5th ZONENSHAIN CONFERENCE ON PLATE TECTONICS

SCHEDULE

	Conference Hall	Small Conference Hall	Hall
	Oral Sessions	**Oral Sessions**	**Poster Sessions**
Wednesday 22, November 1995			
10:00-14:00	SYMPOSIUM 1 Mid-Ocean Ridges and Subduction Zones	SYMPOSIUM 2 Arctic Environment in Global Change	
15:00-19:00	SYMPOSIUM 1 Mid-Ocean Ridges and Subduction Zones	SYMPOSIUM 2 Arctic Environment in Global Change	SYMPOSIUM 3,4,5 Poster Sessions
Thursday 23, November 1995			
10:00-14:00	SYMPOSIUM 3 Regional Geology of the Former USSR Territory	SYMPOSIUM 4 Sedimentary Basins of North Eurasia	
15:00-19:00	SYMPOSIUM 3 Regional Geology of the Former USSR Territory	SYMPOSIUM 4 Sedimentary Basins of North Eurasia	SYMPOSIUM 1,2,6 Poster Sessions
Friday 24, November 1995			
10:00-14:00	SYMPOSIUM 6 Paleogeography and Paleotectonics	SYMPOSIUM 7 Paleoceanography and Evolution of Oceanic Biota	
15:00-19:00	SYMPOSIUM 6 Paleogeography and Paleotectonics	SYMPOSIUM 5 Natural Hazards of Far East Russia	SYMPOSIUM 7,8,9 Poster Sessions
Saturday 25, November 1995			
10:00-14:00	SYMPOSIUM 9 Interaction of Mantle Flows with Surface Processes	SYMPOSIUM 8 Radiolarians: Climatic Affinity and Paleoreconstructions	
15:00	GENERAL DISCUSSION, CLOSING OF THE CONFERENCE		

5th ZONENSHAIN CONFERENCE ON PLATE TECTONICS

Moscow
November 22-25, 1995

Programme and Abstracts

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amplitude structures, and by superimposed dislocations related to thrusting processes that occurred in the adjacent tectonically active areas.

In so far as thrusts within the platform affects the uppermost part of the section only, the structure demonstrates two levels. The lower complexes show only platform-type dislocations, while the upper ones demonstrates a combination of platform and thrust-type dislocations.

A fair-potential zone is located within the folded area between the front of major thrusts and platform boundary, beneath the folded structures. It is inferred by the gravity and magnetic anomalies.

A low-potential zone is established within the folded areas. It is structurally the most complicated region with a combination of intensely dislocated thrust-and-nappe structures.

The established zones vary in the structural styles, size, type of dislocations, and in character and strength of tectonic stresses as well. The inner platform parts are mainly characterized by subvertical (85-95%) stresses of low intensity, while thrusts and nappes within the folded areas combine subhorizontal (50-60%) and subvertical (40-50%) stresses.

THE MAJOR FEATURES OF EARLY TRIASSIC HISTORY OF SEDIMENTARY BASIN ON EURASIA CONTINENTAL MARGIN IN THE BOUNDARIES OF THE SCYTHIAN PLATFORM

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The specific peculiarity of the Lower Triassic complex of the Scythian Platform is its sedparation in two heterogeneous parts wich are substancial reflection of qualititively different historical stages.

The lower part is compiled of primordially isolated sedimentary bodies of continental genesis corresponding to redcoloured orogenic molasse; the upper part consists of both connected laterally and vertically and isolated in recent structure sedimentary and volcanogenic-sedimentary bodies of marine platformal origin.

The first stage corresponds with the intracontinental position of the contemporary Scythian Platform conditioned by Hercynian collision of the East-European Plate and Transcaucasus microcontinent. A series of narrow flexures rapidly filled with material from uplifts between the morphologic depressions originated in that area in Early Indian. The abundance of coarse clastics in lower parts of sequences reflects significant relief roughness and arcose content of clastics means deep denudational cutting of Hercynian basement with opened numerous granite intrusions.

The second stage marks the transformation of the intracontinentalarea into continental margin, connected with propagation of the Tethys ocean basin to the West. It is characterised by establishment of marine sedimentation in the Scythian Platform to the end of Indian age, in conditions of extremely intensive subsidence. The major feature of stage is separation of areas of carbonate, carbonate-terrigeneous and volcanogeneous sedimentation. The first two areas preserved relatively elevated position in compete with the other parts of the basin till the end of Early Triassic. It provided relatively shallow marine curcumstances and stable carbonate sedimentation of different types , wich generally compensated rapid subsidence. The main process was very active development of diverse biogerms. Another substancial process was periodic influx of pyroclastics from adjacent areas.

In the rest part of the Early Triassic basin firstly sequences of carbonates, alevrolites and argillites of various thicknesses and secondly localised volcanic (primarilly basic, rarely acid) rocks alternated with normal sediments accumulated. These both formations accumulated in the depths wich noticeably exceeded depths of generally carbonate precipitation.

Siting of submarine volcanic centreson the boundaries of carbonate and carbonate-terrigeneous sedimentational areas shows their connection with gractures, wich separated areas of rapid but compensated subsidence from the areas of more active, noncompensated one.

During the following development of the region that entire cover of marine sediments was exposed to denudation repeatedly and in contemporary structure of the Scythian Platform it preserved as a number of isolated fragments.

