

Oxygen isotope geochemistry of rocks from the Pre-Pilot Hole of the Chinese Continental Scientific Drilling Project (CCSD-PPH1)

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ABSTRACT

The Qinglongshan O- and H-isotope anomaly occurs within a coesite-bearing, eclogite-facies regional metamorphic belt in Eastern China near Donghai in Jiangsu province. The anomaly is defined by low values of $\delta^{18}\text{O}$ and δD . Garnets from eclogite have $\delta^{18}\text{O}$ as low as -11‰ and rutiles are -15‰ (VSMOW). Phengites have δD of -120‰ (VSMOW). The anomaly is Neoproterozoic in age. Surface outcrops of coesite-eclogite-facies rocks with unusually low $\delta^{18}\text{O}$ and δD values extend over an area of at least 1600 km². The Chinese Continental Scientific Drilling project has made it possible to investigate the depth of the Qinglongshan anomaly and to measure an O-isotope profile across a garnet peridotite body sandwiched between crustal rocks. New O-isotope analyses of minerals separated from drill core gneisses, eclogites, amphibolite, and quartzite verify that the Qinglongshan O-isotope anomaly extends to a depth of at least 432 m. Crustal rocks with unusually low $\delta^{18}\text{O}$ form both the hanging- and foot-walls of a 100 m thick, fault-bounded, garnet peridotite body intersected by the drill. Minerals of the garnet peridotite body have $\delta^{18}\text{O}$ values indistinguishable from mantle nodules and megacrysts. The garnet peridotites may have originated from enriched mantle sources in sub-cratonic lithosphere, isolated from mantle convection. This origin is consistent with the collision of the Archean Sino-Korean craton with the Yangtze plate, consequent subduction, and UHP metamorphism. The garnet peridotite was transported from the mantle and emplaced into UHP crustal rocks during Triassic subduction and cratonic collision.