

which is solved by utilizing Terzaghi consolidation theory and a finite element method.

Land settlement data were collected over a period of ten years in the Southern regions of Russia and Ukraine. At present the value of subsidence at the Belozersk iron ore deposit has exceeded 2.5 meters. The value of subsidence at the Yakovlevo iron ore deposit has reached 20 cm. Land above the Bolshetokmakske manganese ore deposit subsided by 20 cm due to the water withdrawal and by additional 2 meters due to undermining subsidence.

The land subsidence was monitored with topographic leveling. In situ compaction measurements of reservoir have been made in deep mine shafts (Belozersk iron ore deposit - up to 400 m) and in deep boreholes (Yakovlevo iron ore deposit - 200-300 m). The shaft investigations were based on traditional surveying methods. To make in situ measurements, a new borehole technique has been developed. The technique is based on monitoring the distance between radioactive bullets shot into water-depleted layers and between naturally radioactive layers (clays and shales). Calibration has been made in reference borehole in order to insure the accuracy of measurements made within naturally low radioactive layers and to eliminate errors associated with thermal expansion/contraction and deformations of the cable due to loading.

The largest subsidence occurs at the Belozersk deposit, with an affected area of more than 6 km². We estimated the surface subsidence rate of up to 105 mm per month. The subsidence at the Yakovlevo deposit affected area of about 4 km² with an estimated rate of 50 mm per month. Measurements made in mine shafts and deep wells reveal non-uniform deformation of aquifers up to 40 mm per meter depth. The greatest vertical differential displacement is observed at the boundary between hydraulically non-conductive and water-depleted conductive layers.

Inverse subsidence calculations and predicted values were obtained using Terzaghi consolidation theory and the least square method. Calculated values and field measurements show good agreement. The results from finite element numerical modeling of the response of a porous system to pore pressure changes and matrix deformation matches the observed records satisfactorily.

T72A-07 1330h POSTER

Fluidized Sandstone Intrusions reveal late Miocene (7-9 Ma) Stress Orientations between the San Gregorio and San Andreas Faults, Santa Cruz, CA

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The late Miocene (7-9 Ma) sandstone intrusions northwest of Santa Cruz are the largest subaerial exposures of clastic intrusions on earth. Intrusion types include: sills (least frequent; locally >8m thick, statistically parallel to shallow-dipping bedding), clustered intrusions (mostly <10cm thick, no preferred orientation), and dykes (most frequent, greatest individual and cumulative thickness primarily NE-striking, very steep dipping dykes). One giant dyke is 180m thick. Intrusion injected at a very shallow sediment level and locally extruded onto the ancient seafloor. Multiple intrusive phases occur.

The thickness-weighted plots the poles of 328 intrusions define a girdle indicating a maximum principal stress oriented N32E ~horizontal, a minimum principal stress at 302 ~horizontal and a vertical intermediate principal stress. Simultaneous development of both dykes and sills suggests similar magnitudes of s2 and s3 and may also indicate preferential weakness along bedding planes. Paleomagnetic data suggest that the dykes and inferred stress orientations have not been significantly rotated since formation.

Overall the orientation of the dykes is consistent with formation in a shear couple between the San Gregorio and San Andreas faults. s1 is oriented at about 55° to the San Gregorio fault and about 70° to the San Andreas fault suggesting moderate fault weakness. The observed stress orientations are similar to modern orientations and suggest little variation since 7-9 Ma. Although tectonics control intrusion, the fluid overpressures that drove the fluidized sediments are due to thickness variations in the basin and buoyant low density hydrocarbons.

