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High H_2O/Ce source in the mantle: constrain from garnet pyroxenites originated from subducted oceanic crust

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Mantle xenoliths from Jiaohe, China, including spinel pyroxenites, spinel peridotites and garnet pyroxenites xenoliths, were evaluated for the water distribution of the lithospheric mantle. The spinel pyroxenites of Jiaohe have clinopyroxene (cpx) Mg# range from 88.4 to 89.3, higher than those of high-pressure cumulative pyroxenites of Hannuoba, but lower than those of spinel peridotites. Spinel pyroxenites also behaves differently from high-pressure cumulative pyroxenites and spinel peridotites in the covariance diagram between TiO_2 and Mg# in cpx, but with the characteristics similar to Cr-pyroxenites in Hannuoba. Such a phenomenon indicates that the spinel pyroxenites in Jiaohe were formed by metasomatism. But the variation of water content and H_2O/Ce ratio of Jiaohe spinel pyroxenites show a narrower range than that of Hannuoba Cr-pyroxenites. Such a discrepancy between Jiaohe spinel pyroxenites and Hannuoba Cr-pyroxenites may related to the degree of metasomatism they experienced. The Cr_2O_3, Al_2O_3 contents of clinopyroxene in spinel peridotites, which range 1.7 to 14.2 wt.%, well correlate with their Mg#. These correlations are attributed to partial melting. The water contents and H_2O/Ce ratio (which range from 8 to 66 ppm, 22 to 325 distinctively) of these clinopyroxenes shows no rigorous relation with their Mg#. Fluid-related metasomatism can increase the H_2O/Ce ratio of mantle rocks evidenced by the correlation of (Ba/Th) and H_2O/Ce of whole rock. The garnet pyroxenites are considered as remnants of oceanic lower crust. The water content of the garnet pyroxenite is 55-100 ppm, and the H_2O/Ce ratio is 37-742. Compared with the pyroxenites of Hannuoba and Hawaiian, the garnet pyroxenites in Jiaohe have low water content and extremely wide H_2O/Ce ratio. Such features may be formed in the subduction process, which can lower its water content by dehydration, or addition materials with low H_2O/Ce ratio and low water content. Comparing with water content and H_2O/Ce ratio of melts (those melts equilibrium with xenoliths and formed by their partial melting) related with spinel pyroxenites, spinel peridotites and garnet pyroxenites in Jiaohe, the high H_2O/Ce ratio end member of basalt in Shuangliao may related with garnet pyroxenites in Jiaohe.