EARLY TO MIDDLE PALEOZOIC EVOLUTION OF THE >3000 KM PALEO-MARGINS OF THE SOUTHERN CENTRAL ASIAN OROGENIC BELT: IMPLICATIONS FOR THE GONDWANA TO PANGEA TRANSITION

Earth's geodynamic history is characterized by the formation and destruction of several supercontinents that included most of the Earth's landmasses. This process called supercontinent cycle had a deep impact on the evolution of the Earth's lithosphere, atmosphere and biodiversity. It involved the formation of mountain belts during which rocks underwent metamorphism that corresponds to dramatic changes in pressure (*P*) and temperature (*T*). From the Early Paleozoic, continental fragments separated from the northeastern margin of the Gondwana supercontinent and migrated northward. During these events, small interior oceans were successively opened and closed and the northward migration of the continental fragments eventually led to the formation of the Pangea supercontinent in the late Paleozoic. Meanwhile, the peripheral margins of Gondwana recorded the subduction of a giant exterior ocean. However, the mechanisms that affected the peripheral margins are much better understood than the ones that were responsible for the separation and migration of the continental fragments from the northeast margin of Gondwana. The Tarim–North-China collage is located in the southern Central Asian orogenic belt (CAOB) and its Paleozoic tectonic evolution is related to the subduction of the Paleo-Asian and Tethyan oceans that occurred in the Paleozoic. Extensive early to middle Paleozoic magmatic-metamorphic activities developed in the northern and southern margins of the continental blocks forming the Tarim–North-China collage. Whether this activity occurred simultaneously throughout the different continental blocks or not, and whether it was related to the subduction of small interior or large exterior oceans are key issues that need to solved to better understand the forces that led to the transition from Gondwana to Pangea. Previous studies based on zircon geochronology of magmatic and metamorphic rocks from the southern CAOB showed that the continental blocks underwent a long-lasting tectonic evolution from Ordovician to Devonian. Because the characteristics of the deformation preserved in metamorphic rocks have been overlooked, contrasting tectonic models have been proposed and geochronological studies alone are not sufficient to unravel the early to middle Paleozoic tectonic evolution of Tarim–North-China collage as a whole. In order to answer the above-mentioned scientific questions, this joint project proposes to adopt a multidisciplinary approach based on 1) studies of structures and deformation (*D*), 2) studies of *P*–*T* conditions of formation of metamorphic rocks and 3) studies of the timing and duration *(t)* of metamorphic events using new geochronological methods consisting of garnet Lu–Hf and Sm–Nd dating, and conventional zircon and monazite U–Pb complemented with potassium-containing mineral $^{40}Ar/^{39}Ar$ dating. The aim of the project is to proceed to the first systematic application of these methods to representative metamorphic rocks from all the different continental blocks from the southern CAOB in order to constrain the deformational-metamorphic evolution of the northern and southern margins of the Tarim–North-China collage. The acquired data will be synthesized into pressure-temperature-pressure-time-deformation (*P*–*T*–*t*–*D*) evolutions of metamorphic rocks that can be compared to understand if mountain belts along the paleo-margins underwent similar or distinct tectonic evolutions. The findings of this project will also be used to recognize whether the formation of the mountain belts was related to the subduction of interior or exterior oceans and test hypotheses on the mechanisms of supercontinent cycle that governed the transition from Gondwana to Pangea.