T72B MC: Hall D Sunday 1330h

Continent-Continent Collisions and Intraplate Deformation II Posters (joint with G, S, V)

Presiding: G Pavlis, Indiana University; F Vernon, University of California, San Diego

T72B-01 1330h POSTER

Timing and Shortening Rates of Hinterland-Vergent Growth Folding and Active Faulting along the SW Margin of the Chinese Tian Shan

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Deformed Neogene - Pleistocene strata and Pleistocene river terraces record hinterland-vergent faulting and folding along the southwestern margin of the Chinese Tian Shan. Preservation of multiple, clearly deformed fluvial terraces and nearly continuous exposure of underlying Neogene sediments reveal the Talanghe, Atushi, Kashi, and Mingyaole *en echelon* anticlines particularly favorable for determining the geometry, style, timing, and rate of shortening within a foreland basin. We mapped the Neogene structures and Pleistocene terrace surfaces along three southeast-flowing rivers across the Boguzi, Baishikeremu, and Kalangouluke anticlines using 1:50,000 scale air photographs and topographic maps. These north-vergent, hindward-propagating structures are best explained by backthrust fault-propagation fold geometries with a gently south-dipping decollement ~8-9 km deep within the basin fill. Progressively deformed strath terraces deform in a manner grossly similar to models that assume kink-band folding. The deformation style ranges from tight folds in the north and west gradually to open box-like folding in the south and east. All of these anticlines are composed of two distinct stratigraphic sequences that are defined by a syn-tectonic unconformity. The pre-growth Pakabulake (Miocene ?), Atushi, and lower Xiyu Formations are essentially concordant, show no thickness changes and define the geometry of the anticline. In contrast, the growth strata of the upper Xiyu and Wusu Formations record the initiation and progression of folding. The Boguzi section comprises a 4000-m-thick, late Cenozoic sequence of nonmarine sediments. Paleomagnetic samples were collected from 360 sites within the middle-upper section. Based on regional stratigraphic correlation, overall polarity pattern, and a few faunal constraints, a preliminary magnetostratigraphy for the upper part of this sequence correlates to the MPTS from the early part of chron C2An.1n to the early part of chron C1r.2r, between 3.1 and 1.7 Ma. Extrapolation from the section through the best-fit line to the MPTS yields an age of 1.9-1.6 Ma for the lower Xiyu Fm. The overall unit-mean declinations (349° ± 3°) indicate possible counterclockwise (CCW) vertical-axis rotation (11° ± 5°). Assuming all of folding began at about 1.6 Ma, the minimum shortening rate across the Talanghe anticline at the Boguzi section (35%, 5.1 km, 3.2 mm/yr) exceeds that of the Kashi anticline at the Baishikeremu section (16%, 1.4 km, 0.9 mm/yr) to the south, and is less than that of the Atushi anticline at the Wenguri section (59%, 8.8 km, 5.5 mm/yr) to the west. To the west of the Kashi anticline, the minimum shortening across the Mingyaole anticline at the Kalangouluke section is 4.1 km (29%, 2.6 mm/yr). Several sets of progressively deformed Pleistocene fluvial terraces plus the present rivers were surveyed using a total station at three sites. The displacements of terraces from their original geometries suggest similar spatial variations in the magnitude of deformation as the geologic structures underlying the terraces. Luminescence and cosmogenic ¹⁰Be/²⁶Al dating samples collected from these terraces are being analyzed to better constrain when

T72B-02 1330h POSTER

Mapping Subthrust Sedimentary Sections with High Resolution Magnetotelluric Surveys in the Tien Shan, Kochkorka, Kyrgyz Republic

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A high resolution tensor magnetotelluric survey was conducted in 1999 across a thrust fault south of Kochkorka, Kyrgyz Republic, in order to map the extent of the subthrust section of Cenozoic sediments beneath Paleozoic metamorphic rocks. This profile along the Ukok River consisted of 54 MT stations spaced 95 m apart and recorded data at periods from 0.0026-37 seconds. The profile crossed several surface escarpments inferred to be thrust faults and was continued for a short distance onto the valley floor to the north. Apparent resistivities, phases, and Hz transfer functions were fit with a 2-D model with strikes (N100E) oriented subparallel to the range front. The resulting model shows an undulating, discontinuous zone of lower resistivities (1-100 ohm-m) extending to depths as shallow as 150 m and as deep as 1000 m. This zone is approximately 1000-1500 m thick. The surrounding rocks are much more resistive with values in the uppermost 1000 m of 5000-10000 ohm-m, and 300-1000 ohm-m at depths of 1000-8000 m. If the conductive, discontinuous zone is inferred to be Cenozoic sediments, then the subthrust section extends almost 3000 m from the valley floor. Resistive units are found at the surface along the entire southern portion of the profile including at the sites on the valley floor. This is consistent with observations of Paleozoic metamorphic rocks cropping out along the Ukok River, but these units do not extend to depths below 300 m at this end of the line.

