

Headlines Himalaya

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Editorial Team: Shankar Bhandari and Adarsha Subedi

For the 571-572th issues of Headlines Himalaya, we reviewed journal articles from five sources and selected eight happenings from three countries. We selected five happenings from Nepal and three happenings from other Himalayan countries (India and China). The overall coverage of this issue is biodiversity, climate change, microbiology, pollution and environment.

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NEPAL

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NITROGEN SPECIATION AND ISOTOPIC COMPOSITION OF AEROSOLS COLLECTED AT HIMALAYAN FOREST (3326 M A.S.L.): SEASONALITY, SOURCES, AND IMPLICATIONS

LC-MSN AND HR-MS CHARACTERIZATION OF SECONDARY METABOLITES FROM *HYPERICUM JAPONICUM* THUNB. EX MURRAY FROM NEPALESE HIMALAYAN REGION AND ASSESSMENT OF CYTOTOXIC EFFECT AND INHIBITION OF NF-KB AND AP-1 TRANSCRIPTION FACTORS IN VITRO

Gregorio Peron, Jan Hošek, Sangeeta Rajbhandary, Deepak Raj Pant, and Stefano Dall'Acqua

Journal of pharmaceutical and biomedical analysis 174 (2019): 663-673.

ABSTRACT

Hypericum japonicum Thunb. ex Murray is traditionally used in Nepal to treat several diseases, among whom inflammation and acute pain. Although several secondary metabolites from the same *Hypericum* species have been already characterized and considered for their pharmacological use, an exhaustive phytochemical characterization of *H. japonicum* from Nepal is lacking, as well as the assessment of its potential pharmacological properties. Hence, the aims of this study were the characterization of a methanolic extract of *H. japonicum* (HJME) collected from the Northern region of Nepal by LC-MSn and UPLC-QTOF. The assessment of *in vitro* inhibition of nuclear factor kappa-light-chain-enhancer of activated B cells (NF-κB) and activator protein 1 (AP-1) transcription factors and HJME's cytotoxic effect on human cell lines was performed to evaluate the potential use of this herb as a source of anti-inflammatory and cytotoxic lead compounds. Fifty-seven phytoconstituents were identified, being mainly flavonoids, phloroglucinols, phenolic acids and xanthenes. Although compounds characteristic of *H. japonicum* were detected (quercetin, quercetin-7-O-α-l-rhamnoside, quercitrin and hyperoside), several others are here reported for the first time in this species. The results from bioassays indicated that HJME could significantly reduce the viability of human THP-1 cells ($IC_{50} = 5.4 \pm 1.1 \mu\text{g mL}^{-1}$), showing the promising potential of HJME as anti-tumor agent. Furthermore, HJME significantly decreased the activation of both NF-κB and AP-1 at the concentration of $2 \mu\text{g mL}^{-1}$. Overall, these data suggest that *H. japonicum* from Nepal could be used as a source of potential natural anti-inflammatory and anti-tumor lead compounds.

For further details: <https://doi.org/10.1016/j.jpba.2019.06.042>

BACTERIAL COMMUNITY COMPOSITION AND DIVERSITY IN KOSHI RIVER, THE LARGEST RIVER OF NEPAL

Namita Paudel Adhikari, Yongqin Liu, Keshao Liu, Fan Zhang, Subash Adhikari, Yuying Chen, and Xiaobo Liu

Ecological Indicators 104 (2019): 501-511.

ABSTRACT

Large rivers serve as hotspots for the biogeochemical cycling of nutrients in which the role of microorganisms is crucial. Therefore, understanding the bacterial abundance, diversity, community composition, biogeography, and controlling environmental factors in such habitats is important. However, the information is still unexplored in Himalayan Rivers and their associated ecosystem towards the southern slopes, Nepal. Thus, composition and diversity of particle-attached (PA) and free-living (FL) bacteria was investigated along the mainstream and major tributaries of Koshi River i.e. the largest river of Nepal, using 16S rRNA gene-based Illumina MiSeq platform. Bacterial community composition significantly differed in habitat (mainstream and tributaries) and lifestyle (PA and FL), and the habitat variation was more pronounced than lifestyle variation. Likewise, bacterial communities were dissimilar in more geographically distant sites and vice versa. Distinct dominant taxa in mainstream and tributaries were indicative of different input sources and environmental conditions. Ten OTUs belonging to the phyla Proteobacteria, Firmicutes, Actinobacteria, and Bacteroidetes contributed to more 50% of the bacterial community dissimilarity in two habitats. Geographical distance and water physicochemical properties explained for the most

variation in PA and FL bacteria, respectively. Nonetheless, the individual effect of geographical distance was highest in both PA and FL bacteria. Effect of particulate environmental factor like TSS in variation of PA bacteria and that of dissolved environment factors like DOC and EC in FL bacteria was remarkable.

