

Headlines Himalaya

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Editorial Team: Shankar Bhattarai and Soniya Maharjan

For the 621th-622th issues of Headlines Himalaya, we reviewed journal articles from six sources and selected eighteen researches from three countries. We selected seven researches from Nepal and eleven researches from other Himalayan countries (India and China).

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Nepal-Himalaya

ASSESSMENT OF DROUGHT IMPACTS ON CROP YIELDS ACROSS NEPAL DURING 1987–2017

Kalpana Hamal, Shankar Sharma, Nitesh Khadka, Gebremedhin Gebremeskel Haile, Bharat Badayar Joshi, Tianli Xu, and Binod Dawadi

Meteorological Applications 27: e1950

Drought influences agriculture, hydrology, ecology and socio-economic systems globally. As agriculture is the primary source for livelihoods and contributes to ~27% of Nepal's total gross domestic product, it is essential to understand the impact of drought on maize and wheat crop yields to minimize the drought-related risks. This study presents insights about agricultural drought across Nepal during 1987–2017 using the Standardized Precipitation Evapotranspiration Index (SPEI). The temporal evolution of SPEI time series has revealed frequent occurrences of drought episodes during the cropping cycle of summer maize and winter wheat crops. Moreover, the turning point of the drought was detected in 2000 (1987–2000, 2001–2017) in different regions. The averaged frequency for the SPEIs (1, 3, 6 and 12) of drought years for summer maize (winter wheat) in the western, central and eastern regions increased by 13% (12.5%), 6% (7.5%) and 7% (8%), respectively, from 1987–2000 to 2001–2017. The relationship between Standardized Yield Residual Series, the detrended SPEI at 1–12 lags and soil moisture was observed for both crops. The most correlated crop growth period for summer maize and winter wheat was the sowing and growing period, respectively, indicating the sensitive period of water deficit. Besides, the correlation performed in the two sub-periods (1987–2000 and 2001–2017) shows that drought impacts increased in the western and central regions, whereas they substantially decreased in the eastern region during the cropping period of summer maize. However, the drought sensitivity for winter wheat was decreased in the western region but significantly increased in the central and eastern regions of Nepal. The results of this study provide important information useful for policymakers in monitoring and mitigating the drought-related risks on maize and wheat crops in Nepal.

For further readings: <https://doi.org/10.1002/met.1950>

BRICKS IN THE WALL: A REVIEW OF THE ISSUES THAT AFFECT CHILDREN OF IN-COUNTRY SEASONAL MIGRANT WORKERS IN THE BRICK KILNS OF NEPAL

Angela Daly, Alice Hillis, Shubhendra Man Shrestha, and Babu Kaji Shrestha

Geography Compass 2020: e12547

This paper explores experiences of Nepalese children of seasonal migrant workers in brick kilns and the particular vulnerabilities they face, as child labourers, as unpaid workers engaging informally in brick production or household work to the support family economy, or as children left behind in poor communities with varying support. The review provides a thematic analysis from child labour and migration literature from Nepal and South Asia from 2010–2020 to explore issues that affect children of families who internally migrate within Nepal to work in brick kilns. Two key themes and eight subthemes consistently emerged across the papers: Seasonal in-country migration to brick kilns and impacts on children (reasons for children to enter into migrant work; left-behind children; remittances; the role of gender on work and education) and the situation of children working in Nepalese brick kilns (living conditions; working conditions and occupational ill-health; psychosocial distress; child protection). The review found that literature on Nepalese children from brick kiln working families is subsumed into wider studies on migration with impacts on children's lives often reported as outcomes of findings rather than a main focus of studies. Furthermore, there is minimal recent empirical research with such families and children. This may be due to ethical dilemmas of doing research with children and difficulties in maintaining contact with families that move frequently.

