PETROCHRONOLOGY OF THE NORTHEASTERN GONDWANA TERRANES: IMPLICATIONS FOR THE SUPERCONTINENT CYCLE

Earth's tectonic history is characterized by the formation and destruction of several supercontinents that included most of the Earth's continental crust. 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 corresponding to dramatic pressure (*P*) and temperature (*T*) increase. The final assembly of the Gondwana supercontinent and the amalgamation of Pangea, which is the last known supercontinent, occurred between 540 and 280 million years ago. Along the exterior margins of Gondwana, continental fragments were accreted by subduction of a giant peripheral ocean. In contrast, the interior domains of western Gondwana saw continental fragments continuously being detached and subsequently reattached to other blocks to form Pangea. The present-day Asian continent formed by amalgamation of northeast Gondwana-derived continental blocks that lasted over 400 million years but when and how these continental fragments have been detached from northeast Gondwana remains enigmatic. However, answering these two questions is essential for better understanding of what forces are responsible for the formation and break-up of supercontinents. The Tarim-North China collage represents a chain of mountain belts that are located in Central Asia. These mountain belts are considered as having formed along northeast Gondwana between 500 and 400 million years ago, and mainly consist of magmatic-metamorphic rock suites that formed at the time. Previous studies of magmatic rocks used zircon geochronology to constrain the tectonic evolution of the Tarim-North China collage but they led to contrasting tectonic models that can hardly be used to understand the geodynamic evolution of northeast Gondwana. Meanwhile, comprehensive studies of the Early Paleozoic metamorphic rocks from the Tarim-North China collage have been overlooked. Therefore, the goal of the project is to understand when and how continental fragmentation of northeast Gondwana occurred by focusing on metamorphic rocks from the Tarim-North China collage. The project research will be based on garnet Lu─Hf and Sm─Nd geochronology and garnet geochemistry which will provide new constraints on the timing of metamorphism. Also, petrographic and metamorphic studies will be conducted to indicate which *P─T* conditions have been reached during metamorphism. Combining both methods into detailed petrochonological investigations systematically applied to all metamorphic rocks will allow us to understand when and how the mountain belts were formed and propose a new model of tectonic evolution for northeast Gondwana. Moreover, comparing our new tectonic model with the models proposed for the western parts of Gondwana will shed light on the processes that govern Earth's supercontinent cycle. Similar tectonic evolutions for interior domains of both west and northeast Gondwana would indicate that transfer of continental fragments from Gondwana to Pangea was mainly governed by interior geodynamic processes. In contrast, similar tectonic evolutions for the interior of northeast Gondwana and the exterior margins of Gondwana would indicate that these transfers were mainly governed by the geodynamics of the exterior oceans.