



First results of SIRS NEESPI megaproject on land – atmosphere processes in Siberia

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Siberia Integrated Regional Study (SIRS, <http://sirs.scert.ru/en/>) is a Northern Eurasia Earth Science Partnership Initiative (NEESPI) megaproject coordinating national and international activity in the region in line with Earth System Science Program (ESSP) approach aimed at investigation of environmental changes in Siberia in their interrelations with Climate Warming and Global Change.

Siberia is the region where the most pronounced consequences of climate changes already happen and will happen as follows from observations and projections of various models. Variability of climatic characteristics in space and time has been evidenced through in situ and remote sensing measurements and were forecasted by advanced climatic models. These effects create the possibility for large and significant biological, climatic and socioeconomically coupled land use changes throughout this region. Science issues for the Siberia region are growing in global importance not only in relation to climate change (e.g. snow and ice dynamics) and carbon, but also with respect to aquatic, arid, and agricultural systems, snow and ice dynamics. The International Geosphere Biosphere Program (IGBP) reported recently that the Northern Eurasia is one of the critical "Switch and Choke" points in the Earth System, which may function as a generator of small changes in regional systems potentially leading to profound changes in the ways in which the Earth System operates.

The Siberia region requires a new research paradigm. An overarching vision of regional aspects and its various connections to global aspects is now needed in line with the defined by the Earth System Science Partnership Integrated Regional Studies (IRS) approach, which could lead to Siberia IRS (SIRS) program. This requires bringing together scientists from several disciplines and sub-regions into a much wider approach and setting up the relevant structures (institutions, regional and trans-regional and international networks, funding) to lead such integrative studies.

SIRS is developed in cooperation of Russian Academy of Science (Siberian Branch) specialists with their European and American partners/counterparts and is aimed at coordination of multidisciplinary and “distributed” teams of specialists carrying out different scale projects on Siberia environment dynamics. Currently SIRS is supervised by the Russian National Committee for IGBP and managed by its Siberian Branch.

Reported are recent results of investigations of the two major Siberian ecosystems dynamics, which are boreal forests and wetlands, with special emphasis on their role in the carbon cycle as well as results of climatic modeling for the region under study and first elements of the SIRS information-computational infrastructure forming a glue for relevant multidisciplinary research. Among those are:

- First achievements of the Zotino Tall Tower Observation Facility (a climatic research station in the Siberian taiga, established and operated by the Max-Planck-Institute for Biogeochemistry in Jena and the SB RAS Sukachev Institute of Forest, ZOTTO) operation, which should determine boreal forests role in the global carbon cycle more precisely;
- New quantitative estimations of wetlands contribution in carbon sequestration are gained from analysis of ground observations performed at the Great Vasyugan. It is found that carbon balance between \dot{N}_2 emission from peat surface and accumulation by phytomass and peat is still negative for all observation sites. Moreover, it is shown that for IPCC scenarios balance on CO_2 will be kept until 2080, even though bog ecosystem has limited potential on CO_2 accumulation;
- Development of new schemes of soil–vegetation–atmosphere transfer (SVATs) to represent land surface processes in regions with strong land surface hydrologic inhomogeneity and high sensitivity to global warming leads to improvement of regional climate modeling quality; and
- Recently developed key elements of the SIRS information-computational infrastructure, which allow one to perform an assessment of regional climate dynamics in on-line regime.