For further readings: <https://doi.org/10.1111/gec3.12547>

RELATIVE INFLUENCE OF WILD PREY AND LIVESTOCK ABUNDANCE ON CARNIVORE-CAUSED LIVESTOCK PREDATION

Gopal Khanal, Charudutt Mishra, and Kulbhushansingh Ramesh Suryawanshi

Ecology and Evolution 10: 11787-11797

Conservation conflict over livestock depredation is one of the key drivers of large mammalian carnivore declines worldwide. Mitigating this conflict requires strategies informed by reliable knowledge of factors influencing livestock depredation. Wild prey and livestock abundance are critical factors influencing the extent of livestock depredation. We compared whether the extent of livestock predation by snow leopards *Panthera uncia* differed in relation to densities of wild prey, livestock, and snow leopards at two sites in Shey Phoksundo National Park, Nepal. We used camera trap-based spatially explicit capture–recapture models to estimate snow leopard density; double-observer surveys to estimate the density of their main prey species, the blue sheep *Pseudois nayaur*; and interview-based household surveys to estimate livestock population and number of livestock killed by snow leopards. The proportion of livestock lost per household was seven times higher in Upper Dolpa, the site which had higher snow leopard density (2.51 snow leopards per 100 km²) and higher livestock density (17.21 livestock per km²) compared to Lower Dolpa (1.21 snow leopards per 100 km²; 4.5 livestock per km²). The wild prey density was similar across the two sites (1.81 and 1.57 animals per km² in Upper and Lower Dolpa, respectively). Our results suggest that livestock depredation level may largely be determined by the abundances of the snow leopards and livestock and predation levels on livestock can vary even at similar levels of wild prey density. In large parts of the snow leopard range, livestock production is indispensable to local livelihoods and livestock population is expected to increase to meet the demand of cashmere. Hence, we recommend that any efforts to increase livestock populations or conservation initiatives aimed at recovering or increasing snow leopard population be accompanied by better herding practices (e.g., predator-proof corrals) to protect livestock from snow leopard.

For further readings: <https://doi.org/10.1002/ece3.6815>

VARIATION ON SOLAR WIND PARAMETERS AND TOTAL ELECTRON CONTENT OVER MIDDLE-LOW LATITUDE REGIONS DURING INTENSE GEOMAGNETIC STORMS

Roshan Kumar Mishra, Binod Adhikari, Narayan Prasad Chapagain, Rabin Baral, Priyanka Kumari Das, Virginia Klausner, and Manisha Sharma

Radio Science 55: e2020RS007129

Streams of the particle ejected from the sun and the extreme space weather conditions like storms, high-speed streamers (HSSs), interplanetary coronal mass ejections (ICMEs), corotating interaction regions (CIRs) and Interplanetary Shocks (IS) termed as geomagnetic storms have massive influence in the climate and component of the Earth's upper atmosphere such as total electron content (TEC). The Study of TEC helps to understand variation in ionospheric electron density during geomagnetic storms. Global Ionospheric Maps of TEC are a real-time mapping of GPS observations produced by ground-based stations. In this paper, we have analyzed three intense geomagnetic storms of the year 2015: during 16-21 March 2015 (The St. Patrick's Day storm), 21-24 June 2015 and 18-22 December 2015. We present the variations of IMF-Bz, Solar wind Parameters (V_{sw} , N_{sw} , and P_{sw}), and Geomagnetic Indices (AE and SYM-H), and the variation of Vertical Total Electron Content (VTEC) using simultaneous VTEC data from 12 GPS-TEC stations over the Indian, Australian, Brazilian and South African regions. We describe contrast in TEC throughout the globe using global ionospheric maps at a regular 2-hour interval of UT during the three intense geomagnetic storms. Moreover, we observed that heavily TEC influenced areas were found to be transposing through equatorial plane starting from eastern sectors to the western sectors. Indian Ocean, Atlantic Ocean and South Pacific Ocean sectors were affected flowingly. Global Ionospheric Maps evince that Indian and Brazilian sectors were affected heavily explaining the TID and Equatorial Anomaly as seen in those areas. The equatorial and low-latitude regions have been mainly affected by geomagnetic storms. All these results suggested that the acute disruption of global winds (surging towards the equator from higher latitudes) and electric fields commenced from magnetosphere-ionosphere interaction cause the severe modification in the equatorial, low-latitude region. We also checked the cross-correlation of VTEC of LCK3 station and various other stations during the period of high solar and geomagnetic activities; the correlation gradually increased with the nearby stations by latitudes in most of the cases which was another intriguing result. Thus, these results suggested that the storms were affected globally which is why we believe that variation of TEC over various stations of the globe could turn out to be very helpful in predicting solar wind coupling with the magnetosphere-ionosphere