QUANTITATIVE MODELLING OF LITHOSPHERIC STRETCHING AND STRAIN RATE IN THE TIMAN PECHORA BASIN AND ADJACENT CONTINENTAL SHELF

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A database consisting of 129 stratigraphic sections from the Timan Pechora Basin and adjacent continental shelf have been analysed in this study. We are primarily concerned with calculating the subsidence of this region and observing how well theoretical ideas about the formation of extensional sedimentary basins can be applied to this region.

The stratigraphic sections are "backstripped" and the water-loaded subsidence calculated. The novel feature of this work is that geophysical inverse theory has been used to model the water-loaded subsidence data. This approach is completely automatic and does not require any prior knowledge of either the duration of rifting or the number of rift periods. Instead, we determine the distribution of strain rate over geological time that is needed to fit the observed subsidence in a least-squares sense. Both stretching factors and heat flow histories can be directly calculated from the strain rate distribution.

Our modelling shows an excellent fit between theory and the calculated water-loaded subsidence data. The results of this study demonstrate that the Timan Pechora Basin has undergone at least four phases of lithospheric extension during the Phanerozoic, all related to low beta factors (1.05-1.40). In addition, the subsidence modelling confirms that, on the eastern margin of the basin, foreland basin formation, associated with the Uralian Orogeny, was initiated in Permo-Triassic times in this region.

INFLUENCE OF TALAS-FERGANA SHEAR DEVELOPMENT AT THE ARCHITECTURE OF FERGANA INTERMOUNTANE DEPRESSION

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Formation of the Fergana intermountain depression was completely influenced by geodynamic processes within the Late Paleozoic Central Asia belt and within the Mesozoic-Cenozoic Alpian-Himalayan belt. This influence was expressed as four-fazes shear deformations along Talas-Fergana fault and counter clockwise rotation of Fergana block.

The first phase (Pest-Early-Permian) was connected with the Late Hercynian collision (Southern Tyan-Shan), which caused the Fergana block rotation counter clockwise hand at 12-14°, and dextral strike-slip displacements along the Talas-Fergana fault at 100-120 km and deformation in the Fergana sigmoid. The second phase was caused by the Early Kimmerian collision (Gindukush, Vanch-Tanymass zone, Kun'-Lun), leading to shear-spreading (20-30 km) along Talas-Fergana fault and formation of East-Fergana pull-apart structure. At the same time some horst-graben and intergraben zones (depressions of 40 latitude) and near-fault asymmetrical zones of subsidence (Central and Southern Fergana) were formed within the Fergana basin. The late Kimmerian (third phase) collision (the system Varas, Rushansk-Pshart zone, Banggong) led to the next rotation of Fergana block counter clockwise at 7-8° and shear-compression (20-30 km) along Talas-Fergana fault. It caused transformation of the East-Fergana spreading zone into the area of intra-plate folding. The final Oligocene-Anthropogene faze was caused by great collisional processes between Eurasian and Indian plates. They resulted in large-scale compression of Fergana block, its clockwise rotation at 9-10° and shear along Talas-Fergana fault at 50-60 km.

All the described deformations were probably compensated by Chatkal thrusting at Kurama and Chatkal megasheet formation (thrust amplitude is about 30-50 km). The Principle difference of

1 sm/year in recent volcanic belts. Along their trends regimes of extension and compression interchange, as it is typical for transform faults. Transversal zones are often long-living. It is proved by inherited endogenic anomalies as well as by localization of ore deposits of various age.

Problems of interaction of movements along transversal zones with processes at edges of lithosphere plates need special thorough investigations.

HALOGEN FORMATIONS AS PALEOGEODYNAMIC INDICATORS

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Analysis of paleotectonic position of halogen formations performed on a base of notions of plate tectonics showed distinct preference of their location in regard to geodynamic regimes, types of crust, specific character of settings and stages of development. Analysis was made on a base of specially developed geodynamic classification and took into account material for all halogen formations of the former USSR as well as the most important foreign formations and data on the present-day halogenesis.

Dependence of composition, structure and distribution of halogen formations in space and time on paleogeodynamic events and settings was established.

Characteristics of the formations of various geodynamic types are systematized. Groups of the most important for purposes of the paleogeodynamic analysis features are distinguished: 1. petrologic (including composition of halogen and non-halogen components); 2. structural-morphological (thickness, nature of occurrence, shape in plan and in section, zoning, polarity, etc.); 3. spatial (position in vertical and lateral rows); 4. paleolandscape; 5, paleoendogenic.

Determined patterns open up possibilities for solving various paleogeodynamic problems associated with diagnostics and reconstruction of paleosettings, such as: 1. reconstruction of general paleokinematic situation (relationship between plates and their fragments, time and succession of their rupture or convergence, former spatial associations between blocks, "sources of supply" of allogenic blocks, etc.); 2. recognition of particular paleogeodynamic settings; 3. determination of stratigraphical levels and phases of tectonic events; 4. evaluation of some endogeny showing orientation of stress, types of crust, seismicity, etc. in the paleobasins and their margins; 5. reconstruction of facial zoning of paleobasins, trend of their evolution; 6. evaluation of the character of tectonic regime after generation of halogen formations.

