The 39th Tectonic Conference of the Interagency Tectonic Committee, Division of Earth Sciences, Russian Academy of Sciences

Yu. V. Karyakin
Geological Institute, Russian Academy of Sciences, Pyzhevskii per. 7, Moscow, 119017 Russia
Received March 23, 2006
DOI: 10.1134/S0016852106040054

The 39th Tectonic Conference on Regions of Active Tectogenesis in the Recent and Ancient History of the Earth was held January 31–February 3, 2006, by the Interagency Tectonic Committee, Division of Earth Sciences, Russian Academy of Sciences (RAS). The conference was organized by the Geological Institute, RAS, and the Faculty of Geology, Moscow State University (MSU). More than 300 scientists from Russia and other CIS countries took part in the conference.

The conference was opened by Academician Yu.G. Leonov, chairman of the committee. D.Yu. Pushcharovsky, corresponding member of the RAS and dean of the Faculty of Geology, MSU, delivered a welcoming speech.

In line with the subjects of the conference, priority was given to the lectures on active tectogenesis of sedimentary basins and continental margins, collision systems, and intracontinental tectogenesis.

Nineteen plenary lectures were presented at the conference. In the lecture “Parameters of Hot Spots and Thermochemical Plumes in the Process of Their Ascent and Eruption” by N.L. Dobretsov, A.A. Kirdyashkin, A.G. Kirdyashkin, and I.N. Gladkov, it was shown that the thermochemical plumes are the most important regulators of the thermochemical machine of the Earth. These plumes are formed at the core/mantle boundary in the presence of heat flow from the outer core and a local supply of a chemical dope that depresses the melting temperature at the sole of the lower mantle. The laboratory modeling of thermochemical plumes allowed consideration of heat and mass exchange in the plume during its ascent from the core/mantle boundary and estimation of the main parameters of this process. The hot spots treated by the authors as an expression of thermochemical plumes at the Earth’s surface are diverse. Three main types of plumes are recognized depending on their localization: (1) the plumes beneath the oceanic lithosphere (Hawaiian plume) and the continental lithosphere (East African plumes), (2) plumes at the axis of the mid-ocean ridge (Iceland plume), and (3) plumes near the mid-ocean ridge (plume at the Bouvet triple junction).

The lecture by M.V. Mints was focused on the results obtained along regional CMP geotraverses that crossed large tectonic units of the North American, Australian, and East European cratons. Principally new results on the deep structure of the Early Precambrian crust and crust/mantle boundary, as well as on structural features of the upper lithospheric mantle, were obtained. These data testify to the overall tectonic delamination of the Early Precambrian crust, a process that arises owing to the combination of nappe–thrust and over- and underthrust structural assemblages formed in both the Archean and Paleoproterozoic. Some regional boundaries extend down to base of the crust and occasionally enter into the mantle. They may be interpreted as tracks of the buried oceanic plates that underwent subduction in the Neoarchean and Paleoproterozoic. A combination of nappe–thrust and over- and underthrust structural assemblages makes up the crocodile-jaws-type structural features related to submergence of fragments of the lower crustal sheets into the mantle with formation of imbricate thrusts in the upper crust. In the East European Craton, Mints for the first time defined a special type of Paleoproterozoic intracontinental collisional orogens formed by a combination of plume-related and plate-tectonic processes.

A.M. Nikishin demonstrated the links between supercontinental cycles and the first-order cycles of eustatic oscillations of the World Ocean level. Such cycles last for 375 Ma. The epochs of maximal growth of continents (250, 625, and 1000 Ma ago) correspond to the lowest oceanic level, whereas the epochs of maximal breakdown of continents (75, 450, and 810 Ma) are marked by the highest oceanic level. Such supercontinental cyclicity apparently characterizes the post-Archean history of the Earth.

The rates of recent mountain building were discussed by V.G. Trifonov, A.E. Dodonov, E.V. Artushkov, D.M. Bachmanov, A.V. Mikolaichuk, F.A. Vishnyakov, and A.A. Zarshchikov. Acceleration of tectonic
uplift of the central Tien Shan and possible causes of this process were considered. The acceleration of recent uplifting in the central Tien Shan is substantiated from the facies and the thickness of recent molasse, stepwise topography, and recent structural rearrangements. The recent orogenic complex comprises four molasse groups: the Kyrgyzh Group (Oligocene–Middle Miocene), Tien Shan Group (Middle Miocene–Upper Pliocene), Sharpyldak Group (Upper Pliocene and Eopleistocene), and Pleistocene–Holocene. The sediments of the Kyrgyzh and Tien Shan groups become coarser upsection. The rates of incision at various stages and subtypes of topography are estimated as follows: 0.02–0.03 mm/yr for the lower part of the Kyrgyzh Group, ~0.03 mm/yr during deposition of the entire Kyrgyzh Group, 0.05–0.08 mm/yr during deposition of the Tien Shan Group, 0.5–0.7 mm/yr in the Sharpyldak time, and up to 2–3 mm/yr in the Pleistocene. The accelerated uplifting was caused not only by acceleration of horizontal movements. It is assumed that eclogitization of the crust in the Caledonian and Hercynian Tien Shan is the major mechanism of the accelerated uplifting. A decrease in density of the mantle and the adjacent crust as a result of their thermal expansion and phase transitions led to the intense growth of a mountain edifice. The driving forces of this process could have started to act during early phases of recent tectogenesis.

