# The Kyrgyz Tian Shan geoelectric model constrained by extended MT+LMT ensemble at the "Naryn" transect

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The sub-meridian transect of EM soundings "Naryn" crossing the Kyrgyz Tian Shan includes 19 LMT sites and tens of broadband MTs, observed in nineties and subsequently interpreted by Kyrgyz and American geophysicists. We elaborated new approaches for "Naryn" data analysis to increase resolution and stability of the geoelectrical cross-section. To compile an extended quasi-2D ensemble of transfer functions for profile inversion the original processing tools and modern TF invariant transformations were applied to the enriched observation collection, incorporating 23 MTs accomplished with Phoenix equipment in 2005. The results of multi-component bi-modal inversions (2D Varentsov's code) are presented. The conductive layer at the depths 30-50 km and subvertical upper crustal conductors characteristic of the constructed geoelectrical model obtain an explanation in the terms of Tian Shan orogen geotectonics. This study is supported by RFBR grants 04-05-64970 and 04-05-65103.

# Conductivity Image of the Taupo Volcanic Zone, New Zealand

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The Taupo Volcanic Zone (TVZ) in the North Island of New Zealand is characterised by rapid extension, very high heat flow and high rates of rhyolitic magma production. Earthquake hypocentre data show that the seismogenic part of the crust is only about 8 km thick within the TVZ. Phase tensor analyses of 120 magnetotelluric soundings indicate an approximately 2-D regional structure and show that the conductivity decreases rapidly beneath this highly thinned crust. 2D inversions show that this rapid increase in conductivity occurs at 8 km and appears to mark the brittle ductile transition as defined from the seismicity. The high conductivities at deeper levels are most plausibly interpreted as being caused by a fraction of connected melt.

# **L**ooking inside Loihi with Electrical Resistance Tomography

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In July 2006, we collected electrical resistance tomography data using CSEM on the Loihi seamount, an active submarine volcano. The intersecting geometries of approximately 140 transmitter locations broadcasting to 20 receiver locations allow us to build a conductivity image of a horizontal slice through the seamount at a depth of 1000m below the summit. We present the first results from this study.

# The Agulhas MT transect from the coast into the Kaapvaal Craton

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Over the last two years three magnetotelluric (MT) field experiments were conducted along the Agulhas-Karoo Transect. This transect is designed to cross the Cape Fold Belt (CFB) with the Kango Basin, the Namaqua-Natal Mobile Belt (NNMB), the Karoo Basin and the transition into the Kaapvaal Craton. In total, we deployed over 300 MT sites along the 600 km transect with a site spacing of 2-4 km. Focus of the first section of the transect was the Beattie Magnetic Anomaly (BMA) and the Southern Cape Conductive Belt (SCCB), two of Earthś largest continental geophysical anomalies which are situated within the NNMB and extend across the entire southern African continent in east-west direction. The resulting 2D conductivity model of the 150 km long profile from Prince Albert to Fraserburg reveals structural details of both geophysical anomalies and the collision zone between the NNMB and the CFB, at a scale of the entire crust. Three distinct zones of high conductivity are imaged: (i) beneath the surface trace of the maximum of the BMA we observe a high conductivity anomaly at 5 to 10 km depth. (ii) A shallow, regionally continuous sub-horizontal band of high conductivity, that can be related to a 50-70 m thick pyritic-carbonaceous marker horizon and (iii) several highly conductive synformal features in the mid crust are newly imaged beneath the edge of the Great Escarpment. The second and third MT experiments were only completed in December 2005 and in May 2006. They cover the sections from Prince Albert to Mosselbay and from Fraserburg to Strydenburg. The overall data quality is excellent and a preliminary data evaluation indicates correlation with known tectono-stratigraphic units.

# **E**lectromagnetic imaging of the Castellano-Extremeña crust: MT-profile ALCUDIA

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Lately, the joint interpretation of seismic and MT data has been playing a major role in the deep exploration of the Earth. In order to compare the seismic and electromagnetic images, a high resolution MT profile is planned through the easternmost sector of the Central Iberian Zone (CIZ) coinciding with the ALCUDIA vertical seismic reflection profile. As a preliminary study, 9 MT sites with periods ranging from 0.002 to 4000s were registered across the system of the Alcudia anticline - the Almadén syncline – Esteras anticline and Herrera del Duque syncline. After analysis of the dimensionality a N105º preferred direction was found and, accordingly, a 2D joint inversion of the three kinds of data: apparent resistivities, phases and tipper using the REBOCC code was performed. The 2D model shows areas of enhanced conductivity which provide an image the tectonic fold system.