HOT SPOTS ACTIVITY AND THE AND THE BREAK-UP OF PANGEA

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The Mesozoic and Cenozoic positions of the continents that had formed Pangea in the Triassic-Jurassic were derived from paleomagnetic and intraplate volcanic data, paleoclimatic observations such as reef and fossil flora distribution, and geological observations. Major hot spots helped to determine the longitudinal position of Pangea and to construct a model of plate motion during the Pangean break-up. The position of the northern part of Pangea was constrained using Iceland and Jan Mayen hot spots. The Iceland hot spot was tracked from its present day position to Greenland in the Paleocene, to Baffin Bay in the Late Cretaceous, to the Alpha Ridge in the Early Cretaceous, to the Chukchi Borderland in the Middle-Late Jurassic, to the Yenisei-Khatanga Trough in the Late Triassic, and to West Siberia in the Early Triassic. The hot spot activity is expressed by Eastern and Western Greenland volcanics, the Siberian trap basalts, and perhaps by Alpha Ridge and Chukchi Borderland volcanics. The Chukchi Borderland volcanics are related to the early stage of opening of the Canadian Basin. The position of the southern part of Pangea was constrained using the Bouvet hot spot. This hot spot was tracked from its present day position to Western Antarctica in the Early Cretaceous-Late Jurassic, and to South Africa in the Early Jurassic-Late Triassic. This hot spot activity produced the Ferrar and Karoo volcanics.

The model of plate motion obtained agrees with other data on intraplate volcanics which are also related to hot spots. At the time of the opening of the Central Atlantic, the Cape Verde and Canary Island hot spots were located along the ocean's spreading axis. In the same way, the Jebel Mara hot spot may have influenced the opening of the Eastern Mediterranean and produced the Erasthothene Plateau. The Rhine Graben hot spot may have been located at the rifting axis in the North Sea, and the Tibesti hot spot at the rifting axis in the Ligurian Ocean. The contribution of hot spots to the opening of the South Atlantic and Indian oceans has already been discussed by Miller (1993)

RIPHEAN INTRAPLATE RIFTING IN THE THREE-SEGMENT EAST EUROPEAN CRATON

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Three principal crustal segments of the East European Craton (Fennoscandia, Volgo-Uralia, and Sarmatia) having different and once independent Archaen and Paleoproterozoic history are separated by the Meso- to Neoproterozoic (Riphean) transcratonic rift systems which follow pre-existing Proterozoic sutures.

The Central Russian rift System continuing to the south-west in the Volhyn-Orcha depression separates the Fennoscanddian Crustal Segment from the other two segments all the way from Timan to the Trans-European Suture Zone. The Pachelma (also Moscou-Ryazan-Saratov) System indicates the boundary between Volgo-Uralia and Sarmatia.

The transcratonic rift system occur within wide zones of strike-slip faulting and interaction between the three segments. While the Central Russian System exhibits the development during dextral strike-slip movements and motions of Fennoscandia to the present north-east, the Pachelma rift pattern indicates sinistral sense of movements and motion of Sarmatia to the south-south-east.

Totally, the relative motion of the three crustal segments could result in the wide Volhyn-Orsha extension, more probably in the period between 1.4 and 1.2 Ga.

USAGE OF COMPUTER MODELLING DATA IN THE ANALYSIS OF HISTORY OF TRIASSIC SEDIMENTATION IN THE EASTERN PART OF THE SCYTHIAN PLATFORM.

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The backstripping-analysis tecnique realised by the set of programs "SEDIM", wich were carried out in the Laboratory of geology and modelling of sedimentary basins in Geologic Department of the Lomomosov MSU was used in analysis of Triassic history of the region. The procedure of summation and calculation of average,maximal and minimal rates of basement subsidence, its tectonic component and the velocity of sedimentation was used to indicate and generalise the results of modelling of all the observed wells. The modelling was based on the data on 25 deep wells drilled in the Eastern Forecaucasus.

The used method gave the opportunity to distinguish some peculiarities of the regional history unknown before and to get some quantitative characteristics of tectogenesis and sedimentation. The application of backstripping and calculation of initial thicknesses of decompressed Triassic sediments has let to establish the original rates of sedimentation and erosion. Estimations show the difference of the rates calculated from the recent thicknesses without taking decompaction into account from those with decompaction correction by 30 percent reduction. The histograms compiled for three parameters show the major appropriatenesses of the development of the region during Triassic.

Five distinct stages are obvious in Triassic history of the Eastern Forecaucasus. The first stage includes Indian and Olenekian and is characterised by high tectonic activity wich was the greatest one in Olenekian age during the accumulation of Neftekumsk, Kultay and Demyansk Formations.

The rates of basement subsidence differed in diverse areas significantly from few tens metres to 1800 m/mln.y. The average values have much less variations. Thus since earlymost Triassic the subsidence velocity increased gently from 130-150 m/mln.y. to 360 m/mln.y. in the end of Olenekian. The appropiate growth of sedimentational rate to 380 m/mln.y. can be marked. The second stage is defined by decreasing of tectonic activity and sharp slowing down of downwards movements. At the same time some local regions suffered uplifting. This stage covers the Anisian and Ladinian ages. In Kizlyar time (Anisian) the average rates of subsidence reduced to 30 m/mln.y. Nevertheless some wells show the velocities up to 270 m/mln.y. During the Plavny time (Ladinian) dying down of basement subsidence went on to 20 m/mln.y. (max. 130). Uplift movements were taking place during that time and their rates were up to 70 m/mln.y. The third stage includes Carnian and partially Norian ages. That was time of relatively gentle tectonics. The average rates of the basement subsidence did not exceed 10-15 m/mln.y. The fourth stage is defined by the new splash of tectonic activity and it falls into Nogay time (Late Norian). The rapid increase of basement subsidence and sedimentation rates is registered, up to 90 and 130 m/mln.y. by maximum. The fifth stage began in Rhattian. That was the period of attenuating tectonic activity. Rates of subsidence and sedimentation were about 20-30 m/mln.y.