The tectonic setting of crystalline complexes in mobile belts of central Asia was considered by I.K. Kozakov, V.V. Yarmolyuk, E.B. Sal’nikova, V.P. Kovach, A.B. Kotov, and A.M. Kozlovsky on the basis of new geologic and geochronologic data. The crystalline complexes of central Asia are localized in the Early Caledonian domain of mosaic structure (Early Caledonian superterrane) and in the Hercynian linear belts. The U–Pb timing and distribution of Nd isotopic compositions showed that the formation of crystalline rocks in central Asia is related to regional metamorphism that occurred in the Neoarchean, Paleoproterozoic, Vendian, and Phanerozoic. The Archean and Paleoproterozoic crystalline complexes are fragments of ancient platforms. The crystalline complexes formed in the Vendian (565–540 Ma) and Early Paleozoic (510–480 Ma) are known in the Early Caledonian superterrane of central Asia. Their formation is related to accretion and collision in the course of closure of the Late Riphean (~665 Ma) and Vendian (~570 Ma) basins underlain by oceanic crust. The crystalline complexes in the South Altai and South Gobi metamorphic belts were formed 390–360 and 220–230 Ma ago in connection with closure of Tethyan oceanic basins.

The Meso-Cenozoic accretionary and collisional events in central Asia were characterized by M.M. Buslov, I. De Grave, D.A. Koch, and E.V. Soloboewa. It was established that several accretionary–collisional events that created intracontinental orogenic belts occurred at the southern margin of Eurasia as a result of convergence and collision of the Precambrian microcontinents of the Gondwana origin with Eurasia. The deformations spread inland for many thousand kilometers and with concomitant growth of mountain systems. The convergence of the Indian continent and Eurasia controlled the geologic, tectonic, and geodynamic evolution of central Asia over the recent 55 Ma. The remote effect of this event for more than 4500 km from the Himalayas to Baikal reactivated the basement by the dominoes principle with transfer of deformation through rigid Precambrian microcontinents of central Asia located within foldbelts of various ages.

As was shown in the lecture “Variations of Recent Activity of Master Faults in the Lithosphere of Central Asia” by S.I. Sherman and V.A. Savitsky, the reactivation of spatially conservative faults in the lithosphere occurs much more frequently than the dated episodes of fault reactivation even in the Cenozoic. To establish and assess recent reactivation of faults, the quantitative and magnitude indexes of seismic activity of faults were introduced, algorithms of their determination were developed, and the results of their testing were exemplified in fault tectonics and seismicity of the largest faults in the lithosphere of central Asia. The seismic monitoring of faults that is based on the elaborated algorithms provides a principally new view on short-term reactivation of faults and open up new possibilities for short- and medium-term prediction of earthquakes and other processes controlled by active faults.

New data obtained in recent years on the geologic structure of many petroliferous allowed V.V. Kharakhinov to state that the within-plate tectonic activity is realized mainly in zones of elevated conductivity of the lithosphere. The application of the modern geological and geophysical technologies (particularly, seismic records) and powerful interpretative systems has made it possible to reveal the fluid-conducting features in the petroliferous basins that serve as conduits for fluid flows approaching the upper lithospheric layers. The transportation of deep fluids in the upper crust is provided by fluid-conducting systems of three types. The first, subduction–obduction type is controlled by listric thrust and/or normal faults. The second, riftogenic type is related to near-vertical zones of disintegration that have linear, linear–areal, and areal character. The third, mixed type of fluid-conducting systems is formed as a combination of listric faults and near-vertical zones of disintegration. The tectonic processes giving rise to the formation of structural features that control oil and gas pools, as well as the petroleum accumulation itself, are activated in zones of elevated permeability. These phenomena are expressed at a local level through the elevated saturation of disintegrated geologic bodies in oil.

The lecture “Synmetamorphic Magmatic Mingling as an Indicator of Collapse of the Early Paleozoic Collisional System in the Western Baikal Region” presented by E.V. Sklyarov and V.S. Fedorovsky is devoted to tectonic and geodynamic aspects of mechanical mingling of mantle-derived and crustal magmas. The Early