**T42A-02 1050h**

**Depth of the tectosphere beneath Kaapvaal craton**

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T42A-03 1105h

T42A-02 1050h

lies since major compositional (e.g.,

gested that on seismic velocities and (2) the poor depth resolution

vaal Seismic Array and found a systematic difference

is between with the results of geodynamical modeling, allows us to

dimensional velocity reference models. The resulting

ations in reflectivity. These may be revealing thick-

pre-stack and post-stack data to better map local vari-

tics using amplitude analyses and attributes on both

T42A-04 1120h

3-D Imaging of the Precambrian Winagami Sill Complex in

Continental Rebar Revealed?

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The Winagami sill complex, discovered by Litho-

pe's CAT-94 and PRAISE-95 multichannel seismic reflection experiments during the Pale-

otroperic into the crystalline basement underlying the

Western Canada Sedimentary Basin of northwest-

ern Alberta, Canada. Spanning an area of at least

120,000 km², the extent of this upper crustal feature is comparable to large Phanerzoic igneous provinces.

The intrusion of such sill complexes has been inter-

preted as a fundamental stage in the process of cra-

tonization and a key to the strength of cratonic blocks.

The very presence of such structures in southwestern, and also southwestern, Alberta may have contributed to the development of cratonic arcs along the ancient

rifted margin of North America which significantly im-

pacted regional depositional environments. Using a 3-D seismic reflection dataset collected for exploration pur-

pose by the Canadian petroleum industry that probed
to depths of approximately 15 km, we have undertaken 3-D investigation of the Winagami sills. We use

classic receiver functions with common-conversion-point gather-
ging and processing techniques to isolate the high-

sensitivity, major, and multiple multiples. The

The resulting images consistently show a flat, 410-km
discontinuity beneath the craton, which is consistent with the results of geodynamical modeling, allows us to place limits on the thickness of the tectosphere, which is between ~160 and ~370 km.

**T42A-05 1135h**

**Relict Slabs Within the Roots of the Slave and Superior Provinces Observed Using Deep-Looking Magnetotellurics**

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Important clues to the ancient origin of cratonic lithosphere can be found with deep-look magnetotelluric methods. Electrical strike direction observed in the western Superior Province of Canada show a dramatic contrast between crustal fabrics possibly related to Archean subduction. Upper mantle conductors with resistivities > 1000 S/m are notable (for an ordinary py-

erine monomerology dominated upper mantle. Given the depth locations and resolution of such conductors in the lithosphere of the Slave and Superior Provinces are approximately two orders of magnitude higher than petrophysical estimates for the Archean crust, we suggest that such low resistivities are caused by carbon in the form of interconnected graphite. The evidence for deep-seated graphite conductors spatially related to either deep-seated geophysical and geochrono-

mages may be taken together with recent independent esti-

mates that the Earth's mantle has undergone a suite of crustal events to support the concept of a craton end forming and formation of the cratonic root may be related to redox re-

ducting the upper cratonic times and their potential metrical form of these conductors, in addition to other lines of evidence, suggests widespread subduction near the end of the major phase of craton formation.
mean continental thickness have doubled and continental area have halved in the geologic past? I present a first-order model assuming that continental mean height is the steady state height controlled by uplift and erosion. This model predicts that it is more difficult to erode a larger continent. Hence mean continental height and area increases. This prediction is consistent with the general trend between present-day continent elevation and area (except for Antarctica), and can fit the trend well. This is the first time the relationship between continental area and mean elevation is explained.

The model is applied to investigate variations of mean thickness of continents. It is shown that the continental crust mass is increased. Because the mean continental height leads to change in the area of continents, it is predicted that the mean thickness of continents change as the area decreases. Nevertheless, the thickness variation is small, amounts to about 10% from one continent to another. The variation of mean thickness is found to lead to a sea level fluctuation of about 0.3 km, with the lowest sea level in a large continent.