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THE STRUCTURAL EVOLUTION THE EASTERN PART OF KOLYMA NOOSE

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Kolyma Noose is the largest structural part of the Verkhoyansk - Kolyma Mesozoic fold area. According to geological and palaeomagnetic data the change of the eastern part of the structural axis is a result of Mesozoic evolution of region.

The marginal continental blocks are separated from Siberia during Upper Paleozoic, Triassic and Lower Jurassic by continental rifting and formed the liner structure (Prikolim, Omuliovka, Omolon etc.). The subduction under this structure was from side of Protoanui ocean. The large structural transformation took place during Middle Jurassic along the continent-ocean border. It was accompanied by ophiolite obduction on the marginal blocks, olistostrome and regional unconformities. The Uyandin-Yasatchny suprasubduction belt with subduction zone from oceanic side was formed during Upper Jurassic.

The left-strike shear zones was formed (remobilisated) along the border of Siberia and marginal blocks during Middle Jurassic and Upper Triassic - Lower Cretaceous. This shear zones modified the early liner structure of continental margin. The some of marginal blocks were exposed to anticlockwise rotation. The subduction zone forming from Palaeopacific side under the Omolon margin was the cause of this phenomena. This subduction zone put on the southern direction of Omolon motion relatively to Siberia (palaeomagnetic data from Mesozoic sedimentary rocks). The right-strike shear zones were formed in this time on the Palaeopacific Omolon margin. The Chukchi and Siberia collision during Lower Cretaceous modified the eastern part of Kolyma Noose structure. The absolute amplitude of Omolon and Prikolym blocks lateral motion during Upper Jurassic - Lower Cretaceous was near 500 km.

Thus the eastern part of Kolyma Noose structure consist of continental blocks of Siberian origin. This blocks moved during Upper Mesozoic along the edge of Siberia for a short distance.

GEODYNAMIC DEVELOPMENT OF THE NORTHERN PART OF THE PALEOASIAN OCEAN

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1. For the development of geodynamic model of the northern part of the Paleoasian ocean during the Paleozoic (the territory of Western Siberia) a complex geological-geophysical interpretations were carried, including data of deep drilling (over 3000 wells), characteristics of abnormal magnetic and gravimetric fields, data of seismic surveys - deep seismic sounding, method of common depth point, and space-born images. Features of geodynamic development of surrounding territories, revealed at compiling of the Atlas of Paleogeographical Maps of North Eurasia were considered in the model.

2. In the basement of West Siberian sedimentary basin the main structural units are distinguished:

a) Continents and microcontinents with pre-Paleozoic continental crust and passive margins, distributed tectonically to various degrees;

b) Folded systems, consisting of paleo-oceanic and paleo-island arc complexes, indicating branches of Paleoasian ocean, closed at diverse time intervals, and overthrusted over adjacent parts of continents and microcontinents;

c) Fragments of the Paleoasian ocean relics, separated in the process of general collision in a form of "windows" of non-granitic crust, and deeply buried under Paleozoc deposits.

3. In the east of Western Siberia a wide band of Paleozoic passive margin of the Siberian continent was detected, with consolidated crust 34-38 km thick, covered by a pre-Mesozoic carbonate-terrigenous cover 2-5 km thick.

4. Vartovsky and Nyurolsky (Tomsky) microcontinents are situated in the centre of Western Siberia, separated by the Koltogorsky rift, and having appreciably different corresponding characteristics: thickness of the consolidated crust 34-36 km and 30-34 km, thickness of the pre-Mesozoic sedimentary cover 1-2 and 4-5 km, terrigenous in the first case and calcareous in the second.

5. In the west of Western Siberia the Trans-Uralian band of microcontinents and terranes (Baidaratsky, Khanty-Mansi, East Uralian) with the consolidated crust 32-44 km thick is distinguished, serving in many cases as nucleuses of island arcs of the Uralian branch of Paleoasian ocean.

6. A special interest presents the Ob-Zaisan-Salym branch of the paleocean, on the northern extension of which the Yamal-Gydan non-granitic "window" is situated, where the thickness of consolidated crust does not exceed 22-30 km, with the thickness of pre-Mesozoic deposits up to 8-12 km. We consider this branch as the central branch of the Paleoasian ocean.

7. The closing of the northern part of the Paleoasian ocean occurred at displacement to the east (in the former coordinates - to the north) of the East European continent. The major role was played by shift dislocations, caused by the turn of the Siberian continent clockwise and motion of the Kazakhstan continent from the south (in the former coordinates - from the east). The last pulse of this process is related to the Permian/Triassic boundary, when antivergent dynamic pare of cover-folded zones (Novozemalskaya and Tom-Kolyvanskaya), relying on the left-hand Paikhoi-Ob shift zone, was formed.

