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Meso-Cenozoic building of the northern Central Asian Orogenic Belt: thermotectonic history of the Tuva region

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The Tuvinian and West-Sayan mountain ranges (West Sayan, Shapshal, Tannu Ola and Sengilen Range) form part of the Central Asian Orogenic Belt (CAOB), and more specifically they align along the Altai-Sayan-Hangai zone of the CAOB in South Siberia and Mongolia. Its Precambrian-Palaeozoic basement has been subjected to Meso-Cenozoic tectonic reactivation. Two North-South transects across the mountain belts and intervening Meso-Cenozoic basins of Tuva were sampled for apatite fission-track (AFT) thermochronology in order to elucidate the thermal history of the Tuvinian basement in relation to Meso-Cenozoic reactivation of the CAOB. Mainly Palaeozoic granitoid basement was targeted for sampling. Most AFT ages of these granitoids are Late Cretaceous and range between 55 and 115 Ma. Mean lengths of confined fission tracks are relatively long with most values between 13 and 14 μm. Thermal history modeling shows a rapid Late Jurassic – Cretaceous cooling for the sampled Tuvinian crystalline rocks, related to exhumation of the Palaeozoic basement. This exhumation is most likely related to the building and subsequent orogenic collapse of the Mongol-Okhotsk orogen that formed between the Siberian and North China – Mongolian (Sino-Korean or Amurian) continental blocks during the Late Mesozoic. Far-field effects of this orogeny and its collapse, affected the Baikal, Altai and Sayan units of the Central Asian Orogenic Belt, including the Tuvinian basement. After a Palaeogene period of stability, thermal history models for some samples hint at a renewed period of basement cooling during the Neogene. In support of this Neogene event, a single sample from the main West Sayan fault zone contains an apatite population with $\sim$2 Ma reset AFT ages. This is interpreted in the framework of ongoing building of the modern Central Asian orogens and associated fault movements and exhumation of the basement, presumably related with the ongoing India-Eurasia convergence. Sediments derived from the exhumed basement were deposited in large adjoining Meso-Cenozoic basins (e.g. sub-basins of the West Siberian Basin) and in smaller intramontane basins in the Altai-Sayan-Tuva area as well.