For further readings: <https://doi.org/10.1029/2020RS007129>

ARTIFICIAL INTELLIGENCE AND HEALTH IN NEPAL

Alexander van Teijlingen, Tell Tuttle, Hamid Bouchachia, Brijesh Sathian, and Edwin van Teijlingen

Nepal Journal Epidemiology 10: 915-918

The growth in information technology and computer capacity has opened up opportunities to deal with much and much larger data sets than even a decade ago. There has been a technological revolution of big data and Artificial Intelligence (AI). Perhaps many readers would immediately think about robotic surgery or self-driving cars, but there is much more to AI. This Short Communication starts with an overview of the key terms, including AI, machine learning, deep learning and Big Data. This Short Communication highlights so developments of AI in health that could benefit a low-income country like Nepal and stresses the need for Nepal's health and education systems to track such developments and apply them locally. Moreover, Nepal needs to start growing its own AI expertise to help develop national or South Asian solutions. This would require investing in local resources such as access to computer power/capacity as well as training young Nepali to work in AI.

For further readings: <https://doi.org/10.3126/nje.v10i3.31649>

MAKING INCREMENTAL PROGRESS: IMPACTS OF A REDD+ PILOT INITIATIVE IN NEPAL

Bishnu P Sharma, Bhaskar S Karky, Mani Nepal, Subhrendu K Pattanayak, Erin O Sills, and Priya Shyamsundar

Environmental Research Letters 15: 105004

Reducing emissions from deforestation and forest degradation (REDD+) encompasses a range of incentives for developing countries to slow, halt and reverse forest loss and associated forest carbon emissions. Where there is high dependence on biomass energy, cleaner cooking transitions are key to REDD+'s success. Given the poor track record of efforts to promote clean cooking, more evidence is needed on the potential for REDD+ to reduce unsustainable extraction of biomass energy. We present a quasi-experimental impact evaluation of REDD+ in Nepal. Unsurprisingly, we find little evidence of impacts on forest carbon in just two years. We do find that REDD+ reduced forest disturbance as measured by four plot-level indicators (signs of forest fire, soil erosion, encroachment and wildlife) that are predictive of future changes in net carbon emissions and reflective of reduced extraction pressure by households. While our analysis of household survey data does not show that REDD+ reduced harvest of forest products, we find some evidence that it reduced household dependence on firewood for cooking, possibly by increasing use of biogas. Thus, communities in Nepal appear to have improved conditions in their forests without undermining local benefits of those forests. To secure progress towards reduced emissions and improved livelihoods, interventions must be designed to effectively meet household energy needs.

For further readings: <https://iopscience.iop.org/article/10.1088/1748-9326/aba924/>

ACKNOWLEDGING INDIGENOUS AND LOCAL KNOWLEDGE TO FACILITATE COLLABORATION IN LANDSCAPE APPROACHES—LESSONS FROM A SYSTEMATIC REVIEW