The process of the Paleoasian ocean closing is illustrated by the palinspastic schemes.

COLLISION OF OCEANIC PLATEAUS WITH ISLAND ARCS

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Collision of oceanic volcanic plateaus with island arcs takes place in modern geodynamic environment and is well documented in the geological past. In this connection, the study of this phenomenon is a subject of much current interest. Accretion of oceanic volcanic plateaus to outer parts of island arcs is usually a result of subduction of oceanic plates which cary volcanic plateaus. More rarely it occurs due to transform motion.

Commonly, deep trenches which coincide with zones of subduction under island arcs are poorly filled with sediments as compared to trenches along active continental margins. As a consequence, collision of volcanic oceanic plateaus with island arcs proceeds in most cases instanly, without a buffer interaction with the trench sediments. Therefore this type of accretion is called instant. It takes place when major blocks composed of massive volcanics approach. The inner structure of such accreted wedges is characterized by overthrusts and nappes which separate different volcanic orogenic areas, intermontane basins, and erosion and deposition land surfaces. Oceanic plateau and volcanic island elevation were determined from DSDP-ODP data, or from subsidence histories based on crustal age. The global distribution of Campanian soil texture have been estimated from a simple-soil texture model, based on the lithology of parent material, elevation and tectonic stability of the land surface in each 2x2 grid cell, and a general estimate of the local Campanian climate. The Campanian climatology applied to the soil texture model was derived from a prior climate simulation using an intermediate soil texture value globally. The global distribution of Campanian vegetation has been simulate by an Equilibrium Vegetation Ecology (EVE) model. EVE, an interactive component of GENESIS designed to test the effects of changing climate on the distribution of the Late Cretaceous vegetation in response to the model simulated Campanian climate.

The climate of the Campanian has been simulated using the GENESIS (Global ENvironmental and Ecological Simulation of Interactive Systems) climate model, developed by the Interdisciplinary Climate Systems section of the Climate and Global Dynamics Division at NCAR (National Centre for Atmospheric Research, Boulder CO, USA). GENESIS is a comprehensive earth system model, requiring the reconstruction of high resolution solid-earth boundary conditions as input for paleoclimate simulation. Boundary condition data define certain prescribed global fields such as topography, distribution land-sea-ice sheet, gravity wave drag roughness, soil texture, vegetation, and ocean heat flux. Sensitivity tests have shown that climate model simulation results are sensitive to changes in these boundary conditions.

THE PASSIVE MARGIN OF THE DZABKHAN MASSIF IN MONGOLIA

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A number of ancient massifs is reconstructed for Vendian-Middle Cambrian in Mongolian Caledonides: the Tuva-Mongolian, Dzabkhan, Central-Mongolian massifs. They were separated from the Paleoasian Ocean by active margins (Zonenshain L.P., 1972; Dergunov A.B., 1989; Mossakovsky A.A. et al., 1993). An exemption is the eastern passive margin of the Dzabkhan massif (the Baidarak lifted block), which is limited by the Bayankhongor tectonic zone. It is assumed that the zone of spreading was located to the West and South of this massif (in modern coordinates). Transform faults are passing along its eastern margin in the same way as the transform faults of the modern East-African margin. Probably the development of transforms during the Vendian-Cambrian has resulted in the absence of subduction and favoured the formation of a passive margin. Transforms affecting this margin brought about continental rifting, represented by Vendian- Lower Cambrian subaerial picritic basalts, redeposited rhyolite tuffs with dolomites and cherts, containing sponge spicules (Sharausgol zone).

The Bayankhongor ophiolites are represented as a suture between Baidarak block and Shatausgol zone. There are two associations in this zone: The Tsagannur association - ultrabasites, layered gabbroides, sheeted dykes dolerites and tholeiite basaltoides; their petrochemistry and rare-earth elements distribution being similar to those of the MORB. The Khairkhan association - basic tholeiite and subalkaline volcanics with small amount of acid and intermediate rocks, without sheeted dyke complex. This association is similar to that of the MOR islands. The Sm-Nd dating of gabbroides gives us 569±21 Ma, which confirms that the time of spreading corresponds to Earliest Cambrian (Kepezhmskas P.K. et al., 1991). The pillow lavas limestone cement in Tsaganur association contains sponge spicules. Both associations are conformably overlapped by Lower-Middle Cambrian graywackes.

The Archean-Early Proterozoic metamorphic rocks of the Dzabkhan massif basement (Baidarak lifted block) are overlapped by arkose and dolomite with Lower-Middle Riphean stromatolites. Upwards the section carbonaceous slates, polimictic sandstones and carbonate rocks are predominant. Thick layers of dolomite with R_3 stromatolites complete the section. This section is overlapped with structural unconformity by Vendian -Lower-Middle Cambrian basal conglomerates, followed upward by aleurolites with horizons and beds of oncolite limestones, aphyric basalts and many dolerite sills. The limestones of the upper part of section contain brachiopodes Acrotretidae. This suite was probably formed simultaneously with the Bayankhongor basin opening and accumulation of the gray wackes.