# Large-scale electrical conductivity anomalies beneath the center-southern Brazil as imaged by GDS and MT surveys

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Transient geomagnetic variations recorded by an array of 203 stations are analyzed to infer the configuration of internal induced currents in central-eastern part of the South-American platform. The data were subjected to robust regression analysis to derive vertical transfer functions presented as real induction arrows following the GDS method. A strong current concentration is observed close to the north-northwest end of the array. A 3D forward modeling indicated the existence of a 600 km-long crustal conductor running parallel to the structural contour of the Paraguay belt (in center-west Brazil), with a trend of NNE-SSW to the west of the Cuiabá city swinging to WNW-ESE to the east of that city. A nearly E-W MT profile was carried out crossing the conductive anomaly and 2D inversion of the TM mode modeled a strong upper- to mid-crust conductor (resisitivity of 1 ohm.m at depths between 2 km to at least 20 km). From the high conductivity of the anomalous structure and its observed geometry, the most likely interpretation of its source is that it is associated with graphitized biogenic material in metasediments, now deeply underthrust in a Neoproterozoic suture zone. This result strongly support the hypothesis of collision between the Amazon plate and the western Paraná block and the closing of an ocean in the Paraguay belt region, contrary to former propositions of an ensialic evolution for this belt.

# **2**-D interpretation of a magnetotelluric profile in NE Ceará coastal region (NE-Brazil): peliminary results

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The preliminary interpretation of 22 magnetotelluric (MT) and 10 transient (TDEM) soundings carried out along a 100km long profile between Beberibe and Icapui towns located in the eastern coast of the Ceará (NE Brazil). The spacing between sites was 5km approximately. The horizontal fields were sampled in the NS and EW directions at four frequency bands. The static-shift was corrected using the TDEM soundings. The ocean effect was investigated using numerical modelling. The interpretation was based on a 2-D model obtained from the joint inversion of the MT data (TE and TM-modes). The obtained model allow to characterise: 1) the uppermost structures correlated to the Mesocenozoic sedimentary formations and groundwater reservoirs, 2) the underlying structures associated with the Ceará Central and Jaguaribeano crustal subdomains and 3) the structures associated with the Senador Pompeu, Orós and Jaguaribe shear fault systems (Neoproterozoic).

# **F**irst results of Network-MT survey in Central Japan

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In Central Japan, there runs the WSW-ENE trended Niigata-Kobe tectonic zone in its backarc side, and the NS trended seismic and volcanic active zone beneath the Northern Japan Alps in addition to the WSW-ENE trended low-frequency seismic zone of non-volcanic origin in its forearc side. All these crustal activities are considered to be directly or indirectly related to the existence or movement of the crustal fluids such as water or melt. Aiming at elucidating mechanism of the various kinds of crustal activities occurring beneath Central Japan, we have started the Network-MT survey to determine regional and deep electrical conductivity structure down to the upper mantle. In this presentation, we introduce the first results from the datasets which we have just started to obtain since the end of Dec., 2005 on a 135km long survey line in the backarc side.

# Deep crustal electrical conductivity structure from magnetotelluric studies in south indian shield region

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Deep geoelectric structure of Eastern Dharwar Craton and Southern Granulite Terrain were brought out using magnetotelluric (MT) method. MT stations were acquired along 5 different profiles with a total length of over 500 km. An east-west trending 200 km long profile across the Proterozoic Cuddapah basin was occupied with 20 MT stations. The Cuddapah basin boundaries towards the east and western parts of the profile were clearly demarcated in the present study with a sharp change in electrical resistivity. The basement resistivity structure also showed significant variation below the basin as compared to adjacent region. The upper crust is high resistive ($>$ 10000 $\Omega$m) on either side of the basin, while it is less resistive (1000 $\Omega$m) within the basin. The mid-lower crust is less resistive (500 - 2000 $\Omega$m) all along the profile. In the south, north-south trending profiles cross the major shear zones viz., Palghat Cauvery shear zone, Chennimalai shear zone and Moyar Bhavani shear zone. From 3 north-south and 1 east-west profile it is concluded that the terrain boundary of the Dharwar craton towards north and Southern Granulite Terrain towards south has shown marked variation in electrical resistivity. The derived models are correlated with other geophysical methods viz. gravity and deep seismic sounding. For example, a 1500 $\Omega$m resistive layer at mid-lower crust showed good correlation with low velocity/low density layer in the vicinity of Palghat Cauvery shear zone. The correlation of the anomalous geophysical properties of conductivity, density and velocity revealed the juxtaposition of crustal blocks controlled by major faults/shear zones. Lithospheric electrical conductivity structure in the south Indian shield region is compared with the other shields viz. Canadian shield, Baltic shield and discussed.

