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Tectonic evolution and crustal-scale structure of Kyrgyz Central Asian Orogenic Belt: new insights from the Darius programme

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Mechanisms and history of the Late Palaeozoic accretion followed by formation of trunscurrent strike-slip faults were studied in the southern segment of the Central Asian Orogenic Belt (CAOB) within Kyrgyz South Tianshan.

1. South Tianshan Suture: ending accretion process after docking of Tarim craton
This study gives insights into the crustal-scale structure and Upper Paleozoic history of this mountain belt, currently intensely reactivated by the India-Asia collision. Structural, petrological and geochronological studies were carried out within South Tianshan suture east of the Talas-Ferghana Fault (TFF). New data highlight a south-dipping structure featured by a HP metamorphic core complex comprised of c. 320 Ma continental and oceanic eclogites exhumed by top-to-North motion. A large massif (10 x 50 km) of continental HP rocks in the Atbashi Range is comprised of hectometric boudins of eclogites embedded in metapelites and gneissesMetamorphic units exhibit blueschist to eclogite facies conditions, with oceanic (MORB) rocks in the blueschist facies representing the accretionary oceanic prism being thrusted by oceanic rocks and a continental unit in the eclogite facies (510 $\pm$ 50°C and 24 $\pm$ 2 kbar). Evidence for eclogite facies both in metasediments and mafic lithologies and geological structure are in agreement with a previously thinned continental margin. Subduction of this thinned COT (Continent-Ocean Transition) probably occurred by slab pull in a south-dipping subduction zone, while another north-dipping subduction was active below Middle Tianshan. Final stacking of Middle and South Tianshan occurred at 320-310 Ma. These opposite subduction zones are still reflected in the main structures of Tianshan. Reactivation of the South-dipping structures since 30-25 Ma is ascribed to explain the current Tianshan intra-continental subduction from seismology.

2. Talas-Ferghana Fault (TFF) activity & Basin formation
After this accretionary episode, the South Tianshan suture was cross-cut by the TFF, which was active in several stages from 320 Ma to present. The main events of basin formation are ascribed to the activity of the dextral TFF (Rolland et al. 2013, JAES). Ar-Ar dating undertaken on syn-kinematic minerals that feature the phases of motion of the TFF show a first stage of activation occurred at 312 $\pm$ 4 Ma, followed by a main stage of dextral motion in the Late Permian at 256 - 250 Ma, while late stages of reactivation of TFF is featured by emplacement of 195 $\pm$ 3 Ma pegmatitic dykes, formation of transtensional basins during Jurassic, dextral offsets of river valleys and ongoing seismicity.

3. Reactivation of South Tian Shan Suture
Most prominent topography in Central Asia corresponds to the former South Tianshan suture which has been reactivated since about 30 Ma, the former Carboniferous thrusts are reactivated in a pop-up structure with top-north and top-south faults bounding the high mountains of Khan Tengri and Pobeda peaks (7440 m a.s.l.).