Chemistry of eclogite-facies fluids during continental subduction: evidence from the Khungui eclogite in Zavkhan Terrane, Western Mongolia

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Subduction zones are key regions of chemical and mass transfer between Earth’s surface and mantle, which can be characterized in part by studying the composition of fluids present slab subduction and related fluid-rock interaction (Ferrando et a., 2005; Frezzotti and Ferrando, 2015; Frezzotti et al., 2007; Malaspina et al., 2009, 2015, 2017; Manning, 2004). High pressure (HP) and ultrahigh-pressure (UHP) rocks provide to us with critical information about fluid interaction in the deeper part of the subduction zone. However, the fluid inclusions (FI) from HP/UHP rocks have received less attention than other lithologies. Therefore, the fluid activity of continental/oceanic subduction is not fully understood. Here, we present the first result of FI’s from the Khungui eclogite in Zavkhan Terrane, Central Asian Orogenic Belt. Based on the main mineral assemblage of the Khungui eclogite, three metamorphic stages (prograde, eclogite and decompression) are classified. The *P-T* condition of the eclogite stage of the Khungui eclogite yielded 2.1-2.2 GPa at 580-610 ˚C (Bayarbold et al., 2022). FI’s were observed from the garnet (Grt) and elongated the quartz (Qz) in the matrix. All FI can be divided into two types: primary and secondary. The Qz contains primary and secondary FI’s which are clearly distinguished by texture and salinity. Primary FI’s in the Qz contain several phases that consist of liquid (L), vapor (V) and the halite crystal whereas secondary FI’s in the Qz include L+V phases. The Grt includes only primary FI’s occurred in the high-Ca part of the Grt rim which corresponds to the eclogite metamorphism stage of the Khungui eclogite. Primary FI’s in the Grt show two different types that consist of multi (L+V+calcite+phengite+unknown phases) and bi (L+V) phases. Bi-phase FI’s are most commonly observed from the Grt whereas multiphase FI’s rarely occur from the Grt. Moreover, no additional gas compounds are detected from primary/secondary FI’s in the Khungui eclogite. Another interesting thing is that the reaction zone revealed by element mapping is occurred between the Grt and multiphase FI. Due to the reaction, the Grt side was depleted in Al and Ca composition. These observations suggest that high salinity (up to NaCl-13-30 wt.%) FI’s dominate under eclogite condition with fluid-saturated $MgCl_2$-Na(K)Cl-H_2O which is revealed by the eutectic temperature of primary FI whereas low salinity (<NaCl-13 wt.%) fluid dominates at the decompression stage of the Khungui eclogite.

Keywords: Fluid inclusion, Salinity, Eclogite, Continental Subduction