# **E**lectrical conductivity across the Sorgenfrei-Tornquist Zone

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The Sorgenfrei-Tornquist Zone (STZ) makes up the northern boundary of the Trans European Suture Zone (TESZ). We have made extensive MT measurements across the STZ using both LP and broad band AMT instruments in order to penetrate the conductive sedimentary basins in the Danish Basin. The geoelectric structure of the area is reasonably 2D as revealed from analyzing both tipper and impedance tensor data. Meanwhile there are 3D effects in the data making the combination of tipper and the determinant average of the impedance more robust for 2D inversion. A main problem in studying transition zones with conductive sedimentary rocks on one side is the screening effect of the sediments, which in this case has a conductance between 1 and 2.5 kS. We have found that these screening effects are so severe that no meaningful crustal (and even upper mantle) conductivity model can be obtained unless apriori information about the sedimentary structure is added to help the inverse modelling. In this case we could make use of borehole and reflections seismic results from the area to define a good apriori model of the conductance of the sedimentary basin. The upper crust on the Baltic Shield and below the sedimentary basin in Denmark is generally resistive. At the northern border of the STZ a steep crustal conductor penetrating the whole crust can be identified. This conductor may be connected to a lower crustal/upper mantle conductor centered on the STZ proper. Below Denmark the lower crust and upper mantle is generally conductive with resistivities around 100 Ohm-m except for a resistive keel to the south of the STZ. The high resistivity of the Baltic Shield lithosphere to the north is seen to continue under the STZ until to depths exceeding 300 km.

# **Q**uasi-3D model of the Kirovograd conductivity anomaly, Ukraine.

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Geomagnetic depth sounding data have been collected at a large number of sites to study the Kirovograd conductivity anomaly traversing the Dnepr-Donetsk depression within the Ukrainian Shield. Induction arrows in a period range from 400 s to about 2 hours were estimated by reprocessing older analogue geomagnetic records. To estimate the non-2D conductivity distribution across the area, thin sheet inversion of the induction vectors was carried out. In order to increase the vertical resolution of the electromagnetic interpretation and to estimate the two-level structure with the shallower Dnepr-Donetsk conductor and a deeper conductor of the Kirovograd anomaly magnetotelluric data collected at sites Porsk and Zuevtsy were processed for magnetotelluric impedances within the period range of 40 s to about 2 hours. Directional and decomposition analysis was carried out and the inverse procedure for anisotropic layered media was applied to estimate the vertical conductivity distribution.

# Electrical resistivity structure of the erzincan basin, eastern anatolia, turkey

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Neogene-Quaternary aged Erzincan Basin, is located within the North Anatolian Fault Zone and is formed with pull-apart mechanism. In this study, we aimed to examine the electrical resistivity structure and depth of this basin. For these purposes, wide-band magnetotelluric data were collected at 23 stations along two parallel profiles crossing the Erzincan Basin, with a spacing of 1-2 km. The Groom-Bailey decomposition was performed and as a result it is found that the strike in the survey area is dominated with an angle of N75E. Two-dimensional inversion analyses using the code of Ogawa and Uchida (1996) was performed for TM, TE and joint inversion of both modes.