For further details: <https://doi.org/10.1016/j.ecolind.2019.05.009>

ASSESSING THE SPATIAL, SPECTRAL, AND TEMPORAL CONSISTENCY OF TOPOGRAPHICALLY CORRECTED LANDSAT TIME SERIES COMPOSITES ACROSS THE MOUNTAINOUS FORESTS OF NEPAL

Kaspar Hurni , Jamon Van Den Hoek, and Jefferson Fox

Remote Sensing of Environment 231 (2019): 111225.

ABSTRACT

In mountainous regions slope and aspect result in variations in the illumination condition and the same land cover type can therefore show differences in the reflectance depending on the orientation of the terrain slope towards the sun and the sensor of the satellite. Different topographic illumination correction methods exist and their performance varies depending on e.g. sun zenith and land cover type. Similarly a variety of evaluation criteria exist to assess the performance of the topographic correction methods and each evaluation criteria usually only considers certain aspects of the ability of the topographic correction method in reducing signal-to-noise. In this article we present a novel framework for the evaluation of topographically corrected image composites using cloud computing. We evaluated six topographic correction methods (Bin Tan, C-Correction, Minnaert with slope, Sun-Canopy-Sensor plus C-Correction, Statistical-Empirical, and Variable Empirical Coefficient Algorithm) in forest areas of four Landsat footprints in Nepal for a time series of image composites from 1988 to 2016. Our evaluation shows that the Statistical-Empirical topographic correction method provides the best overall performance, but in some years and footprints also other methods can show the best performance. We discuss these differences and related reasons in detail and give recommendations on the best use and evaluation of topographic correction methods.

For further details: <https://doi.org/10.1016/j.rse.2019.111225>

TRENDS IN WINTER FOG EVENTS IN THE TERAI REGION OF NEPAL

Shreemat Shrestha, Graham A. Moore, and Murray C. Peel

Agricultural and forest meteorology 259 (2018): 118-130.

ABSTRACT

Winter fog events of the Indo Gangetic plain (IGP) including the Terai area of Nepal are considered to be one of the important public concerns due to their effect on people's health, transportation, and agriculture. Unlike the IGP area of India, Pakistan and Bangladesh there are only very few fog related studies reported about the Terai region of Nepal. This study is carried out to study the occurrence of fog in the Terai region of Nepal by analysing the historical visibility data from 1980 to 2015 at four airports in the region (Nepalgunj, Bhairahawa, Simara and Biratnagar). It was found that the fog events in the Terai start in the month of November reach the peak in December/January and end by the end of February. The average number of foggy days ranged from 24 days to 56 days per annum and average number of day-time foggy hours varied from 71 to 169 in the study. Visibility during winter is decreasing at all stations during the study period. The Man Kendall test indicated fog related parameters such as foggy days, foggy hours, dense foggy days, dense foggy hours have increasing trends at least at 0.1 level of statistical significance during the study period. The increasing trend of foggy days and daytime foggy hours may reduce winter crop production and negatively affect the food security of the Terai region of Nepal.

For further details: <https://doi.org/10.1016/j.agrformet.2018.04.018>

ENVIRONMENTAL VARIABILITY AND CHILD GROWTH IN NEPAL

Gerald Shively, Celeste Sununtnasuk, and Molly Brown

Health & place 35 (2015): 37-51.

ABSTRACT

Data from the 2011 Nepal Demographic Health Survey are combined with satellite remotely sensed Normalized Difference Vegetation Index (NDVI) data to evaluate whether interannual variability in weather is associated with child health. For stunting, we focus on children older than 24 months of age. NDVI anomaly averages during cropping months are evaluated during the year before birth, the year of birth, and the second year after birth. For wasting, we assess children under 59 months of age and relate growth to NDVI averages for the current and most recent growing periods. Correlations between short-run indicators of child growth and intensity of green vegetation are generally positive. Regressions that control for a range of child-, mother- and household-specific characteristics produce mixed evidence regarding the role of NDVI anomalies during critical periods in a child's early life and the subsequent probability of stunting and wasting. Overall findings suggest that the relationship between environmental conditions and child growth are heterogeneous across the landscape in Nepal and, in many cases, highly non-linear and sensitive to departures from normality.

For further details: <https://doi.org/10.1016/j.healthplace.2015.06.008>

India-Himalaya

A NEW *MICROHYLA* SPECIES (ANURA: MICROHYLIDAE) FROM RIPARIAN EVERGREEN FOREST IN THE EASTERN HIMALAYAN STATE OF ARUNACHAL PRADESH, INDIA

S. D. Biju, Sonali Garg, Rachunliu G. Kamei and Gopinathan Maheswaran

Zootaxa 4674 (2019): 100-116.