Portia Adade Williams, Likho Sikutshwa, and Sheona Shackleton

Land 9: 9090331

The need to recognize diverse actors, their knowledge and values is being widely promoted as critical for sustainability in contemporary land use, natural resource management and conservation initiatives. However, in much of the case study literature, the value of including indigenous and local knowledge (ILK) in the management and governance of landscapes tends to be overlooked and undervalued. Understanding ILK as comprising indigenous, local and traditional knowledge, this systematic review synthesizes how ILK has been viewed and incorporated into landscape-based studies; what processes, mechanisms and areas of focus have been used to integrate it; and the challenges and opportunities that arise in doing so. Queries from bibliographic databases (Web of Science, JSTOR, Scopus and Africa Wide) were employed. Findings from the review underscore that the literature and case studies that link landscapes and ILK are dominated by a focus on agricultural systems, followed by social-ecological systems, indigenous governance, natural resource management, biodiversity conservation and climate change studies, especially those related to early warning systems for disaster risk reduction. The growing importance of multi-stakeholder collaborations in local landscape research and the promotion of inclusive consultations have helped to bring ILK to the fore in the knowledge development process. This, in turn, has helped to support improved landscape management, governance and planning for more resilient landscapes. However, more research is needed to explore ways to more effectively link ILK and scientific knowledge in landscape studies, particularly in the co-management of these social-ecological systems. More studies that confirm the usefulness of ILK, recognize multiple landscape values and their interaction with structures and policies dealing with landscape management and conservation are necessary for enhanced sustainability.

For further reading: <https://doi.org/10.3390/land9090331>

India-Himalaya

PRODUCTION AND TRANSPORT OF SUPRAGLACIAL DEBRIS: INSIGHTS FROM COSMOGENIC ¹⁰BE AND NUMERICAL MODELING, CHHOTA SHIGRI GLACIER, INDIAN HIMALAYA

D. Scherler and D. L. Egholm

Many mountain glaciers carry some amount of rocky debris on them, which modifies surface ablation rates. The debris is typically derived from erosion of the surrounding topography and its supraglacial extent is predominantly controlled by the relative accumulation rates of debris versus snow. Because Global Warming results in shrinking glaciers as well as thawing permafrost worldwide, changes in both rates will most likely affect the evolution of supraglacial debris cover and thus the response of glaciers to climate change. Here we report ^{10}Be concentrations measured in five amalgamated debris samples collected from the main medial moraine of the Chhota Shigri Glacier, India. Results suggest headwall erosion rates that are $\sim 0.5\text{--}1\text{ mm year}^{-1}$, and apparently increasing (^{10}Be concentrations are decreasing) toward the present. We employed a numerical ice flow model that we combined with a new Lagrangian particle tracing routine to explore the impact of spatial and temporal variability in erosion rates and source areas on ^{10}Be concentrations in the medial moraine. Our modeling results show that neither changes in source areas, related to the transient response of the glacier to ongoing climate change, nor four different scenarios of spatial and temporal variability in erosion rates could explain the observed trend in ^{10}Be concentrations. Although not accounted for in our modeling explicitly, we suggest that the observed trend could be due to transiently enhanced erosion of recently deglaciated areas, or to greater spatial variability in erosion rates than explored in our models.

For further readings: <https://doi.org/10.1029/2020JF005586>

CLIMATIC VARIABILITY AT GANGTOK AND TADONG WEATHER OBSERVATORIES IN SIKKIM, INDIA, DURING 1961-2017

Parvendra Kumar, Milap Chand Sharma, Rakesh Saini, and Girish Kumar Singh

Scientific Reports 10: 15177

The present study documents the long-term trends in the temperature and precipitation of a poorly represented region, the Sikkim, eastern Himalaya using the Mann-Kendall non-parametric test and the Sen's slope estimator. Additionally, the normal distribution curves and Cusum charts have been used to identify the shifts in extreme events and to detect the points of change in the climatic data series for robust analysis. The minimum temperatures recorded a positive trend in Gangtok ($0.036\text{ }^{\circ}\text{C year}^{-1}$ from 1961 to 2017) as well as in Tadong ($0.065\text{ }^{\circ}\text{C year}^{-1}$ from 1981 to 2010) stations, while the maximum temperatures showed no trend in Tadong station from 1981 to 2010 which is consistent with the trend in Gangtok station for the overlapped period. However, it was negative for the overall assessed period ($-0.027\text{ }^{\circ}\text{C year}^{-1}$ from 1961 to 2017) in Gangtok. The average temperatures in Gangtok recorded no trend whereas a positive trend ($0.035\text{ }^{\circ}\text{C year}^{-1}$ from 1981 to 2010) was observed at Tadong station. A similar positive trend in the average temperatures has been detected at Gangtok also for the overlapped period. Accelerated warming was noticed during the last two decades with an increase in the probability of extreme events of temperatures (minimum, maximum, average) at the higher end. Precipitation was found to be more variable across the observed period and suggested no trend in the study area

