and the topography is rather flat in these two areas. Most part in Sinus Iridum has an elevation of about -3000 to -2000 meters and a topographic slope of less than 1 degree. While the topography decline from southeast corner (near Mare Imbrium) to northwest corner (near Montes Jura) with a drop of over 500 meters. (2) The FeO content of Sinus Iridum is similar with Mare Imbrium, with a mean content of 15.8%, while the TiO2 content is obvious lower that the latter. Different geological units inside Sinus Iridum shows variation in composition, which indicating variation of properties of magmation in different geological period. Earlier basalt filled by several times magma filling event is mainly low-titanium basalt, while the later magma flow is rather high-titanium. Besides, the composition of the west and northeast parts is very similar, which indicating a same period magma filling event in these two area. The materials inside the Sinus Iridum is mainly dominated by pyroxene and feldspar with absorption bands at 1 μm and 2 μm, the
highlands surrounding is mainly composed of feldspar materials lacking any distinctive Fe-related absorptions. While in crater wall near Montes Jura, there exists some olivine-rich zones with a strong 1 μm absorption band but weak 2 μm absorption band, which probably is ejecta materials excavated by impact from the deep. (3) Long-term and massive magmatic activities and impact events left to abundant volcanic landforms and impact craters, including winkle ridges, mare rilles, small bowl-shaped craters and crater chains. This paper suggests that these winkle ridges mainly originate from tectonic action, such as fault movement, while crater chain may be formed by both secondary impact and magmatic activities.


Figure 1 FeO and TiO₂ abundance of Sinus Iridum based on Clementine UVVIS data. The white line in the right figure distinguishes different geologic units, indicating multiple magma filling event.

Figure 2 Composite image of spectral parameter maps if the Sinus Iridum region calculated from M3 data. Red is the integrated band depth (IBD) at 1 μm, green is the IBC at 2 μm, and blue is the apparent reflectance at 1.58μm.