ABSTRACT

A new frog species of the genus *Microhyla* (Anura, Microhylidae) is described from riparian mid-elevation (860 m asl) evergreen forest in Namdapha National Park, located in the eastern Himalayan state of Arunachal Pradesh, India. The new species can be morphologically distinguished from other congeners by a suite of characters such as adult size, dorsal and lateral colouration and markings, snout shape, foot webbing, and digit tip morphology. Phylogenetically, the new species is more closely related to some of the smallest known members of the genus. It forms a deeply divergent sister lineage to the clade containing members of the *Microhyla zeylanica* species group that are restricted to Peninsular India and Sri Lanka, and shows sequential relationship with Southeast Asian species *M. superciliaris*, followed by clade containing *M. aurantiventris* + *M. butleri*. The discovery indicates that novel taxa representing distinct evolutionary lineages still remain to be formally described in the genus *Microhyla*, especially from less explored regions such as the eastern Himalayan forests in Northeast India.

For further details: <http://dx.doi.org/10.11646/zootaxa.4674.1.5>

TREE-RING $\delta^{18}\text{O}$ RECORDS OF ABATING JUNE–JULY MONSOON RAINFALL OVER THE HIMALAYAN REGION IN THE LAST 273 YEARS

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Quaternary International 532 (2019): 48-56.

ABSTRACT

There are knowledge gaps in the long-term changes in Indian summer monsoon rainfall (ISMR, June–September) behaviour, which affects the livelihood of large population in the Indian subcontinent. To better understand ISMR variability, we reconstructed June–July rainfall for the period 1743–2015 CE from Dingad valley, Uttarakhand, central Himalaya using $\delta^{18}\text{O}$ variations in tree rings. For this, regional mean tree-ring isotope chronology, prepared by merging $\delta^{18}\text{O}$ chronologies of two conifer (*Abies pindrow* (Royle ex D. Don) Royle and *Picea smithiana* (Wall.) Boiss) and one broadleaf deciduous species (*Aesculus indica* (Wall. ex Camb.) Hook), was used. The reconstructed rainfall series revealed significant correlations with the observational monsoon records from different regions of India. The most conspicuous feature in our reconstructed series is a decreasing rainfall trend since 1743 CE with the driest period in the late 20th and early 21st centuries, which is consistent with other monsoon rainfall proxies from a large part of the south Asian monsoon region (India, Nepal, Bhutan, Myanmar and Tibet Plateau). Consistency of reconstructed series with instrumental records and proxies from different regions revealed the capture of regional scale rainfall features in our data testifying its utility in understanding ISMR variability in long-term perspective.

For further details: <https://doi.org/10.1016/j.quaint.2019.09.030>

China Himalaya

NITROGEN SPECIATION AND ISOTOPIC COMPOSITION OF AEROSOLS COLLECTED AT HIMALAYAN FOREST (3326 M A.S.L.): SEASONALITY, SOURCES, AND IMPLICATIONS

Hemraj Bhattarai, Yan-Lin Zhang, Chandra Mouli Pavuluri, Xin Wan, Guangming Wu, Peilin Li, Fang Cao, Wengi Zhang, Yongjie Wang, Shichang Kang, Kirpa Ram, Kimitaka Kawamura, Zhenming Ji, David Widory, and Zhiyuan Cong

Environmental Science and Technology 53 (2019): 12247-12256

ABSTRACT

Nitrogenous aerosols are ubiquitous in the environment and thus play a vital role in the nutrient balance as well as the Earth's climate system. However, their abundance, sources, and deposition are poorly understood, particularly in the fragile and ecosensitive Himalayan and Tibetan Plateau (HTP) region. Here, we report concentrations of nitrogen species and isotopic composition ($\delta^{15}\text{N}$) in aerosol samples collected from a forest site in the HTP (i.e., Southeast Tibet). Our results revealed that both organic and inorganic nitrogen contribute almost equally with high abundance of ammonium nitrogen ($\text{NH}_4^+\text{-N}$) and water-insoluble organic nitrogen (WION), contributing ~40% each to aerosol total nitrogen (TN). The concentrations and $\delta^{15}\text{N}$ exhibit a significant seasonality with ~2 times higher in winter than in summer with no significant diurnal variations for any species. Moreover, winter aerosols mainly originated from biomass burning emissions from North India and East Pakistan and reached the HTP through a long-range atmospheric transport. The TN dry deposition and total deposition fluxes were $2.04 \text{ kg ha}^{-1} \text{ yr}^{-1}$ and $6.12 \text{ kg ha}^{-1} \text{ yr}^{-1}$ respectively. Our results demonstrate that the air contamination from South Asia reach the HTP and is most likely impacting the high altitude ecosystems in an accepted scenario of increasing emissions over South Asia.

For further details: <https://doi.org/10.1021/acs.est.9b03999>