For further readings: [10.1038/s41598-020-71163-y](https://doi.org/10.1038/s41598-020-71163-y)

MICROBIAL DIVERSITY IN RELATION TO PHYSICO-CHEMICAL PROPERTIES OF HOT WATER PONDS LOCATED IN THE YAMUNOTRI LANDSCAPE OF GARHWAL HIMALAYA

Rahul Kumar and Ramesh C. Sharma

Heliyon 6: e04850

The current study includes the assessment of physico-chemical characteristics along with the microbial diversity of hot water samples collected from three important sacred hot water springs of the Uttarakhand Himalaya close to the world-famous Hindu shrine Yamunotri temple. Hot water samples were collected for two consecutive years 2015–2016 in two sampling operations each year. A total of fifteen physico-chemical attributes of hot water were recorded. Microbes of hot water ponds were characterized by morphological, biochemical, MALDI-TOF MS, and

molecular approaches. A total of twenty-two microbial strains were identified from the Surya Kund with water temperature ranging between 86 °C and 89 °C; twenty-two microbial strains were identified from the Draupadi Kund with water temperature ranging between 65 °C and 69 °C and twenty-one microbial strains were identified from the Yamunotri Tapt Kund with water temperature ranging between 45 °C and 48 °C during the study period. The present study on the assessment of physico-chemical characteristics and thermophilic microbial diversity of all the three hot water springs can be a useful reference for further studies on similar aspects in other parts of the Himalaya. The available data will also help to understand the reasons behind the curative properties of these hot water springs. This baseline information will also be instrumental for the conservation and management of these hot water springs.

For further readings: <https://doi.org/10.1016/j.heliyon.2020.e04850>

DISENTANGLING SOURCE OF MOISTURE DRIVING GLACIER DYNAMICS AND IDENTIFICATION OF 8.2 KA EVENT: EVIDENCE FROM PORE WATER ISOTOPES, WESTERN HIMALAYA

Om Kumar , A. L. Ramanathan, Jostein Bakke, B. S. Kotlia, and J. P. Shrivastava

Scientific Reports 10: 15324

Two atmospheric circulation patterns, the Indian Summer Monsoon (ISM) and mid-latitude Westerlies control precipitation and thus glacier variability in the Himalaya. However, the role of the ISM and westerlies in controlling climate and thus past glacier variability in the Himalaya is poorly understood because of the paucity of the ice core records. In this article, we present a new Holocene paleorecord disentangling the presence of the ISM and mid-latitude westerlies and their effect on glacier fluctuations during the Holocene. Our new record is based on high-resolution multi-proxy analyses ($\delta^{18}\text{O}$ porewater, deuterium-excess, grain size analysis, permeability, and environmental magnetism) of lake sediments retrieved from Chandratat Lake, Western Himalaya. Our study provides new evidence that improves the current understanding of the forcing factor behind glacier advances and retreat in the Western Himalaya and identifies the 8.2 ka cold event using the aforementioned proxies. The results indicate that the ISM dominated precipitation ~ 21% of the time, whereas the mid-latitude westerlies dominated precipitation ~ 79% of the time during the last 11 ka cal BP. This is the first study that portrays the moisture sources by using the above proxies from the Himalayan region as an alternative of ice core records.

For further readings: <https://doi.org/10.1038/s41598-020-71686-4>

PREVALENCE OF DIABETES AND PREDIABETES IN TRIBAL POPULATION OF KASHMIR: LESSONS FOR THE FUTURE

Mohd Ashraf Ganie, Tajali Sahar, Aafia Rashid, Mohd Saleem Baba, Nisar Ahmad, Hilal Bhat, Imtiaz Ahmad Wani, and Zafar Amin Shah

