The Origin, Evolution and Present State of Subcontinental Lithosphere—an IUGS-SECE conference

Beijing, China, June 25–30, 2005

The international conference, *The origin, evolution and present state of subcontinental lithosphere*, was held at Peking University, Beijing, China, June 25th to 30th, 2005. It had two components: a three-day indoor symposium followed by a three-day field excursion. It was organized and co-sponsored by the IUGS Commission on Solid Earth Composition and Evolution (SECE), National Natural Science Foundation of China, Elsevier Publisher, Peking University, China University of Geosciences in Beijing and Institute of Geology and Geophysics of Chinese Academy of Sciences.

The conference was successful with over 100 participants, 51 oral and 20 poster presentations given by scientists from Australia, Canada, China, France, Israel, Japan, UK and USA. A number of them are world leading petrologists, geochemists, tectonophysicists and geophysicists with deep interests and experiences in studying the origin and evolution of Earth's continents. Breadth, depth and novelty in both observations and interpretations ensured the conference both exciting and stimulating. "This is one of the best meetings I have ever attended" is a common view by many participants. The indoor symposium was organized into the following topics:

- Continental lithosphere: Concepts, observations, problems and hypotheses
- Crustal geochemistry and tectonics: Observations and interpretations
- Petrology and geochemistry of rocks at active tectonic zones and orogenies
- Geophysics: Observations and interpretations
- Ultra-high pressure metamorphism, continental collision, and crustal evolution

All these topics are essential components towards a better understanding of the origin, evolution and present state of subcontinental lithosphere. The geology in China, in particular the tectonic evolution of eastern China, offers a unique ground for testing relevant hypotheses, which is the very reason why this conference was held in Beijing. New hypotheses on continental lithosphere thinning have been put forward. For example, the lithosphere thinning and Mesozoic/Cenozoic volcanism in eastern China may indeed be a special consequence of plate tectonics. This hypothesis well explains why lithosphere thinning occurs mostly beneath continents where there apparently exist subducted (or subducting) oceanic lithosphere, whether beneath the "stable craton" (e.g., the North China craton), or genetically associated with zones of continental collision (e.g., Tibetan plateau) and oceanic lithosphere subduction (e.g., the southern Andes). This hypothesis also explains why the subcontinental lithosphere has been persistent both in time and space beneath continents where no subducted slabs exist (e.g., beneath much of the African plate). Lithosphere foundering as a result of dense eclogite formation in the mafic lower crust has received acceptance as an alternative for lithosphere thinning although the required mechanisms of subcrust lithosphere weakening remains poorly known. The recognition of asthenosphere-lithosphere decoupling and the role of the thermal boundary layer at this interface provides a logical alternative to explain the origin and composition of within-continent volcanism. Re-Os isotopic studies on mantle xenoliths are confirmed to be a useful means to reveal the lithospheric histories on local, regional and even perhaps global scales. Geochronology, in combination with Hf-O isotopes, of zircons is shown to be a powerful tool to date earth events, to infer the provenance and to place constraints on the rate of continental crust accretion over Earth's history. Secular compositional variation of within-continent basalts together with mantle xenoliths they contain records precisely how the mantle sources have evolved with time. The spatially and temporarily associated granitoids, despite being product of largely crustal melting, are a direct response to crust-mantle interaction in terms of both heat and material. High resolution seismic mantle tomography holds promise for providing better constraints on both physical properties and structures of subcontinental lithosphere-asthenosphere, necessary for improved models of the origin and evolution of continents and within-continent volcanism. The effect of continental subduction, as evidenced by collision-exhumed ultrahigh-pressure metamorphic rocks, on the evolution of subcontinental lithosphere has received attention.

The three-day field excursion was both informative and fruitful. The xenolith-bearing Mesozoic (Fangcheng, Linyi) and Cenozoic (Daxizhuang, Jiaozhou) basalts as well as the eclogites and garnet pyroxenites within the host of granitic gneisses from the famous Sulu (-Dabie) ultrahigh-pressure metamorphic belt in the coastal Shandong Province offered the participants personal experiences: (1) the lithosphere of the North China Craton that should have been > 200 km thick has been thinned to be no more than 80 km thick today, and (2) the physically buoyant continental crustal material (i.e., granitic gneisses) can subduct into the mantle in excess of 150 km before brought back to the surface by continental collision.

The conference has achieved all of its objectives, including "We welcome field geologists, petrologists, geochemists, tectonophysicists, and geophysicists of all areas with a common goal of enhancing our understanding the working of the Earth by means of future collaborative efforts".

(Abstracts submitted to the conference are available on the website *http//www.episodes.org).*

Participants in front of the meeting hall at Peking University.

Yaoling Niu
Durham University
Durham DH1 3LE
UK

Shuguang Song & Lifei Zhang
Peking University
Beijing 100871
CHINA