T72B-03 1330h POSTER

On the Nature of an Unusual Wave Group Observed in the North Tien Shan Region

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We have studied an unusual wave group that propagates in the northern Tien Shan region along the border between the mountain ranges and the Chu and Ili depressions to the north. This wave group, which we call S_L , stands out against the short-period coda on the recordings of local earthquakes and quarry explosions at the distances up to 100 km. The lapse time t_m needed for the S_L group to reach maximum amplitude varies between 98 s and 131 s, and at the same time, it does not depend on epicentral distance. At distances up to 30 km, the S_L group has a very narrow spectrum ($T=1.5-1.8$ s), but when the epicentral distance increases the predominant period also increases up to approximately 2.5 s (at D 100 km). Characteristics of the wave group are significantly different for the Zaili fault zone than for the regions to the west of 76° E and to the east of 79° E. In the Zaili fault region the S_L group is characterized by great variability of kinematic, amplitude and polarization parameters even for nearby paths. The relative duration of the S_L group at the level of 0.7 of the maximum varies from 4 s to 36 s. Particle motions in this group are in the vertical plane for the paths near Zaili fault zone and in the horizontal plane in other regions. We suggest that the S_L group consists of shear waves propagating in subvertical wave-guide and reflected from a thin upper mantle layer.

T72B-04 1330h POSTER

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We analyzed broadband array data from teleseismic P phases recorded by digital seismic stations operating in the Tien Shan of central Asia since 1991. For the period from 1991 to 1997 we used data from the ten-element Kyrgyzstan Network (KNET). From 1997 to the summer of 2000 this array was progressively expanded with portable broadband instruments from IRIS-PASSCAL to a total array of 38 stations. We applied a new array processing procedure based on special functions called multiwavelets and techniques described in recent papers by Bear and Pavlis [1999a,b]. This processing tool produces simultaneous estimates of four physical measurements: (1) an average array slowness vector, (2) a set of static corrections of individual seismograms relative to the best fit plane wave, (3) array average particle motion ellipses, and (4) individual station particle motion ellipses. The multiwavelet functions also allow us to produce estimates of the uncertainty of each of these measurements. By using staged decimators we can produce a self-similar analysis of these quantities at long periods in which the analysis window grows in a fixed scaling relation to the dominate period of the analysis band. This allows us to study the frequency dependence of wavefield scattering on particle motions using a window size that is a fixed number of cycles at the dominate period of individual, narrowband estimates. We compare the results from the multiwavelet analysis with multitaper polarization estimates. The multitaper technique has a strong genetic relation to multiwavelets, but it does not share the self-similar time window scaling relation. Preliminary results indicate large deviations in measured slowness vectors from those predicted for radially symmetric earth models. Particle motion ellipses differ significantly from the longitudinal direction with a frequency dependence in the results suggesting depth-dependent anisotropy and/or lateral variations in lithospheric scattering properties beneath the Tien Shan.

T72B-05 1330h POSTER

Lateral Variation of Crustal Structure Beneath the Tibetan Plateau: Inference from Rayleigh Wave Group Velocity Inversion