The implications of these numerical results are sufficiently important that they should be verified by different numerical models. If several different models obtain similar results we may be more confident that we are observing an unexpected phenomenon. We have, therefore, employed a two-dimensional purely finite-difference numerical model to test the robustness of the flow reversals reported previously but with different numerical approximations. We find flow reversals also occur in our numerical model with similar parameters to those employed by Lowman et al. We present evidence that this critical parameter range in which flow reversals occur and compare this to previously reported results. Our study provides independent confirmation of the unexpected physical result that internal heating in models with thick surface plates leads naturally to spontaneous flow reversals in two-dimensional flow.

Dynamic Analysis of the Abrupt Motion Change of the Pacific Plate at 43 Ma

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The causes and mechanisms for abrupt changes in tectonic plate motions are important and unresolved issues in geodynamics. We have analyzed the direction change data of the Pacific Plate at 43 Ma using principal axes of angular momentum. With the angular velocity data of the Pacific plate (Koppers et al., EPSL, 185, 2001) and the results of Conocen plate motions (Gordon et al., Geophys. Res. Lett., 1996), we determined the direction and boundary shape of the Pacific plate at 43 Ma. We then deduced the internal tectonic stress that was acting on the Pacific plate, which represents the vector difference between the driving and resisting torques. This provided us with direct constraints on the magnitude of the forcing which may have caused the abrupt motion change of the Pacific plate. Based on our analysis, the change in plate motion at 43 Ma may have been related to a change in the geological setting of the plate. This suggests that this abrupt motion change is a highly constrained dynamic system, driven by changing stress patterns in the underlying, coupled, mantle.

Variation of mean continental elevation with continent and time

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What determines the mean elevation and the extent of plate tectonics? Direct evidence for the lower continental crust volume, what determines the mean thickness (and hence total area) of all continents? Could
and gneisses under greenish to amethystine facies. Thirteen metasedimentary rocks collected from Kosei, Shandan, and Jingyang were studied with petrographic microscopy and were analyzed for major and trace elements. They are characterized by LREE enrichment (106/LChondrite abundance) with negative europium anomalies (Ex/Eu≈2.5-3.7), similar to the post-Archean shales. Besides, their Th/Sr ratios are greater than 3, indicating their 4/3 values are less than -10. These geochemical characteristics indicate that their major sources were supra-crustal continental materials. U-Pb SHRIMP studies on the zircons separated from the greenish facies metagabbros show that the ages of the zircons are mostly scattered around 1.8-2.5Ga. This age may correspond to that of the continent-continent collision event which led to formation of the continental basement in the early Proterozoic time. Besides, based on the above results, it can be concluded that the Alashan microcontinent may have a closer affinity with the Sino-Korean craton than with the Yangtze craton, for the Sino-Korean craton is characterized by a geological event at 1.8Ga, while the Yangtze craton at 2.5Ga. Furthermore, the age of 0.8Ga in their respective tectonic evolutionary histories. Moreover, few zircons are inferred to have a meta- morphic age of about 400Ma from the Pb loss, indicating that the Alashan microcontinent is characterized by a geological event at 1.8Ga, which may correspond to that of the continental basement. This age may be concluded that the Alashan microcontinent may have been reactivated during the late Paleozoic time.

T51A-09 0830h POSTER
Lithosphere Compartments and Their Dynamics on the Romanian Territory. Seismotectonic Consequences
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Various models for plate tectonics on the Romanian territory were constructed mainly based on geological arguments. The papers attempts to outline plate boundaries; their geophysical behavior and the geophysical investigations were used to document a three-plated model for the Romanian margin. As a result, the following observations are indicated: (1) Eastern European Plate (EFP), Mesozoic micro-plate (MP), and Mesozoic micro-plate (MMP) are separated by major contacts: Tornquist-Teisseyre (TTZ) compressional zone, Propoca-Cameno, and the Trans Carpathia transform fault. Past to present dynamics is discussed with emphasis on the consequence of the Black Sea evolution. In Romania it means that crust extension related to the basin opening and the W Black Sea basin opens split the MP into several terranes. After the Black Sea evolution, active rifts in SW Arabian Plate could offer present driving forces on the terranes, which might have taken place in various environments. East Carpathians, crustal extension at the inclined boundary of TTZ and came into an oblique subduction which produces a large block of the lithosphere into an oblique subduction to which peculiarities of volcanic activity are related. (2) Florida Peninsula, from west to east of the Nazca Plate...