# A wide band magnetotelluric investigations to delineate the deep crustal conductivity structure in Antarctica

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India has completed 24 Indian Scientific Expeditions to Antarctica since 1981 and carried out various geological and geophysical investigations. In the 24th expedition, (2004-05), for the first time, a wide band magnetotelluric (MT) study was initiated by NGRI. The aim of the study is to map the deep electrical conductivity structure of Antarctica around the Indian Maitri station. Limited long period MT studies were taken up earlier in Antarctica by other countries. Wide band MT data acquisition (1000-0.001 Hz) covering both AMT and MT signals were faced with problems related to data acquisition. The problems were overcome in the present study with computer aided online processing facility using internally heated laptop computer and special electrodes. In the first phase, MT profile was along the exposed formation of Schirmacher oasis land area in E-W direction. In the 25th Indian Scientific Expedition to Antarctica, December 2005 to March 2006, during the second phase of study, a total of six stations have been occupied with a station interval of 3-4 km. The MT study is carried out in the south of Schirmacher oasis. The stations are occupied along a profile oriented in a NE-SW direction One station near Maitri, the Indian base station is situated in gneissic terrain and other five on the continental ice sheet. High quality MT data have been collected at each station for duration about 4-5 days to acquire long period signals and also to obtain good quality of short period signals. Use of titanium electrodes as e-probes has reduced the contact resistance further to kilo-ohms and facilitated recording of high frequency signals. In the present study, the logistics of field data acquisition procedures of the wide band magnetotelluric study are presented along with a preliminary deep crustal geoelectric section. The crustal structure is compared with similar results from Indian shield. The deep electrical structure is compared with crustal structure obtained earlier from gravity studies.

# MT survey on impact crater

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We present the first results of an MT field survey to study the electrical conductivity of an impact crater (Nördlinger Ries; Southern Germany) created by an asteroid of 1500m diameter. The impact left a crater of 20km in diameter. The data were collected in and outside the crater along two profiles oriented north and west from the center to 40km distance. At crustal depths (8s-128s) the data show nearly isotropic conductivities, outside the common anisotropy known for Southern Germany. First models indicate, that this cant be explained with highly conductive sediments. This may lead to the conclusion that the missing anisotropy is caused by the impact event.

# Regional magnetotelluric profile crossing structures of Central Poland; initial results

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In 2005, magnetotelluric investigations were initiated along the regional profile, which runs from Zgorzelec to Wi¿ajny and crosses major geological structures of Central Poland, including the Transeuropean Suture Zone. The length of the profile is 700 km and has 161 deep magnetotelluric sounding sites. The main objectives of the project include identification of sub-Zechstein sedimentary structures and evaluation of resistivity distribution within the deep crust, at the contact of East European Precambrian Craton and Central Europe Paleozoic structures. Preliminary geophysical interpretation of ca. 2/3 MT sounding data was made based on automatic 2D inversion using NLCG and SBI algorithms. An attempt of integrated magnetotelluric, seismic and borehole data interpretation for selected parts of the profile was also made. A resistivity distribution model along the measurement profile was obtained as a result of geophysical interpretation. Of great interest is varied resistivity of the formation resting between the Zechstein evaporate complex, which screens seismic energy, and the crystalline basement.

# **3**D MT geoelectric model of the Central Betic crust (Spain). Interpretation and geodynamic implications

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Magnetotelluric studies carried out in the Central Betics (Spain) have shown the complexity of the geoelectric structures at crustal levels. After several approaches using 2D inversion, which provided a preview of the conductivity structures, 3D modeling was chosen as the best strategy to reproduce the measured data. Hence a 3D model was created, covering an area of 220 km x 240 km and with good vertical resolution up to 40 km. Departing from an initial model created from the interpolation of 1D inversions of the data at each site, and the addition of known geologic and geographic constraints, the final model was obtained through a trial and error process using a 3D forward modeling code. At shallow levels, the model reproduces the main geologic features, and infers their continuation in depth. At upper-mid crustal level, the most striking and better resolved feature is a 3D conductor body, located below the Nevado-Filábride metamorphic complex. The position and extension range of this body, which were tested and quantified using the rms between model and data responses, allowed interpreting it as belonging to the allochthonous part of the Betics, as opposed to its Iberian basement. Using additional geophysical data, the conductive body is interpreted as a lithologic unit formed by ophiolites or lower crustal rocks containing a conducting mineral phase, located below the Nevado-Filábride, following the core of its main anticline and cut in its bottom by the Betics detachment level. Finally, in order to reduce the misfits between data and model responses at some parts of the model, the 3D inversion code wsinv3dmt is presently being applied.