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It is well known that the Tibetan Plateau is very heterogeneous in crustal structures. Unfortunately, previous studies using seismic ray paths that pass through Tibet as well as neighboring tectonic units did not have sufficient resolution to resolve the details. We investigate the characteristics of shear wave velocity structures for various portions of Tibet by inverting the dispersion curves of the Rayleigh wave group velocities. The dataset was collected in a broadband seismic experiment consisting of 12 temporal stations along the west Tibet-southwest Tarim border during 1998-1999. It provides a unique advantage of uncontaminated signals that travel entirely within Tibet. The most pronounced characteristic is that most of the dispersion curves, with only one exception, show minima around period of 30 s, and then increase with period. This exceptional raypath, which show local minimum group velocity around period of 60 s and obviously slower than others for periods longer than 40 s, mainly samples the Qiangtang block and part of Songpan-Ganzu block to the north, implying the shear velocity in lower crust and upper mantle beneath Qiangtang block is much slower than other regions. However, waveforms generated from the same earthquake and recorded at stations located in the Tarim basin side present higher group velocities for periods larger than 40 s. Apparently, the upper mantle beneath Tarim basin efficiently speed up the Rayleigh waves, indicating that the physical property boundary between Tibetan plateau and Tarim basin are quite sharp. For raypaths sample equally both the Lhasa and Qiangtang block between longitude of 80° and 90°E show similar dispersion. Average crustal shear wave velocity ranges from 3.3 to 3.5 km/s when the mocho depth is chosen as 70 km. For region to the west of the western termination of Tsangpo suture, the group velocities for periods larger than 30 s are higher compared with elsewhere in Tibetan plateau. More details will be presented at the meeting.

T72B-06 1330h POSTER

The Mw7.6, Manyi (Tibet) Earthquake: Co-seismic Slip Solution and Post-seismic Relaxation Processes From ERS InSAR Data

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ERS2 radar data acquired before and after the Mw7.6, Manyi (Tibet) earthquake of November 8, 1997, provide geodetic information about the surface displacement produced by the earthquake and post-seismic processes occurring in the 2 years following the event. The co-seismic data reveal a smooth, N78E, 170 km long surface rupture following the trace of a quaternary fault visible on satellite images. The inferred sense of slip is left-lateral, consistent with slip on the EW plane of the Harvard CMT solution. The fault slip distribution derived from the interferometric map is bimodal: a main event ruptured the 130 km-long eastern section of the fault with a maximum slip of 7 m, a sub-event ruptured the western 40 km-long section of the fault with up to 2.6 m of slip. Fault slip solutions obtained by inversion of interferometric map using the simulated annealing and the singular value decomposition approaches indicate that the rupture extended to a depth of 15 km with a maximum slip of 7 to 8 m occurring between the depths of 4 and 8 km. SAR interferograms spanning intervals 0.38 yr, 0.67 yr, and 1.92 yr after the earthquake show up to 3.4 cm, 4.0 cm, and 6.7 cm of relative range displacement between the two sides of the fault, respectively, in a direction consistent with left-lateral slip on the fault. The data could be fit almost equally well with logarithmic and exponential time functions, implying relaxation times of 100 and 210 days, respectively. We interpret the observed post-seismic displacement field as the result of afterslip on deep sections of the fault, visco-elastic relaxation in the lower crust and upper mantle, and poro-elastic rebound in the near-field of the fault.

T72B-07 1330h POSTER

TRANSALP - New Deep Seismic Images of the Eastern Alps

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New images of a recently acquired combined vibroseis/explosives seismic survey across the Eastern Alps between Munich and Venice are presented with first interpretations. This survey forms part of a multidisciplinary German-Austrian-Italian research program for investigating the orogenic processes driven by the collision of the European and African-Adriatic continental lithospheric plates. The northern and southernmost parts of the 340 km long sections display the Molasse basins (hydrocarbon bearing) with maximum 6-8 km deep Jurassic-Tertiary-Quaternary sedimentary infill and the reflective lower crust with its base at about 30 km depth dipping towards the Alpine axis. A strongly pronounced V-shape of reflection pattern is seen below the Alpine axis down to the crust-mantle boundary at about 55 km depth displaying some asymmetry with stronger dips within the upper 30 km on the northern (European) side but stronger dips in the lower part of the southern (Adriatic) section. This is the area where the Tauern Window, a high-grade metamorphic window is exposed. There are similarities but also significant differences in the tectonic style as compared to Western Alpine sections.