To the East from Sharausgol zone, which was a sialic block within paleoocean a thick series of Middle-Upper Cambrian turbidites (Dzagin suite) has a wide-spread occurrence. This series consists of rhythmically interbedded oligomict sandstones (quartz, feldspar) and aleurolites, overlaps the rocks of the Sharausgol zone. In the Caledonides of West Mongolia and Altai-Sayan region - the Gornoaltai series is represented by analogous turbidites. This indicates that in Middle-Upper Cambrian within the Western and Central Mongolian Caledonides paleotectonic conditions were similar. Possibly at that time a collision occurred between the ancient massifs and the Siberian paleocontinent. The sialic clastic sediments (turbidites) were transported from the uplifted continental margin and deposited in a canyon-fan system at the foot of the massifs slope.

THE VILUY-MARKHA DYKE BELT INNER-STRUCTURE - THE INDICATER OF THE MIDDLE PALEOZOIC PARTOM-VILUY RIFT GEODINAMIC EVOLUTION (SIBERIAN PLATE)

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The Viluy-Markha Belt is one of the most important elements of the Partom-Viluy paleorift. On the basis of generalization and systematization of the large-scale aeromagnetic survey data the detailed map of dyke propagation within the whole area of the Belt including its re-coverd part has been worked out. The Belt extends for more than 850 km from SSW to NNE. Its width varies from 60 to 200 km. The Dyke Belt includes more than 1500 elementary bodies. The extensity of these bodies varies from 1-3 km to 50-80 km. Dyke swarms of the Viluy-Markha Belt are forming into groups of systems of definite morphological and spatial features. The four Major Dyke Systems determined the Belt appearance and connected it in a single whole are distinguished. These are extensive, distinot totalities consisting of the large linear constructions. The latter are represented by the files or by "en echelon" of relatively massive extensive dykes. Side by side with the Major Systems the Acoompanying Systems are distinguished. The latter ones have relatively local propagation and as a rule look like as the totality of uncoordinated relatively small fields. The mutual arragment of the Major and the Accompanying Systems reflecting the paleorift relieving of geodynamic stress nature shows the maine tendention of rifting evolution.

On the base of the inner-structure study of the Viluy-Markha Belt geodynamic regimes of the Dyke Belt formations the models of dyke emplacement mechanism and the dynamics of midcontinental rifting are traced.

Due to the preserved structure of the Dyke Belt and the rift producing it, the Belt is an ideal object for wide range circle of fundamental problems to be solved.

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THE ROLE OF INTRAPLATE STRESSES IN THE EVOLUTION OF THE SEDIMENTARY BASINS OF RUSSIAN PLATFORM: COMPUTER MODELLING APPROACH

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Sedimentary Basin Geology and Modelling Lab., Moscow University The burial history analysis of the Russian Platform sedimentary basins shows two different styles of tectonic activity during the time: stages with high rates of basin subsidence and uplifting of adjacent areas and stages of slow subsidence of the entire region. Some of these events were controlled by the lithospheric extension, another didn't associated with the rifting.

The Dnieper-Donets Basin (DDB) is considered as a sample. The model of the thermal lithosphere relaxation after the Late Devonian rifting don't explain the Late Carboniferous subsidence pattern. MacKenzie model predicts the abrupt subsidence during the rifting caused by the lithospheric extension and the composed exponentially reduced subsidence later caused by the contraction of the lithosphere. Such subsidence pattern is observed in Late Devonian - Early Carboniferous, but the Late Carboniferous one is characterized by the high tectnonic subsidence rates. Simultaneously Ukranian Shield and Voronezh High areas uplifted. The theoretical width of the postrift basin is about 600 km, but the actual one is twice as lesser. The rifting manifestation such as volcanism are absent.

The supposed cause of such events is the lithosphere buckling caused by the intraplate stresses. The indirect evidence is the accordance between the width of structures with the halfwavelength of the lithosphere buckling.

Three numerical models were constructed in order to examine this asumption. The first model models the burial and thermal history of the DDB inthe Devonian-Carboniferous. The lithospheric extension, thermal expansion during the rifting and contraction after that were taken into account. Tectonic subsidence from the thermal model was compared with the backstripped one. The excess of the subsidence, which hasn't the explanation in this model, was obtained from the comparison.

The second model determined the lithospheric flexure controlled by the longitudinal compressional stresses. The rheology of the lithosphere was estimated on the base of the thermal model. The calculated shape of the lithosphere was correlated with the observations. The correlation shows the good agreement between the modelled and observed parameters (such as widths of structures, values and relations of subsidense/uplifting).

The third model determined the distribution of the sresses in the entire platform caused by the boundary forces. The boundary conditions were choosed on the base of geological data. It is shown, the fold axes are nearly orthogonal to the sress lines.

So, computer modellig shows, the integrated model, considered lithospheric extension, thermal relaxation and bucklig caused by the intraplate stresses, give a satisfactory explanation of the burial history of the Russian Platform large structures in the Devonian-Carboniferous.

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THE HISTORY OF THE NEOCOMAIN-TURONIAN ACTIVE CONTINRENTAL MARGINS OF THE EARTH

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The scenario of the Earth active continental margin evolution is reconstructed here for Neocomian - Turonian times when pulsatory alternating magmatic and orogenic events occurred. Jurassic - Neocomian times were distinguished by the combinated development of the continental marginal volcanic belts (with extensional conditions in back-arc domains) and island arcs located near continents.

