Zircon U-Pb Geochronology and Geochemistry of the Intrusions Associated with the Jiawula Pb-Zn-Ag Deposit in the Great Xing'an Range, NE China and their Implications for Mineralization

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Located in the eastern part of the Central Asian Orogenic Belt, the Jiawula Ag-Pb-Zn deposit is classified as a volcanic to subvolcanic vein-type deposit. Most of the ores are hosted by Jurassic rocks of the Tamulangou and Nanping Formations. Northwest- and north-northwest-trending faults branch out to the northwest and converge to the southeast. Orebodies are controlled by these faults, which have a genetic relationship with the volcanic edifice. The intrusions in the Jiawula deposit are mainly composed of Indosinian granite and granodiorite, as well as late Yanshanian syenite porphyry, quartz porphyry, and quartz monzonite porphyry. Zircon SHRIMP U-Pb analyses yield weighted mean ages of 150.1±1.8 Ma for quartz porphyry, 148.8±2.2 Ma for syenite porphyry, and 145.3±1.9 Ma for monzonite porphyry, indicating a Yanshanian magmatic event. An earlier Indosinian magmatic event is represented by granodiorite (254±2 Ma), dacite porphyry (252.9±4.8 Ma), and diorite porphyry (247±4.1 Ma). Both the Indosinian and Yanshanian igneous rocks are classified as I-type granitoids. The late Jurassic intrusions are highly fractionated and characterized by negative anomalies of Eu, Sr, P, and Ti. The hypabyssal intrusions have initial $^{87}Sr/^{86}Sr$ values between 0.70458 and 0.70522, and εNd(t) values of -3.4 to -0.2, indicating relatively older crust at the Jiawula deposit relative to the more juvenile crust in most of this area. Magma generation at Jiawula is linked to juvenile lower crustal and slightly enriched mantle sources. The ~250 Ma magmatic episode in Jiawula might be related to the subduction of the Mongol-Okhotsk oceanic plate towards the south beneath the Erguna massif. The ~150 Ma magmatic event occurred after the closure of the Mongol-Okhotsk Ocean followed by the change in subduction direction of the Paleo-Pacific plate. Varying temperature, stronger fractionation, and higher oxygen fugacity related to the magmatic-hydrothermal transition might be favorable for the Ag-Pb-Zn mineralization.