T72B-08 1330h POSTER

Complex Deformation in Eastern Iran: Implications from SAR Interferometric Analysis of the 10 May 1997 Zirkuh $M_w = 7.2$ Earthquake

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Collision of the Arabian plate with Eurasia is causing deformation in the Zagros contact zone and also as far as 1000 km away in discrete belts of strain spanning Iran. In easternmost Iran, between about 20° and 34° N, deformation is primarily strike-slip on right-lateral, north-trending faults on both sides of the low, flat Lut block. North of the Lut block, the faults change to left-lateral slip on east-west trends. The 1997 Zirkuh earthquake ruptured the entire 125-km length of the north-south Abiz fault, up to its intersection with the east-west Dasht-e-Bayaz fault. In addition to the 10 May 1997 $M_w = 7.2$ Zirkuh event, these two faults have broken in a series of four $M = 6$ to 7 earthquakes in the 20th century. The eastern Dasht-e-Bayaz fault cuts the Abiz fault and is very linear through generally low-relief terrain, suggesting nearly pure strike-slip deformation. The Abiz fault and other right-lateral strike-slip faults nearby have curved traces and cut through or along the sides of substantial mountain ranges, consistent with more transpressional strain. Some connect with thrust faults.

Repeat-pass synthetic aperture radar (SAR) interferometry (IntSAR) enables the measurement of surface deformation that occurred in the time between the two SAR passes. In remote areas of Iran, other types of geodetic measurements are not available, so IntSAR provides new information on the upper crustal strain, while the arid climate makes it suitable for the ERS-1 and ERS-2 satellites, despite infrequent coverage. IntSAR analysis of the 1997 Zirkuh earthquake reveals clear fault segmentation along the right-lateral Abiz fault. In the segment transition zones, the co-seismic slip drops dramatically. The southernmost third of the fault was imaged by both ascending and descending ERS scenes, which provides two components of the surface deformation, indicating a substantial thrust slip motion on or beside the southern segment. These interpretations are consistent with field observations of offset faults and seismic waveform analysis.

T72B-09 1330h POSTER

Mesozoic Intracontinental Deformation of the Western North China Block: Structural Geology and Basin Analysis of the Helan Shan and Western Ordos Basin

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The Helan Shan and western Ordos basin of north-west China preserves an excellent and unique record of intracontinental deformation associated with the latest Paleozoic through Mesozoic tectonic amalgamation of Asia. The north trend of contractile structures in the Helan Shan is in stark contrast to the trends of structures in the major east-trending orogenic belts that bound the North China Block, the Yinshan-Yanshan belt and the Qinling Shan. Paleozoic and Mesozoic collisions have occurred along the northern and southern margins of the North China Block. To the north, Mongolian volcanic arcs accreted to the North China Block in the Permian, and the composite North China Block collided with the Siberian craton in the Jurassic. To the south, the South China Block collided along the Qinling belt in the Triassic. Given the context of these north-south tectonic collisions, east-trending structures of the Yinshan belt and Qinling Shan are predictable. However, the orientation of concurrent contractile structures in the Helan Shan is problematic.

An integrated structural and stratigraphic analysis of the Helan Shan fold and thrust belt and western Ordos foreland basin allows reconstruction of the tectonic

setting of the region and constrains the relationships between the major north-trending and east-trending mountain belts of north China. Structures of the Helan Shan fold and thrust belt consist of basement-involved thrust faults, folds, and high-angle reverse faults. Overall vergence of the range is to the east, however, late-stage(?), west-vergent, reverse faults are present in the central portion of the thrust belt and may be responsible for maintaining wedge taper. Middle Jurassic-Early Cretaceous synorogenic conglomerates overlap the frontal part of the fold and thrust belt wedge and have subsequently been folded and faulted by later fold and thrust belt deformation. These conglomerates are thought to record the main phase of shortening and internal deformation of the wedge to maintain taper, as well as terminal deformation along the frontal portion of the wedge. The earlier Mesozoic history of the orogenic belt is more enigmatic, but is recorded by a thick, nonmarine, Triassic-Jurassic sedimentary sequence. Paleodrainage reorganization and provenance changes in the lower part of the Jurassic section are tentatively interpreted to signal the initial influence of shortening in the Helan Shan fold and thrust belt.

