Continental construction in Central Asia: evaluation of juvenile vs. recycled crust and identification of Pacific-type orogens

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New or “juvenile” crust forms and grows mainly through mafic to andesitic magmatism at Pacific-type (P-type) or accretionary type convergent margins as well as via tectonic accretion of oceanic, island-arc and translation of continental terranes. During the last decades the juvenile or recycled nature of crust has been commonly evaluated using whole-rock isotope and Hf-in-zircon isotope methos. However, evidence for the accretionary (or P-type) nature of an orogenic belt comes from geological data, for example, from the presence of accretionary complexes (AC), intra-oceanic arcs (IOA), oceanic plate stratigraphy units (OPS), and MORB-OIB derived blueschist belts (BSB). The Central Asian Orogenic Belt (CAOB) represents the world’s largest province of Phanerozoic juvenile crustal growth during ca. 800 m.y. between the East European, Siberian, North China and Tarim cratons. From geological point of view, the CAOB is a typical P-type belt as it hosts numerous occurrences of accretionary complexes, intra-oceanic arcs, OPS units, and MORB-OIB derived blueschist belts. In spite of its accretionary nature, supported by positive whole rock Nd isotope characteristics in CAOB granitoids, the Hf-in-zircon isotope data reveal a big portion of recycled crust. Such a controversy can be explained by presence of accreted microcontinents, isotopically mixed igneous reservoirs and by the tectonic erosion of juvenile crust. The most probable localities of tectonic erosion in the CAOB are the middle and southern Tienshan and southern Transbaikalia because these regions comprise a predominantly recycled crust (based on isotope data), but the geological data show presence of intra-oceanic arcs, blueschist belts and accreted OPS with oceanic island basalts (OIB) and tectonically juxtaposed coeval arc granitoids and accretionary units. This warrants combination of detailed geological studies with isotopic results, as on their own they may not reflect such processes as tectonic erosion of juvenile crust and/or arc subduction. The works was supported by the Ministry of Education and Science, Russian Federation, grant no. 14.Y26.31.0018.

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