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PRE95410 隕石母天体の宇宙線照射年代と平均公転軌道半径
Cosmic-ray exposure age and heliocentric distance of the parent body of the rumuruti chondrite PRE 95410

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We measured concentrations and isotopic ratios of noble gases in the rumuruti (R) chondrite Mt. Prestrud (PRE) 95410. This meteorite contains high concentrations of solar and cosmogenic noble gases, from which solar gas implantation rate (concentrations of solar noble gases implanted per unit time) can be estimated. By comparing the solar gas implantation rates between PRE 95410 and lunar regolith samples, the parent-body heliocentric distance of the meteorite can be obtained, as solar wind flux is inversely related to the square of heliocentric distance. Based on the exposure model of solar noble gases and galactic cosmic rays, we calculated the exposure age on its parent body (15.4±5.2 Ma), exposure age in space after ejection from the parent body (9.5±1.3 Ma), and heliocentric distance of the parent body (1.3±0.2 AU) . The calculated exposure age in space is consistent with the peak of space exposure age distribution of other R chondrites. The derived heliocentric distance suggests the location of parent body when constituents of the PRE 95410 meteorite were exposed to the solar wind. From the previous studies of mineralogy and chemistry, R chondrites might have formed between the regions where ordinary and carbonaceous chondrites formed (2-4 AU). Hence the heliocentric distance of the PRE 95410 parent body studied in this work is not consistent with the formation region. This may imply that the parent body of the PRE 95410 migrated from the R chondrite formation region to the inner area where irradiated by solar wind before the ejection of the meteorite (9.5±1.3 Ma). Kr isotopic ratios show excesses of 80Kr and 82Kr produced by neutron capture reaction on Br during space exposure. The minimum radius of the PRE 95410 meteoroid was calculated as 53 cm from the abundances of neutron-induced Kr.
Keywords: Rumuruti chondrite, noble gas analysis, cosmic-ray exposure age, heliocentric distance