

Solar Radiation Heating Effects on 3200 Phaethon

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Abstract

The F- and B-type asteroids, subclasses among the C-complex (C-, G-, B-, and F-types), and dehydrated CI and CM carbonaceous chondrites, probably linking with each other, underwent thermal metamorphism and dehydration by high-temperature heatings at more than several 100°C for a certain period of time after aqueous alteration in their parent bodies. However, their primary heating mechanism and its timing are less certain and controversial yet. Here we investigated the solar radiation heating effects on Near-Earth Apollo asteroid 3200 Phaethon (F- or B-type) at present planetary epoch, as a potential heat source of thermal metamorphism. As a result, we have found that the solar radiation heating effects on Phaethon can be a promising heat source of thermal metamorphism, if still hydrated. We have

also found definitive result of latitudinally-inhomogeneous solar radiation heatings on Phaethon because of its highly-tilted pole axis close to its orbital plane, in which the north pole–northern mid-latitude region should be selectively and temporally heated to higher temperatures than other regions. Therefore, we hypothesized that this region is more thermally metamorphosed and dehydrated than other regions, implying the latitudinally-dependent color variations on Phaethon’s surface with time, if solar radiation heatings are the primary heat source of thermal metamorphism.

Key words: Solar system: minor planets, asteroids

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