Diabetes Research and Clinical Practice 169: 108457

Considering a surge in the incidence of Diabetes mellitus (DM) across all ethnic groups and lack of any representative data from the tribal communities of Jammu and Kashmir, the present study aimed to assess the prevalence of DM and prediabetes in them. Subjects were recruited from five districts of Kashmir valley using multistage cluster sampling by probability proportional to size (PPS) technique. Data collection included recording of socio-demographic, medical facts, assessment of anthropometric parameters and biochemical evaluation HbA1c and random blood glucose measurements as per the American Diabetes Association (ADA) criteria were used for diagnosis of DM. A total of 6808 subjects were recruited in this study including 2872 (42%) men and 3936 (58%) women with mean age of 39.60 ± 20.19 years and 35.17 ± 16.70 years, respectively. Around 8.60% subjects were obese, 38.9% were found to be hypertensive, 73% had dyslipidemia and 3.75% had metabolic syndrome. About 1.26% (0.5% males and 0.9% females) had DM and 11.64% had prediabetes based on HbA1c cut offs. Increasing age, body mass index and family history portend significant risk factors while smoking and sedentary lifestyle increased the risk marginally. Although the prevalence of DM among tribals of Kashmir valley is lower than general

population, the higher prediabetes to DM ratio may indicate a future trend of increasing DM prevalence in this disadvantageous subpopulation.

For further readings: [10.1016/j.diabres.2020.108457](https://doi.org/10.1016/j.diabres.2020.108457)

China Himalaya

MIOCENE SUBSIDENCE AND SURFACE UPLIFT OF SOUTHERNMOST TIBET INDUCED BY INDIAN SUBDUCTION DYNAMICS

T. Shen, G. Wang, A. Replumaz, L. Husson, A. A. G. Webb, M. Bernet, P. H. Leloup, P. Zhang, G. Mahéo, and K. Zhang

Geochemistry, Geophysics, Geosystems 21: e2020GC009078

The Indus-Yarlung suture of southernmost Tibet marks the initial collisional zone, the ongoing India-Asia collision, and yet more than ~30 million years after the onset of collision, a thick detrital sedimentary unit was deposited just north of the suture: the Kailas Formation. The mechanism permitting subsidence of the deep intracontinental Kailas basin in a compressional tectonic regime remains uncertain. We present new apatite (16-11 Ma) and zircon (24-19 Ma) fission-track (AFT and ZFT) ages from the Gangdese batholith just north of the Kailas basin. ZFT analysis of modern-river sand from the northern Gangdese magmatic arc indicates an exhumation at 27.3 ± 1.3 Ma. Thermal modeling indicates that the batholith experienced reheating between 28 and 20 Ma, coeval with deposition in the Kailas basin (between 26 and 21 Ma), followed by overall rapid cooling between 20 and 17 Ma. We interpret this thermal history as a phase of regional Oligocene-Miocene sedimentary burial followed by exhumation. By modeling mantle dynamics in the geodynamic framework of the India-Asia collision, we show that transient dynamic topography over the relative southward folding of the Indian slab is consistent with burial and exhumation of the Gangdese magmatic arc during Oligocene-Miocene time. The northward migration of the Indian continent relative to its own stationary slab created a wave of dynamic topography that caused subsidence in the overriding plate north of the Himalaya, followed by a phase of surface uplift since ~27 Ma of the northern Gangdese magmatic arc. During latest Oligocene-early Miocene time, the dynamic deflection center was in the Kailas area, and it progressively relocated southwards to its present position at the Ganges basin.

For further readings: <https://doi.org/10.1029/2020GC009078>

LITHOSPHERIC DENSITY STRUCTURE AND EFFECTIVE ELASTIC THICKNESS BENEATH HIMALAYA AND TIBETAN PLATEAU: INFERENCE FROM THE INTEGRATED ANALYSIS OF GRAVITY, GEOID, AND TOPOGRAPHIC DATA INCORPORATING SEISMIC CONSTRAINTS

