Geophysical Research Abstracts
Vol. 19, EGU2017-4816, 2017
EGU General Assembly 2017

Development of a multidisciplinary method for mapping spatial extent and C-content of tropical ombrotrophic peatlands

Gábor Illés (1), Agus Kristijono (2), Norbert Pfeifer (3), László Pásztor (4), Ari Shandhyavitri (5), Gábor Szatmári (4), Sigit Sutikno (5), Gábor Molnár (6), Péter László (4), Mátyás Árvai (4), János Mészáros (9), Sándor Koós (4), Zsófia Bakacsi (4), Katalin Takács (4), Géza Király (7), Balázs Székely (3,6,8)

(1) NARIC Forest Research Institute, Sárvár, Hungary (illes.gabor@erti.naik.hu), (2) Badan Pengkajian dan Penerapatan Teknologi, Jakarta, Indonesia (gus.kris@yahoo.com.sg), (3) Department of Geodesy and Geoinformation, Technische Universität, Wien, Vienna, Austria (Norbert.Pfeifer@geo.tuwien.ac.at), (4) Institute for Soil Sciences and Agricultural Chemistry, Centre for Agricultural Research, Hungarian Academy of Sciences, Budapest, Hungary (pasztor.laszlo@agrar.mta.hu), (5) Pusat Studi Bencana, Universitas Riau, Pekanbaru, Indonesia (ssutiknoyk@gmail.com), (6) Department of Geophysics and Space Science, Eötvös University, Budapest, Hungary (molnar@sas.elte.hu), (7) University of Sopron, Department of Geodesy and Remote Sensing, Sopron, Hungary (kiraly.geza@emk.nyme.hu), (8) Interdisziplinäres Ökologisches Zentrum, TU Bergakademie Freiberg, Freiberg, Germany (balazs.szekely@geo.tuwien.ac.at), (9) Department of Cartography and Geoinformatics, Eötvös University, Budapest, Hungary (messer.janos@gmail.com)

One of the world's most worrying environmental problems is the peat land CO_2 emission problem of Indonesia: peat lands developed during the Quaternary are now under strong human influence; the artificial lowering of the natural water table leads to rapid drying and compaction of the peat layer, which then becomes vulnerable to subsurface fire. The emitted CO_2 of this process is assessed to be 0.5 billion tonnes from Indonesia that is slightly higher than total emission of e.g. United Kingdom in 2014 (0.42 billion tonnes). To cope with the problem it is inevitable to assess the extents of peat lands and volumetric estimation of the potentially affected layers.
Methods suitable for mapping of the peat lands (current situation and as far as possible retrospectively), thickness determination and partly thickness estimation of the peat layer are integrated in an advanced geostatistical approach building upon geomorphic, ecological, remote sensing, and geophysical methods to provide information on peat matrix attributes such as peat thickness of organo-mineral horizons between peat and underlying substrate, the presence of buried wood, buttressed trees or tip-up pools and soil type.
In order to cope with the problem, our research group is developing a multidisciplinary methodology making use of our experience in soil science, GIS, remote sensing for forestry and ecology, geomorphometry, geophysics, LiDAR remote sensing, parameter estimation and geostatistical methods. The methodology is based largely on GIS data integration, but also applies technologies of 'big data' processing. Our integrative attitude ensures the holistic consideration of the problem, analyzing its origins, temporal development and varying spatial extent, its subprocesses in a multi-scale, inter- and transdisciplinary approach. At the same time practical problems, feasibility, costs, and human resource need consideration in order to design a viable solution.
In the development of the solution, elements of gathered experience is integrated acquired in previous similar projects in Hungary, in the Pannonian Basin and in Indonesia, in southern Kalimantan and Indragiri Hilir, Sumatra. The pointwise and profilewise data acquisition of peat forms is converted to mapping methods augmented with a sophisticated sampling strategy. Besides the similarities – freshwater, ombrotrophic peatlands – we also have to focus on remarkable dissimilarities – e.g., herbaceous vs. woody peat material. In the case of the Pannonian Basin the peat occurrences have been developed as the filling up of the floodplains. In the Indonesian case, however, only the basin flanks are partly comparable to that generation mechanism, whereas see level changes play an important role in the development of the vast Indonesian peat occurrences.
Geomorphometric approach helps in designing the sample strategy, remote sensing tools are responsible to deliver high-resolution topographic data as input. The varying thickness is assessed with geophysical measurements and shallow boreholes deployed at sampling points and profiles dictated by the sophisticated sampling strategy. During the measurement and sampling the experience gathered is fed back to the sampling strategy giving a dynamic plan for the continuation of the sampling.
The advanced evaluation and visualization techniques applied result in a digital map system that also contains estimates on its quality and accuracy in the spatial context. This new approach brings us closer to the understanding of Indonesian peatland development that may also be used elsewhere in similar environmental contexts.