Comparison of tectonic history between the north-trending Helan Shan and east-trending Yinshan allows a detailed record of style and orientation of Mesozoic strain around the Ordos block. This knowledge, in turn, promises the ability to distinguish the relative importance of east Asia and central Asia tectonics as well as Ordos block mechanics in shaping the Mesozoic deformational patterns of northern China.

T72B-10 1330h POSTER

The Ulakhan Fault System, Northeast Russia

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The Ulakhan fault system in northeast Russia is believed to represent the boundary between the North American and Okhotsk plates. This extensive, left-lateral, strike-slip system is easily identifiable in satellite imagery and topographic maps. The Ulakhan fault itself is particularly clear between the basins of the Kolyma and Indigirka Rivers. To the north, the Ulakhan fault splays into a series of faults, which step towards the Arctic Ocean along the North America - Eurasia plate boundary. The exact location of that plate boundary is unclear. To the south, the fault system becomes less apparent within the Okhotsk-Chukotka Volcanic Belt, although it has been suggested that the system continues across Shelikhov Gulf to northwestern Kamchatka.

In this study, we have combined improved seismicity data with Russian geological work to obtain an improved view of the Ulakhan system. Russian seismic networks have located hundreds of microseismic events along the Ulakhan. We have relocated these events using improved local travel-time curves and secondary phases. The relocations, as well as the teleseismic events in the region, appear to cluster along the Ulakhan fault and its major splays. The main section of the fault is characterized by a band of seismicity that strikes from northwest to southeast for approximately 1,500 kilometers. The seismicity becomes more diffuse in the Seymchan-Buyunda basin, which has been interpreted as a pull-apart basin.

The combination of seismicity, focal mechanism studies, river offsets, analysis of satellite imagery, paleoseismic features, and stream length gradient indices suggest that the Ulakhan fault is presently active, and a major part of the North America - Okhotsk strain is released along it.

T72B-11 1330h POSTER

Earthquake Relocation as Evidence for Active Faulting in the Seward Peninsula, Alaska

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The Seward Peninsula is a highly seismically active region in Western Alaska with one of the highest levels of seismicity for a region traditionally considered as intraplate. Including the adjacent part of eastern Chukotka, Russia, there has been at least one magnitude 7 and eight magnitude 6 events in this century, making this area more seismically active than the New Madrid region. It has been proposed that this region is located on the boundary between the North American plate and a proposed Bering plate driven by the extrusion of southwestern Alaska due to terrane accretion in southeastern Alaska. The area is generally believed to be in north-south extension.

A local seismic network was deployed in the Seward Peninsula by the University of Alaska from 1978 to 1982. Events detected by this network were originally located by analysis of only P-wave arrival times and showed a high level of diffuse microseismicity. We have re-picked and/or reanalyzed Pn, Pg, and Sg arrivals recorded by the network and relocated the events incorporating all three phases. Our preliminary relocations are based on a Pn velocity of approximately 8.0 km/s, Pg of approximately 5.9 km/s, and Sg of approximately 3.6 km/s; initial analysis suggests that Pn, Pg, and Sg velocities do not vary significantly throughout the region.

Where the original locations showed only diffuse clusters, the relocated events define several linear trends. Short, well defined trends are oriented roughly east-west, are consistent with the existence of active normal faulting inferred from geology and field mapping by numerous authors. Satellite photos, topographic maps, and geologic maps are used to identify the active faults suggested by epicenter lineations. More regional trends are of diverse orientations and may provide insights on the regional tectonics.

T72B-12 1330h POSTER

Where is the Energy in Asia? A Synopsis of Seismological, Geothermal and Analytical Energy Assessments of the India-Asia Collision