M. Ravikumar, B. Singh, V. Pavan Kumar, A. V. Satyakumar, D. S. Ramesh, and V. M. Tiwari

Tectonics 39: e2020TC006219

Investigation of deep crustal and lithospheric structures is essential to understand the nature of geodynamical processes beneath the Himalaya and Tibetan plateau of the India-Eurasia collision zone. Our density cross sections across the Himalaya-Eurasia collision zone using integrated 2-D modeling of gravity, topography, and geoid data incorporating constraints from seismic information supports the above contention. Analysis of gravity, geoid, and elevation data over the interior of the Tibetan plateau predicts complete isostatic compensation, whereas margins of the plateau, having large topographic gradients, show lack of isostatic compensation as the Airy Moho differs from flexural Moho and seismic Moho beneath the Himalaya. Our 2-D modeled lithospheric cross sections show thick crust (~75 km) and thick lithosphere (~240 km) beneath the Himalayas and southern Tibetan plateau and relatively thin crust (~60 km) and thin lithosphere (~140 km) beneath the northern Tibetan plateau. Therefore,

depth of lithosphere-asthenosphere boundary (LAB) mimics the Moho relief. Thinner crust and thin lithosphere under northern Tibetan plateau suggest the importance of the mantle isostasy where the temperature is anomalously high. This corroborates with the presence of recent potassic volcanism, inefficient Sn propagation, east and southeast oriented global positioning system displacements, and large shear wave splitting anisotropy (>2 s). Excellent correlation between effective elastic thickness and lithospheric thickness predicts hot and deformable lithosphere in the northern Tibet and underthrusting of cold Indian mantle beneath the Himalayas.

For further readings: <https://doi.org/10.1029/2020TC006219>

NEW INSIGHTS INTO CRUSTAL AND MANTLE FLOW BENEATH THE RED RIVER FAULT ZONE AND ADJACENT AREAS ON THE SOUTHERN MARGIN OF THE TIBETAN PLATEAU REVEALED BY A 3-D MAGNETOTELLURIC STUDY

Nian Yu, Martyn Unsworth, Xuben Wang, Dewei Li, Enci Wang, Ruiheng Li, Yuanbang Hu, and Xuelin Cai

Journal of Geophysical Research Solid Earth 125: e2020JB019396

A number of geodynamic models have been proposed for the southeastern margin of the Tibetan plateau and include a range of deformation processes. One unresolved issue is whether crustal and mantle flow occurs, and if it does, how flow contributes to the mass balance of the India-Asia collision. To address this question, new magnetotelluric data were collected and used to derive a three-dimensional electrical resistivity model of the crust and upper mantle beneath the Red River Fault (RRF) zone and adjacent areas. The most prominent features of the model are (1) a resistor in the upper-middle crust directly beneath the trace of the RRF; (2) a major change in upper mantle resistivity across the RRF; and (3) a significant conductor in the upper mantle northeast of the RRF, which extends upward into the crust, and which requires a melt fraction of up to 3%. The model suggests that the lower crustal conductors may be due to melt/fluids derived from the mantle, rather than from outward flow from Tibet. The most likely source of fluids and melts could be upwelling mantle flow related to the Hainan mantle plume. The change in resistivity across the RRF implies a change in lithospheric strength may explain the present-day localization of deformation and uplift at this location. The resistivity model may also give insights into the distribution of ore deposits in Ailao Shan, since many mineral deposits are derived from magmatic fluids generated in the mantle at the edges of regions of thick lithosphere.

