Tracing fluids from the stagnant Pacific slab in the mantle transition zone beneath the eastern North China Craton using molybdenum isotopes

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Molybdenum (Mo) stable isotopes hold great potential for investigating mantle heterogeneities, especially those related to subduction processes. However the use of this system is currently hampered by a limited understanding of the mobility of Mo in the mantle. Here we present Mo isotope data for a suite of extensively characterized Cenozoic basalts from the eastern North China Craton (NCC). These basalts record the mixture of relatively shallowly derived components with Indian Ocean mantle Hf-Nd isotope signatures, with deeply derived components reflecting Pacific mantle isotopic signatures. The Mo/Ce and $\delta^{98/95}$Mo (relative to NIST3134) of the basalts predominantly record the mixing of melts from the two different mantle sources. However, the basanites in this suite range to higher $\delta^{98/95}$Mo with no radiogenic isotope change, and show decreasing Dy/Yb with increasing Mo/Ce and Ba/Nb. This suggests that increases in carbonated fluid inputs from the stagnant Pacific slab in the mantle transition zone resulted in increases in the extent of melting of the basanite mantle source. This study indicates that Mo is a mobile trace element in intraplate mantle settings, comparable to other mobile lithophile elements, such as B and Ba. However, as Mo is not as efficiently extracted from the downgoing plate by subduction zone processes, Mo isotope systematics can thus help reveal flux melting processes beneath the eastern NCC, triggered by deeply derived fluids from the stagnant Pacific slab.