# Electrical resistivity structure of transitional ocean-continent subduction zones: the Marlborough strike-slip system, northern South Island, New Zealand

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The Marlborough strike slip fault system of the northern South Island, New Zealand, lies in the transition of plate convergence from near decoupling between upper and lower plates in true subduction (northern North Island), to essentially complete coupling between the plates with near-continuous lithospheric thickening and no subduction (central South Island). Study of the Marlborough system may clarify internal physical state of strike slip fault zones versus fault slip degree and rate, and illuminate partially coupled systems as regards deep fluid regimes and anisotropy. Preliminary results from an initial transect of 32 broad-band (0.004 – 1000 s) MT soundings collected earlier this year suggest enhanced deep crustal/uppermost mantle conductivity near the center of the northern South Island overlying a steep increase in plate dip and possible fluid release.

# **H**igh-resolution magnetotellurics in the Santa Domingo Basin, New Mexico, USA

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During SAGE (Summer of Applied Geophysical Experience) 2002 and 2005 a 6.4 km long magnetotelluric survey with 100 m station spacing was conducted in the Santa Domingo Basin, New Mexico. The results indicate: (1) upper unsaturated and freshwater basin fill between 200-500 m deep with resistivities of >10 Ωm, (2) a deeper conductive, water-saturated region with higher brine and clay concentrations approximately 1.2-6 km thick with resistivities of 1-9 Ωm, and (3) an underlying resistive basement with resistivities of 100–1000 Ωm. Sensitivity testing confirms a large vertical fracture and faulted offsets within the underlying, resistive Precambrian crystalline basement.

# **3**D geoelectrical image of the SW Iberian Peninsula

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A number of magnetotelluric profiles in the SW of the Iberian Peninsula corresponding to the southern branch of the Variscan Iberian Massif have been carried out. This area is characterised by three distinct tectonic terranes: the South Portuguese Zone (SPZ), the Ossa Morena Zone (OMZ) and the Central Iberian Zone (CIZ). The boundaries between these zones have a suture character: between SPZ/OMZ the Beja-Acebuches ophiolitic complex and between OMC/CIZ the central blastomylonitic core of the Badajoz-Córdoba shear zone. In order to get a global image of the distribution of the main conductive features a three-dimensional forward modelling of the whole area was carried out. The data consist of 61 MT sites with periods ranging from 0.004s to 4000s selected from a total of 200 MT sites. These sites were chosen according to the general shape of the apparent resistivity, phase and geomagnetic transfer functions so that they represent the most regional structure. The 3D image shows the lateral prolongation of the main sutures and also the regional extension of a middle crust conductive layer.

# Deep electrical image along Kalugumalai-Kanyakumari transect,

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Southern Granulite terrain in the southern part of India has recently gained importance since its relation to the reconstruction of the Gondwana super continents. In order to understand the deep crustal structure, seismic, gravity and magnetotelluric studies have been initiated. As part of this, magnetotelluric (MT) profile has been taken up along Kalugumalai - Kanyakumari in southern part of India. The study is aimed to determine the deep electrical structure and to map the structure of the lithosphere. The profile is an extension of the earlier study in this region along Kuppam - Kalugumalai. A total of 18 stations with frequency ranging from 8 KHz to .001 Hz were carried out with a station spacing of 3-5 km covering nearly 110 km profile. The analysis of the MT data indicates 2-D nature of the subsurface. The geoelectric model along the profile has showed distinct character spatially correlatable with reflectors from deep seismic studies. The geoelectric model is compared with gravity, deep seismic sounding section and discussed.

# The EMTESZ project: 2-D and 3-D modelling of MT data across the Trans-European Suture Zone

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The Trans-European Suture Zone (TESZ) is one of the largest tectonic boundaries in Europe, separating the East European Platform from the Paleozoic mobile belts of central and western Europe. Within the EMTESZ project the TESZ zone in Pomerania/Poland is investigated with MT. 2-D models were calculated with the inversion algorithm after Rodi and Mackie, in which one can clearly identify the transition zone between the resistive Precambrian shield in the NE and the better conducting Paleozoic platform in the SW. The area of the TTZ is controlled by local inhomogeneities beneath the upper good conducting zone caused by saline pore water. But because the data show 3-D characteristics first attempts with Siripunvaraporn's 3-D inversion code have been carried out.