For further readings: <https://doi.org/10.1029/2020JB019396>

SOIL FUNGAL COMMUNITY COMPOSITION DIFFERS SIGNIFICANTLY AMONG THE ANTARCTIC, ARCTIC, AND TIBETAN PLATEAU

Tao Zhang, Nengfei Wang, and Liyan Yu

Extremophiles 24: 821-829

Fungi are widely distributed in all terrestrial ecosystems, and they are essential to the recycling of nutrients in all terrestrial habitats on earth. We wanted to determine the relationship between soil fungal communities and geochemical factors (geographical location and soil physicochemical properties) in three widely separated geographical regions (the Antarctic, Arctic, and Tibet Plateau). Using high-throughput Illumina amplicon sequencing, we characterized the fungal communities in 53 soil samples collected from the three regions. The fungal richness and diversity indices were not significantly different among the three regions. However, fungal community composition and many fungal taxa (Thelebolales, Verrucariales, Sordariales, Chaetothyriales, Hypocreales, Pleosporales, Capnodiales, and Dothideales) significantly differed among three regions. Furthermore, geographical location (latitude and altitude) and six soil physicochemical properties (SiO_4^{2-} -Si, pH, NO_3^- -N, organic nitrogen, NO_2^- -N, and organic carbon) were significant geochemical factors those were correlated with the soil fungal community composition. These results suggest that many geochemical factors influence the distribution of the fungal species within the Antarctic, Arctic, and Tibet Plateau.

For further readings: DOI: [10.1007/s00792-020-01197-7](https://doi.org/10.1007/s00792-020-01197-7)

DIVERSE BACTERIAL COMMUNITIES FROM Q Aidam Basin OF THE QINGHAI-TIBET PLATEAU: INSIGHTS INTO VARIATIONS IN BACTERIAL DIVERSITY ACROSS DIFFERENT REGIONS

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The Qaidam Basin of the Qinghai-Tibet Plateau is a cold, hyper-arid desert that presents extreme challenges to microbial communities. As little is known about variations between surface and subsurface microbial communities, high-throughput DNA sequencing was used in this study to profile bacterial communities of the soil samples collected at different depths in three regions in the Qaidam Basin. The α -diversity indices (Chao, Shannon, and Simpson) indicated that bacterial abundance and diversity were higher in the east and the high-elevation regions compared to the west region. In general, *Firmicutes* was dominant in the west region, while *Proteobacteria* and *Acidobacteria* were dominant in the east and the high-elevation regions. The structure of the bacterial communities differed greatly across regions, being strongly correlated with total organic carbon (TOC) and total nitrogen (TN) content. The differences in bacterial communities between the surface and the subsurface soil samples were smaller than the differences across the regions. Network analyses of environmental factors and bacterial genera indicated significant positive correlations in all regions. Overall, our study provides evidence that TOC and TN are the best predictors of both surface and subsurface bacterial communities across the Qaidam Basin. This study concludes that the bacterial community structure is influenced by both the spatial distance and the local environment, but environmental factors are the primary drivers of bacterial spatial patterns in the Qaidam Basin.

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DETERMINING THE CONTRIBUTIONS OF CLIMATE CHANGE AND HUMAN ACTIVITIES TO THE VEGETATION NPP DYNAMICS IN THE QINGHAI-TIBET PLATEAU, CHINA, FROM 2000 TO 2015

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Reflecting on the change in the global biodiversity pattern, the Tibetan Plateau, considered to be a "natural laboratory" for analyzing environmental change in China and around the world, has suffered profound changes in the vegetation ecosystem. This study introduces the gravity center model and geographical detectors to examine and discuss the spatial-temporal change pattern and the driving mechanism behind vegetation net primary production (NPP) in the Qinghai-Tibet Plateau from the year 2000 to 2015 while also quantitatively classifying the relative roles incorporated in the NPP change process. The study found that (1) from 2000 to 2015, the annual average NPP of the Tibetan Plateau demonstrated a declining trend from southeast to northwest. (2) The gravity center of vegetation NPP on the Qinghai-Tibet Plateau seems to have shifted eastward in the past 16 years, indicating that the level of vegetation NPP in the east depicts a greater increment and growth rate than the west. (3) In the arid regions, temperature and rainfall appear as the dominant factors for vegetation NPP, while slope and aspect parameters have constantly assumed dominancy for the same in the tropical rainforest-monsoon ecological zone in southeastern Tibet. (4) The structure of vegetation NPP exhibits an interaction between human and natural factors, which enhances the influence of single factors. (5) Considering the global ecological change and related human activities, certain differences are observed in the dominant and interaction factors for different study periods and ecological subregions in the Qinghai-Tibet Plateau. The research results could prove conclusive for vegetation ecological protection in the Qinghai-Tibet plateau.

For further readings: [10.1007/s10661-020-08606-6](https://doi.org/10.1007/s10661-020-08606-6)