In the Late Neocomian - Early Albian the Middle Cretaceous global orogeny took place which resulted in almost complete extinction of subduction processes within the continent-ocean transition zone and disappearance of the related perioceanic island-arcs and continental marginal volcanic belts simultaneously in obduction of island-arc, back-arc, and oceanic complexes together with rock assemblages of microcontinents over continents took place. The Middle Cretaceous hypercollision was caused by a sharp increase in the spreading rate and origination of new mid-ocean ridges (MOR) followed by an increase in the rate of convergence of oceanic and continental plates. Compensating rims of thrusted terranes around continents were formed at continental margins in the Late Neocomian - Aptian under the strong compression regime.

In Albian - Turonian times these compression initiated accelerated subduction of oceanic plates under continents and the origin of new convergent plate boundaries with an extended system of continental marginal volcanic belts having no analogues in the Mesozoic and Cenozoic.

The peculiar events of the Middle Cretaceous history at active continental margins occurred in response to sharp intensification of endogenous activity of the Earth and can be correlated to simultaneous events such as the rearrangement of MOR, fast growth of the oceanic crust, peak activity of within-plate magmatism, and prolonged lack of the Earth magnetic inversion.

PROBLEMS OF INTRAPLATE TECTONICS. AN EXAMPLE OF PRINCIPAL UNSOLVED PROBLEMS FOR AN AREA OF THE FORMER USSR AND FOR MANY OTHER LARGE INTRACONTINENTAL COUNTRIES OF THE WORLD

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1. For the most part the papers concerning the development or the Theory of Tectonics of Lithospheric plates (TTLP) deal with margins of lithospheric plates themselves of with oceanic areas as the objects of research although the most part of the countries and of the industrial regions is situated within parts of lithospheric plates.

2. The development of TTLP as applied to intraplate conditions (including processes, mechanisms, models and adaptation to nonalternative geotectonic conceptions such as ones connected with rotation of the Earth.

3. Constructing the theory it is necessary to take into account the common lows of synenergetics, adapting them to the specific features of the development of the Earth.

4. In the connection with the absence of such typical plate tectonic processes as spreading, subduction, and so on in the intraplate surroundings it is necessary, dealing with these areas of lithospheric plates, to pay a specific attention both to studying of shear mechanisms and formation of structures constrained from conception of regmagenesis.

5. The rotogenesis, upper mantle convection, and synergetic models and mechanisms can provide a clue to research these processes.

6. The methods of indication of deep geodynamic processes and problems of geodynamics of preplatform stages of the development are of special importance for exploration of these areas.

7. The investigation of geodynamic surroundings for intraplate areas helps to forecast regional and local significance of these ones and to do it in the shortest and the most efficient way.

EVOLUTION OF THE NORTH-WESTERN PART OF THE EAST-EUROPEAN PLATFORM

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1. This structure was formed during several stages and every stage reveals its own tectonic "style". In the Catarchean-Early Archean time the so-called "granite domes" and "granite-greenstone areas" were formed under effect of convection and following the synenergetics laws, those made up the "cores" of the protolthospheric plates, i.e. "lithoplinths". Their relics are recorded within the limits of the Kola and Karelian lithoplinths.

2. Mechanisms of plate tectonics seem to have started as early as in Archean. The White Sea paleoocean was generated under their effects. The second half of Archean s typified by a general compression and by commonly occurring collision accompanied by formation of overthrust structures and of obduction of the oceanic crust over the continent (the Kolmozero-Voron'ya zone).

3. In the Sumian-Sariolian time the subduction of the oceanic portion of the Karelian lithospheric plate under the Kola lithospheric plate had been taking place. In the inner portions of the converging plates the continental rift genesis s recorded (the East-Karelian, Imandra-Varzuga zones, etc.).

4. The intraplate geodynamic surroundings with formation of terrigenous strata and of structures of the amphiclise type are related with Jatulian stage of the region evolution.

5. The Convergence of the Svekophenian and Karelian - Kola lithospheric plates was the principal event of the Karelian-Vepsian time. Subduction of the Svekophenian plate occurred in company with the "overjumping" and formation of daughter" zones. At that time a complex of alkaline granites and syenites was formed in the centre of the Kola peninsula. The intrusive traps of Karelia (the Obonezh'ye area) answer the final stage of this time.

GEOLOGICAL BOUNDARIES AS REFLECTION OF TECTONIC EVENTS (ON THE EXAMPLE OF VCM - VORONEZH ANTECLISE)

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Two types of boundaries in the history of development of VCM are distinguished. The indicate on change of tectonic conditions of its development. For Precambrian this manifests in granitoidic magmatism accompanied by Wilson cycles and satisfying as a rule the subduction conditions and subsequent collision. For VCM at least three "granitoidic" boundaries are distinguished: Saltykovskiy (3000 mln. years), Atamanovskiy (2500 mln. years) and Bobrovskiy (2100-2000 Ma). The final (3-rd) boundary perfectly coordinates with the collision model at the end of early Proterozoic. The first and the second ones traditionally considered as the result of "intracraton orogeny" are probably the result of plate terrain interaction in Late Archaean.

For sedimentary cover the interruption in sedimentation is the evidence of great tectonic events. They are characterized by arch elevation formation with archogenic regime, by developed weathering crust formation, by lava effusion in zones of spreading and strengthening of hydrothermal activity.

