Geophysical Research Abstracts
Vol. 12, EGU2010-12758, 2010
EGU General Assembly 2010

Monitoring impact of urban settlements on nearby protected areas from space

Christoph Aubrecht (1), Malanding Jaiteh (2), Alexander de Sherbinin (2), Travis Longcore (3), and Chris Elvidge (4)

(1) AIT Austrian Institute of Technology, Vienna, Austria (christoph.aubrecht@ait.ac.at), (2) Center for International Earth Science Information Network (CIESIN) and NASA Socioeconomic Data and Applications Center (SEDAC), The Earth Institute at Columbia University, Palisades, NY, USA, (3) GIS Research Laboratory, University of Southern California, Los Angeles, CA, USA, (4) National Oceanic & Atmospheric Administration (NOAA), National Geophysical Data Center (NGDC), Boulder, CO, USA

In this paper we present a satellite based approach to monitor impacts of urban settlements on nearby protected areas worldwide. The footprint of human occupation is uniquely visible from space in the form of artificial night lighting, ranging from the burning of the rainforest to massive offshore fisheries to the omnipresent lights of cities and towns and related connecting road networks. The National Oceanic and Atmospheric Administration, National Geophysical Data Center (NOAA-NGDC) processes and archives data acquired by the U.S. Air Force Defense Meteorological Satellite Program (DMSP) Operational Linescan System (OLS) which was initially designed to monitor the global distribution of clouds using visible and thermal infrared spectral bands. At night the visible band signal is intensified with a photomultiplier tube enabling the detection of moonlit clouds. The boost in gain provides this sensor with the unique capability of observing lights present at the earth's surface at night.
Considering nighttime lights as a proxy for anthropogenic activities also influencing neighboring regions enables a globally consistent human impact analysis. The assessment of impacts on threatened ecosystems and related loss of biodiversity is essential in the context of the global (climate) change debate whereas monitoring and protecting the diversity of life on Earth is one of the 'global issues' affecting society. UNEP's World Conservation Monitoring Centre (WCMC) provides information on spatial distribution and delineation of protected areas. The information for this World Database on Protected Areas (WDPA) has been compiled since 1981 and is made available to the global community through UNEP's Protected Areas Programme. The WDPA is a joint project of UNEP and the IUCN World Commission on Protected Areas (WCPA) being prepared in collaboration with governments and NGOs.
A set of spatial indicators describing lighting impact and approximated human influence was developed based on joint analysis of the two data sets. Increasing research activities on assessing ecological consequences of artificial night lighting in recent years have attracted the attention of both scientist and journalists. The term light pollution is widely used referring to any adverse effect of artificial light including sky glow, glare, light trespass, light clutter, decreased visibility at night, and energy waste (definition according to the International Dark-Sky Association).
First results of the analysis indicate that regions in Europe and Asia Minor, the Caribbean, South and East Asia as well as in the Eastern part of the United States are most affected. Introducing aggregated data on biomes reveals that temperate broadleaf and mixed forests suffer the biggest impact in terms of light pollution in protected areas.
The presented impact assessment underscores the need for accurate and consistent spatial data on a global scale and can help to indicate which protected areas are most threatened by human activities. It is an important step towards public communication and raising general awareness on the topic of light pollution and its ecological consequences.