# The combined seismo-geoelectric and density model of the earth crust along the Magadan - Vrangel island geo-transect

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In the presentation, a seismo-geoelectric model of the earth crust along the 2DV geotransect at the 1100 km interval is described. The geoelectric model is constructed using MTS data with a spacing of 1 km. Data of DSS, deep refraction and reflection method were used for creation of the seismic model. The velocity model of the earth crust obtained using the seismo-tomographic set of software is presented.

The main peculiarity of the geoelectric section is the occurrence of conductive layers along virtually the entire profile at depths from several to 30km. The shape of the conductive layers clearly corresponds to large-magnitude folds with diameters of tens of kilometers. The velocity model reveals layers with higher and lower velocity. Their configuration in the upper and middle parts of the crust is quite similar to the configuration of the conductive layers. It also positively correlates with the gravitational field. The density model was solved by the trial-and-error method under conditions of fixed geoelectric model boundaries. Values of density were obtained from the velocity model with use of the statistic interdependence of Vp and $\sigma$.

The conductive layers represent ancient primarily sedimentary formations with organogenic deposits transformed into graphite under exposure to high-temperature metamorphism.

# The research of vertical and horizontal electrotelluric field at Lake Baikal.

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Timed observations of electrotelluric field have been made from the ice surface of the lake and on its shore. At the lake the ratio of vertical electrical field to horizontal in the range that varies from the first seconds to the first minutes is hundredth and thousandth of a second which is at the level of noise. The obtained result confirms the model of flat wave. At the station which is on the shore the vertical field is greater than horizontal which is connected with geoelectrical heterogeneity of the media. To control the behavior of heterogeneity of the spectral-time field electrical tripper is used. Based on the data from tripper monitoring anomalous changes connected with earthquakes with on the epicentric distances up to 300km have been revealed. Longitudinal MTS curve free of influence from local geoelectrical heterogeneities have been obtained at the lake. Crust and astenospheric conductive layer became apparent on the curve as minimums.

# Mapping of deep electrical image in southern granulite terrain

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Southern Granulite terrain in southern part of India has attained importance in recent years, as the interest in studies related to reconstruction of Gondwana super continents is increased considerably. In order to understand the deep crustal structure, seismic, gravity, magnetotelluric studies are taken up. As part of this, magnetotelluric (MT) profile has been taken up during Aug - Sep 2004 in southern part of India. The study is aimed to determine the deep electrical structure and to map the structure of the lithosphere along Palani (Vattalkundu) -Kalugumalai. The profile is an extension of the earlier study in this region along Kuppam-Palani. A total of twenty stations with frequency ranging from 8 KHz to .001 Hz were carried out with a station spacing of 3-5 km covering nearly 100 km profile. The analysis of the MT data indicates 2-D nature of the subsurface. The geoelectric model along the profile has showed distinct character spatially correlatable with reflectors from deep seismic studies. The geoelectric model is compared with gravity, deep seismic sounding section and discussed.

# Magnetotellurics in the Santa Domingo Basin, New Mexico

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During SAGE 2002 and 2005 a 6.4 km long magnetotelluric survey was conducted within the Santa Domingo Basin, New Mexico. The results indicates (1) an upper resistive region between 200-500 m thick with resistivities of 10-30 Ωm, (2) a deeper conductive region approximately 1.2-6 km thick with resistivities of 1-9 Ωm, and (3) an underlying resistive basement with resistivities of 10-1000 Ωm. The upper region is Quaternary/Tertiary basin fill containing a freshwater aquifer at its base. The deeper conductive region is a combination of a brine solution and conductive clays at the base of the aquifer as well as filling a large vertical fracture/fault zone within the underlying Precambrian crystalline basement.

# Geoelectric structure in the Sikkim Himalayas using magnetotelluric studies

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The Sikkim Himalaya forms one of the important segment of eastern Himalaya and provides a representative cross section. The four physiography based transverse zones like the Sub, Lower, Higher and Tibetan ?Himalaya conform four major tectonic belts namely foothill, inner, axial and trans axial belts respectively. They are represented by characteristic structural and stratigraphic attributes and are delimited by important dislocations. During 2005 field campaign (May to July) magnetotelluric studies across the Sikkim Himalaya were carried out along 120 km long traverse from Siliguri (south) to Yumthang (north). A total of 20 broad band (0.001 to 1000 s) sites were occupied during this period with a station interval of 5 ? 8 km. Due to the noise contamination from electrical power lines etc 3 sites were not considered for processing. Impedances were computed after robust processing of single site and remote reference sites. As the study region is influenced by rugged topography, the effect of topography on magnetotelluric response function is studied. The data reflects the electrical signature of Main Boundary Thrust and Main Central Thrust. The geoelectric model from the present study together with the 100 line (Indepth II) geoelectic section is presented and discussed.

