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Data Repository

TEXT DR1. ANALYTICAL METHODS

Electron Microprobe Analyses

Compositional analyses of representative minerals were determined on the JOEL JXA 8230 electron probe microanalysis (EPMA) in the Center for Global Tectonics of School of Earth Sciences, China University of Geosciences, Wuhan (CUG). The operating conditions for qualitative analyses were 15 kV accelerating voltage, 20 nA beam current, 1–3 μm electron beam diameter, and 10–20 s counting time. Natural mineral standards from SPI company were used for corrections. The program ZAF was used for matrix corrections.

Major and Trace Elements Analyses on Bulk Rock Samples

Freshest samples were selected for whole-rock geochemical analysis. Each sample was carefully cleaned and crushed in a corundum jaw crusher to a size of 60 mesh and then powdered in an agate ring mill to less than 200 mesh. Major elements were determined by X-ray fluorescence (XRF) spectrometry (Shimadzu XRF-1800) at the State Key Laboratory of Geological Processes and Mineral Resources (GPMR), CUG, Wuhan. The analytical accuracy is better than 5%. Trace elements were analyzed using an Agilent 7500a inductively coupled mass spectrometry (ICP-MS) at the GPMR. The detailed sample-digestion procedure for ICP-MS analyses, and the analytical precision and accuracy for trace element analyses, are the same as those described by Liu et al. (2008a).

Zircon U-Pb Dating

The samples were pulverized to 80–100 mesh, elutriated, and separated using liquid and magnetic separation method. Zircons with no significant inclusions or cracks were selected using a binocular microscope. The structure and origin of zircon grains were studied by Cathodoluminescence (CL) imaging using a MonoCL4+ instrument mounted on a Quanta 400 FEG scanning electron microscope at the GPMR, CUG.

The zircon U–Pb isotopes and trace element analyses were conducted with an Agilent 7500a laser-ablation inductively coupled plasma mass spectrometer (LA-ICP-MS), coupled to a GeoLas 2005 193 nm laser microprobe at the GPMR. The laser beam diameter was 32 μm. Each analysis incorporated a background acquisition of ~20 s followed by 50 s data acquisition from the sample. Detailed operating conditions for the laser ablation system and the ICP-MS and procedures for data reduction are described by Liu et al. (2008b). The standard NIST SRM 610 silicate glass was analyzed to quantify elemental concentration. Zircon 91500 ($^{206}Pb/^{238}U$ age = 1062.4 ± 0.4 Ma, Wiedenbeck et al., 1995) was used as external standard for age calculation and was analyzed twice every six analyses. Zircon standards GJ-1 (599.8 ± 1.7 Ma, 2σ, Jackson et al., 2004) were used for unknown samples. Off-line selection and integration of background and analysis signals, and time-drift correction and quantitative calibration for trace element analyses and U-Pb dating were performed by ICPMSDataCal (Liu et al., 2010). The concordia diagrams and weighted mean calculations were made using Isoplot/Ex_ver4.15 (Ludwig, 2003). Analytical uncertainty for individual spot is 1σ. The $^{207}Pb/^{206}Pb$ ages are adopted.

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