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A North-South profile through Kyrgyzstan: thermochronology and geochronology from the intracontinental mountain belts of the Northern Pamir to the Northern Tien Shan

J. De Grave (1), M. Buslov (2), P. Van den haute (1), V. Batalev (3), S. Glorie (1), J. Dewanckele (1)

(1) Geochronology Group, Dept. of Mineralogy & Petrology, Ghent University, Ghent, Belgium, (2) Geological Institute, Siberian Branch of the Russian Academy of Science, Novosibirsk, Russia, (3) International Geodynamics Research Centre, Bishkek, Kyrgyzstan (Johan.Degrave@Ugent.be / Fax: +32 9 264 4984)

As part of an ongoing investigation into the Meso-Cenozoic tectonic history of the intracontinental Central Asian Orogenic System (CAOS) about 100 basement samples from the Tien Shan and northern Pamir Mountains were collected during several field campaigns. Several north-south profiles cross the general east-west trend of the mountain ranges within Kyrgyzstan, the Kyrgyz-Tajik border area and southern Kazakhstan.

Low-temperature thermochronologic techniques, mainly apatite fission-track (AFT) dating and thermal history modelling reveal an important wide-scale Mesozoic cooling event for the Kyrgyz basement rocks, and in particular for the ancestral Tien Shan. The AFT analysis is supported by limited K-feldspar $^{40}Ar/^{39}Ar$ data and at the time of writing preparations are made for apatite (U-Th)/He dating. We interpret this Mesozoic cooling as being associated with a phase of tectonic reactivation and denudation of the ancestral Tien Shan mountain belt. It is clear from the foreland basins to the north (Junggar) and south (Tarim) of the Mesozoic Tien Shan, that km-scale continental sediments were derived from growing mountain ranges in the Tien Shan. We link the tectonic activity to the Cimmerian orogeny, a result from the punctuated collisions of the Tibetan tectonic blocks with the Mesozoic southern Eurasian margin.

Modelling also yielded a possible Late Cenozoic cooling phase, which can be related to the construction and denudation of the modern Tien Shan that started forming in the Miocene as a distant tectonic effect of the indentation of India into the Eurasian continent. In particular, the underthrusting of the rigid Tarim plate (east) and the loading of the Pamir thrust sheets (west) are responsible for the Cenozoic transpressive reactivation of the Tien Shan. Sediments derived from the newly growing Tien Shan orogen are deposited in the Junggar and Tarim foreland basins, but also km-thick sediment sequences are found in large intramontane basins (e.g. Issyk-Kul Basin) between the Tien Shan ranges and between the southern Tien Shan and advancing Pamir thrusts (Alai Basin). We anticipate that near-future apatite (U-Th)/He dating will further constrain the timing of Late Cenozoic events.

A majority of our samples were taken in the northern part of the Kyrgyz Tien Shan, where the basement is dominated by a large granitoid batholith. At several locations zircons from granites and (grano)diorites from the batholith were sampled and dated using the SHRIMP $^{238}U/^{206}Pb$ system. This study reveals a Late Ordovician – Early Silurian crystallisation age ($\sim$420-440 Ma) for the batholith. The Late Ordovician – Early Silurian batholith is associated with the closure of the Turkestan Ocean. This oceanic basin between the composite Kazakhstan microcontinent and the Junggar terrane on one hand and the Tarim microcontinent on the other hand, closed completely in the Late Devonian-Early Carboniferous and is a major event in the formation of the Central Asian basement and the construction of the Eurasian continent. The batholith, ancient island arc systems trapped between the converging plates, and ophiolite bearing sutures within the ancestral Tien Shan represent this important Central Asian suture zone. Using our multichronological approach the aim is to constrain the timing of main formation and reactivation episodes in the CAOS realm.