# **A** magnetotelluric study across the Iapetus suture zone in Ireland: Preliminary results of 3D forward modelling

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In the last three years 39 magnetotelluric sites on five parallel profiles have been acquired in central and SW Ireland. One of the aims of this survey is to image the Iapetus suture zone, a remnant of the collision between Laurentia and Avalonia. The period range of the data, from 0.033 s to 10000 s, allows contains information on the electrical conductivity to asthenospheric depths. We use 3D forward modelling to reconstruct the electric signature of the suture zone.

First results show a conductive block in the north-western part of the study region that agrees with the proposed accretionary wedge model. In contrast a highly resistive block underneath a thin sedimentary cover is needed to explain the data in the south-west. The induction vectors corroborate with these results and indicate an affect of the Atlantic Ocean only at periods above 1000 s.

# High-resolution magnetotelluric studies of the archaean-proterozoic border zone in fennoscandian shield, finland

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In the MT-FIRE project we have carried out audiomagnetotelluric (AMT) and magnetotelluric (MT) measurements along the key parts of the FIRE (FInnish Reflection Experiment) reflection seismic lines. One of the primary aims of the project is a high-resolution study of electrical conductivity across the Archaean-Proterozoic border in the central Fennoscandian Shield. Results of 2D inversion show that both the Kainuu and Savo Belts are highly conductive and the crust to the east of the Kainuu Belt is very resistive compared to more conductive crust to the west. Yet the upper part of the Iisalmi complex is resistive but underlain by a highly conductive layer in middle to lower crust.

# Magnetotelluric profiles in central and southern Australia: Imaging the construction of a continent.

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Three magnetotelluric profiles have been carried out in central and southern Australia. The 360km long Amadeus and 380km long northern Gawler profiles were designed to investigate proposed zones of Proterozoic accretion. Results suggest that a south-dipping subduction zone existed on the southern margin of the North Australia Craton and that accretionary structures on the northern margin of the South Australia Craton were also south-dipping, the first such constraints on the polarity of Proterozoic subduction. The 150km long eastern Arunta profile was designed to investigate Palaeozoic intracratonic orogeny. The imaged resistivity structure appears to map regions affected by fluid-rock interaction.

# Modelling of conductance for central Italy

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Spatial distribution of the electrical conductance in Central Italy is studied by analyzing long period geomagnetic transfer functions across the region. The transfer functions for periods of 1000 to 7000 s are available at 14 sites of an Italian geomagnetic depth sounding network set up in the late 1990s. First direct thin sheet models constructed from estimated conductances of seas and surface and sea bottom sediments do not explain the observed data satisfactorily. The probabilistic Monte Carlo Markov chain approach is then used to solve the inverse problem for the conductance distribution across the region, which provides an improved model with a good fit to the observations. Correlation of the results to the local geology is discussed.

# Conductance distribution across the TESZ in MW Poland

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EMTESZ-Pomerania is international project for studying geoelectrical ctructure of the crust and upper mantle between the European Paleozoic Platform and the Precambrian Craton in NW Poland. The main experimental phase finished in 2005 year. MT. We interpreted 64 long period geomagnetic transfer functions concentrated round two seismic profiles. The probabilistic Monte Carlo Markov chain approach is then used to solve the inverse problem for the conductance distribution across the region, which provides an improved model with a good fit to the observations. Correlation of the results to the local geology is discussed.

