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Magma evolution of the Emeishan mantle plume: insights from the Hongge diabase in the Panxi region, SW China

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As the product of mantle-derived magma, mafic-ultramafic rocks provide an important window for exploring the origin and evolution of basaltic magma. A huge amount of mafic-ultramafic rocks were produced at ca. 260 Ma due to the activity of Emeishan mantle plume. Among which, the layered intrusions hosting Fe-Ti-V oxide deposits in the Panxi region have attracted widespread attention. However, little research has been done on the mafic dikes associated with these layered intrusions. In this study, the diabase dikes in the Hongge layered intrusion were examined to understand the evolution of the magmatic system of the Emeishan mantle plume. The sampled Hongge diabases contain two generation of minerals, i. e., phenocryst and matrix. It is found that Mg# values of clinopyroxene varied continuously from the phenocryst core to rim and matrix, while the An values of plagioclase show an obvious discontinuity. The MELTS simulation results show that the composition variation could not be explained by a simple process of magma ascending, reflecting the basaltic magma may have mixed with the synchronous syenitic magma during the evolution process. Our research suggests that the Emeishan mantle plume magmatism is characterized by trans-crustal, polyphase and multi-stage evolution, and “self-mixing” between co-genetic magmas is also nonnegligible.