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Plate collision of India and Asia and the phenomenon of intracrustal deformation with associated fracturing and mechanical heating in the far field is analysed on the basis of synoptic 2-D plan view maps of crustal slices of seismic energy flow, b-value, potential energy change, anomalous heat transfer and simplified analytical as well as 3-D numerical studies. The seismological data set shows broad bands (20 km resolution) of increased seismic activity cutting through the Asian Plate. The most prominent of which are a semicircular pattern coinciding with the Tien Shan and the first Himalayan Thrusts (Main Frontal and Main Boundary Thrusts) ahead of India. The b-value map (Frequency-Magnitude slope) is of lower spatial resolution but shows up with a low b-value (the ratio of large to small earthquakes is shifted in favour of larger ones) in those areas of high seismic energy release and high b-values in regions of low seismic energy release. In the numerical and analytical approaches the high-energy release (low b-value) pattern can be reproduced by the maximum shear stress trajectories of a homogeneous plate that is thickening as a result of indentation. The seismic potential energy change (Tanimoto and Okamoto, Geophys. Res. Lett. Vol. 27, No. 15, 2313-2316, 2000) captures the same pattern of predominant thickening deformation but also shows domains where significant potential energy is lost (extension, high b-value). These correlate well with anomalous heat losses of Asia, which can be interpreted in turn as conversion of stored, gravitational-potential-energy into mechanical heating. Notably, the Himalayan Geothermal Belt (Hochstein and Regenauer-Lieb, J.Volc.Geotherm.Res. 83, 75-92, 1998) and the Lake Baikal extension zones clearly stand out as areas of high potential energy losses. The theoretical approach predicts a transition from a first phase of global thickening after collision and a subsequent phase of extension superposed onto regional thickening. The energy maps document the second phase.

URL: http://www.sg.geophys.ethz.ch

T72B-13 1330h POSTER

Crustal Architecture of the Northwestern Mongolian Altai

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We report preliminary results from 6 weeks of detailed field work carried out during summer, 2000 in northwestern Mongolia investigating the crustal architecture of the Altai at latitude 48N. The region can be divided into 5 separate Cenozoic structural domains each dominated by a major dextral strike-slip fault system. Gentle bends along these faults are marked by transpressional uplifts including asymmetric thrust ridges, restraining bends containing flower structure cross-strike fault geometries, and triangular thrust-bounded massifs. These transpressional uplifts (Tsambagarav Massif, Altan Huhey Uul, Sair Uul, Asgat Nuruu, Onno Hayrhan Uul, Mengildyk Nuruu) comprise the highest mountains in the Altai and are structural and metamorphic culminations exposing polydeformed greenschist-amphibolite grade basement recording at least 2 phases of Paleozoic ductile deformation overprinted by Cenozoic brittle structures. Cenozoic thrust faults with the greatest amounts of displacement bound the west and southwest sides of ranges throughout the region and consistently verge WSW. Many of these faults are considered active because they deform Quaternary alluvium and form prominent scarps. We have joined our transect to previous work carried out in the Chinese Altai to create the first modern crustal section across the entire northwestern Altai. Samples were collected for fission-track dating, Ar-Ar dating of mylonites and metamorphic fabrics, and for geochemical analysis to further refine the timing of deformation and tectonic significance of basement rocks. Our preliminary results indicate the importance of restraining bends in nucleating Cenozoic topographic uplift and acting as nodes from which transpressional mountain ranges have grown along-strike and perpendicular to fault strike. On a more regional scale, the Siberian and Hangay cratons have played a major role in localizing Late Cenozoic deformation along their boundaries. The geometric relationship between the craton boundaries and the dominantly northeast SHmax (derived from Indias continued northeastward indentation) has dictated the kinematics of Late Cenozoic deformation in the Altai, Gobi Altai and Sayan-Baikal regions.

URL: http://www.le.ac.uk/geology/wdc2/wdchome.html

T72C MC: Hall D Sunday 1330h

Interactions Between Tectonics and Surface Processes III Posters (joint with H, S, NG)

Presiding: G Tucker, Institute of Technology; C C Sorlien, Institute for Crustal Studies

T72C-01 1330h POSTER

Further Investigation Into the Late Holocene Faulting Record of the Rapidly Creeping Southern Calaveras Fault

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It is not known whether large earthquakes can rupture the central and southern Calaveras fault. Extending from the Calaveras Reservoir to south of Hollister, California, the fault creeps rapidly (7 to 15 mm/yr) and is seismically active, with many microseismic events and moderate-sized earthquakes. Historically, however, this section of the Calaveras fault has not ruptured in any large magnitude (M>7) earthquakes. Understanding the affect of high creep rates on the mechanics of