

Regional heterogeneity in the water content of the Cenozoic lithospheric mantle of Eastern China

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The major and trace elements and H₂O contents of minerals in peridotite xenoliths hosted by the Cenozoic basalts in Northeast China (NEC) were evaluated using electron microprobe, laser-ablation ICP-MS and Fourier transform infrared spectroscopy, respectively. Although a potential loss of H during the xenoliths' ascent cannot be excluded for olivine, orthopyroxene (opx) and clinopyroxene (cpx) largely preserved the H₂O contents of their mantle source in all of the samples, as inferred from (1) the homogenous H₂O contents within single pyroxene grains, and (2) the equilibrium H₂O partitioning between cpx and opx. No OH was detected for pyroxenes of peridotite xenoliths from the north part of NEC (NNEC). Combined with previously published data from the North China Craton (NCC) and the South China Block (SCB), the regional heterogeneity in the water contents in the Cenozoic lithospheric mantle beneath the whole Eastern China has been revealed. The lithospheric mantle beneath the NNEC is completely dry. The "bulk" water contents of the lithospheric mantle of the south part of NEC and the NCC have similar ranges and average values, whereas those of the SCB are much higher (12-195 ppm, average 90±45 ppm for whole rock). The regional variations in the H₂O content of the Cenozoic lithospheric mantle of Eastern China cannot be caused by partial melting, mantle metasomatism or variations in redox state. We propose that the lithospheric mantle beneath the different regions of Eastern China may have distinct origins and may have undergone distinct geodynamic processes.