In Riphean-Baikal stage the isolating of future Voronezh anteclise geoblock took place. In Caledonian stage this geoblock was the area of steady elevation and denudation. In Paleozoic history of VCM connected with the Hercyne stage a number of boundaries of radical reconstruction of structural plan (from monocline to arch elevation with Mamon riftogenic structure) and the final formation of Voronezh anteclise are clearly distinguished. One more reconstruction of structural plan is connected with the beginning of Alpian stage. Neotectonic stage of development from the methodological point of view has specific significance-there is the opportunity of typization and ranging of fold and fault structures, revealing the mechanism of their formation and evolution from the point of view of membrane tectonics. Geodynamic model of neotectonic stage can be used for decoding tectonic structures and processes of older stages.

RIPHEAN-PALEOZOIC RIFT AND INVERSION EPOCHS IN THE HISTORY OF THE EAST EUROPEAN CRATON

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Early Riphean rift epoch. Origin of the rift system along the eastern margin of the East European Craton (Kama-Belaya passive margin, Abdulinsky rift, Pachelma rift). The rifting was related to the opening of the ocean to the east of craton. Inversion tectonics at the end of Early Riphean.

Middle Riphean rift epoch. Origin of the Middle Russian rift system (Volyn-Orsha-Valday-Bologoevo-Soligalich-Kotlas rift belt) and Mezen-Timan rift system. The rifting was related to the hypothetical opening of the ocean basins (Timan and Polish paleooceans). Inversion tectonics at the end of the Middle Riphean.

Late Riphean rift epoch. Origin of the rift system at the eastern part of the East European Craton and regeneration of some paleorifts (White Sea rifts, Timan-Vyatka-Kama-Belaya-Abdulinsky rift system, Pachelma rift system, Moscow grabens). The rifting was related to the hypothetical opening of the Timan-Ural ocean basin. Inversion tectonics at the end of the Late Riphean.

Early Vendian rift epoch. Weak regeneration of some paleorifts (Volyn-Orsha-Pachelma belt), formation of the Volyn flood basalt province. The rifting was related to the hypothetical origin of the Tornquist paleo-ocean. The rifting was followed by Late Vendian - early Early Cambrian postrift subsidence ended by inversion tectonics.

Early Paleozoic rift epoch. Three rift systems originated during the Early Paleozoic: Baltic rift belt, Pechora rift system and Peri-Caspian rift system. The rifting was governed by Paleo-Ural ocean opening and Tornquist ocean evolution. The rift phase ended by Caledonian inversion tectonics.

Middle-Late Devonian rift epoch. A large rift system originated along the eastern margin of the East European Craton (paleocontinent) during the Middle-Late Devonian. It includes Pripyat-Dnieper-Donets-Karpinsky rift belt, the Peri-Caspian rift system (including Don-Medveditsa, Samara and Buzuluksky rifts), the Timan-Pechora-East Barents Sea rift system, Kola-White Sea rift-magmatic-kimberlite province, reactivated Riphean Soligalich and Vyatka paleorifts. The rifting was accompanided by numerous magmatic events in different parts of east European paleocontinent. The Middle-Late Devonian rifting was governed by a proposed change of subduction systems in Paleo-Ural ocean to the east and Paleo-Scythian ocean to the south. The rifting led to local ocean crust spreading in the Peri-Caspian and East-Barents Sea basins, and induced large scale postrift subsidence in the eastern part of the East European paleocontinent.

Permian/Triassic boundary rift epoch. At the Permian/Triassic boundary tension event took place inside the Craton. A few former rifted basins underwent weak rifting and basaltic magmatism.

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GEOLOGICAL HISTORY OF BARENTS SEA REGION ACCORDING TO DATA OF COMPUTER MODELLING.

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Computer modelling of processes of geological development of Barents Sea region was carried out on the base of data on wells (1-D models) and seismic profiles (2-D models). The following stages are distinguished in geological history of Barents Sea according to computer modelling and geologic data:

1. Cambrian(?)-Silurian stage. That was the stage of shallow marine carbonate platform.

2. Devonian stage wich includes two substages: Early-Middle Devonian and Late Devonian. Rift troughs of Spitsbergen, Norwegian part of Barents Sea and Pechora originated during the first substage. The main rift structure of Barents Sea - the East Barents Sea depression established in the second substage. Continental crust was thinned and partially destroyed the same time.

3. Carboniferous -Early Permian stage. That time in marginal areas shallow-marine platform existed and deep-water sediments of non-compensated basin accumulated in the depression.

4. Late Permian - Early Triassic stage of "avalanche" sedimentation. East Baren

3. Carboniferous -Early Permian stage. That time in marginal areas shallow-marine platform existed and deep-water sediments of non-compensated basin accumulated in the depression.

4. Late Permian - Early Triassic stage of "avalanche" sedimentation. East Barents Sea trough was filled by clinoform complexes that time. A tectonic event took place at the boundary of permian and Triassic wich expressed in 500 m subsidence of the trough already filled by Upper Permian sediments.

5. Middle Triassic - Late Triassic stage was marked by gentle tectonics and terrigeneous sedimentation.

6. Late Jurassic stage caused 200 m deepening of the depression wich was filled again by Neocomian clinoform complexes.

7. Postneocomian stage of the shelf platform was defined by clayey sedimentation.

8. Postcretaceous stage. Uplifting of the territory Barents Sea and erosion with its maximum in Oligocene took place.

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