# **A** wide band magnetotelluric investigations to delineate the deep crustal conductivity structure in Antarctica

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India has completed 24 Indian Scientific Expeditions to Antarctica since 1981 and carried out various geological and geophysical investigations. In the 24th expedition, (2004-05), for the first time, a wide band magnetotelluric (MT) study was initiated by NGRI. The aim of the study is to map the deep electrical conductivity structure of Antarctica around the Indian Maitri station. Limited long period MT studies were taken up earlier in Antarctica by other countries. Wide band MT data acquisition (1000-0.001 Hz) covering both AMT and MT signals were faced with problems related to data acquisition. The problems were overcome in the present study with computer aided online processing facility using internally heated laptop computer and special electrodes. In the first phase, MT profile was along the exposed formation of Schirmacher oasis land area in E-W direction. In the 25th Indian Scientific Expedition to Antarctica, December 2005 to March 2006, during the second phase of study, a total of six stations have been occupied with a station interval of 3-4 km. The MT study is carried out in the south of Schirmacher oasis. The stations are occupied along a profile oriented in a NE-SW direction One station near Maitri, the Indian base station is situated in gneissic terrain and other five on the continental ice sheet. High quality MT data have been collected at each station for duration about 4-5 days to acquire long period signals and also to obtain good quality of short period signals. Use of titanium electrodes as e-probes has reduced the contact resistance further to kilo-ohms and facilitated recording of high frequency signals. In the present study, the logistics of field data acquisition procedures of the wide band magnetotelluric study are presented along with a preliminary deep crustal geoelectric section. The crustal structure is compared with similar results from Indian shield. The deep electrical structure is compared with crustal structure obtained earlier from gravity studies.

# **D**eep crustal structure related to the Libby Thrust Belt of the Northern Rocky Mountains, USA

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Long-period and broadband data magnetotelluric (MT) data were acquired along a 140 km transect west from the Whitefish Range, Montana, to the Selkirk Crest, Idaho, USA – crossing the Purcell anticlinorium, Sylvanite anticline, and Purcell trench. A 2-D model characterizes two sub-horizontal, conductive horizons. A shallow conductive layer (10-15 km depth) begins west of the Whitefish Range, extends west for 60 km and ends beneath the Sylvanite anticline, and a more conductive deep layer (25-35 km depth) extends 60 km west from the Purcell anticlinorium to east of the Purcell trench. The entire crust is resistive farther west. These conductive horizons are interpreted as thrust repetitions of a single layer; the intervening resistive horizon is inferred to be displaced Archean crystalline basement. Total thrust shortening of 150-200 km is indicated.

# Magnetotelluric imaging of crustal magma storage beneath the Mesozoic crystalline mountains in a non-volcanic region, Northeast Japan

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Mesozoic crystalline mountains (Iide Mountains) in a non-volcanic region of the Northeast Japan arc were imaged by wide-band magnetotelluric soundings. A two-dimensional model shows that an anomalous conductive body (¡ 10ohmm) is clearly visible beneath the Iide Mountains. The conductor widens with increasing depth, and extends from the near-surface down to the base of the crust and perhaps into the upper mantle. The location of the conductive body correlates with high-temperature hot springs with high 3He/4He ratio, thinning of the brittle seismogenic layer and anomalies of low seismic velocity. We conclude that the conductor reflects the presence of partial melts in the crust, related to renewed magmatism in the present-day subduction system.

# Conductivity images of Proterozoic basin (Bhima), southern India

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We present an analysis and preliminary interpretation of magnetotelluric data collected in the Bhima basin (Proterozoic sediments) in southern part of India. The region is characterized by the sediments deposited in intra-cratonic basin with granite, gneisses as a basement. In general the deposition took place in an undisturbed, quite sea conditions. Magnetotelluric studies were conducted along three N-S profiles at 33 stations with station spacing of 7-10 km and profile spacing of 10 km in the frequency range 300–0.003 Hz. The preliminary two dimensional inversion models show a very resistive crust and upper mantle, and a surprising lack of conductive structures marking the contact region between of Archaean Craton and Proterozoic basin. The conductive lithosphere is thicker towards the cratonic region, while is thinner in the proterozoic terrane.

# COMPILATION OF MAGNETOTELLURIC EXPERIMENTS IN IBERIAN PENINSULA

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In the Iberian Peninsula different groups from Spain and Portugal have been developing methodological aspects of the magnetotelluric method, as well as its application to different scales and geological scenarios since late 80's. In this work we summarise some of the applications, covering a broad range from near surface to lithospheric studies. The near-surface studied have focussed are mainly related to hydrogeology and geological hazard studies. On the other hand the lithospheric studies have been carried out mainly in the alpine chains present in Iberia, namely Pyrenees, Cantabria Mountains and Betics, and also in the Variscan terranes of SW Iberia. Moreover, studies related to geothermal problems have been done in the Majorca, Azores and Canary islands among others.