



Monitoring Western Siberian Wetlands from satellite observations and in situ observations

E.A. Zakharova (1), A.V. Kouraev (2,1), M.V. Kolmakova (3,2), V.A. Bazanov (3), A.A. Skugarev (3), A.E. Berezin (3), S.N. Kirpotin (3), V.A. Zemtsov (3), N.M. Mognard (2,4)

(1) State Oceanography Institute, St. Petersburg branch, Russia, (2) Universite de Toulouse; UPS (OMP-PCA), LEGOS, F-31400 Toulouse, France, (3) Tomsk State University, Tomsk, Russia, (4) CNES; LEGOS, F-31400 Toulouse, France

Western Siberia is a large region with mostly flat relief. Most of its territory comprises the watershed of the Ob' river, and much smaller part in the north - watersheds of Nadym, Pur and Taz rivers. Flat relief significantly affects the hydrographical network, creating a multitude of interconnected natural objects - large and small rivers streams, large floodplains, lakes, bogs etc. The region is also abundant with lakes, mainly small ones with surface area less than 1 km² and depths of 2-5 m. Flooded areas and bogs also act as a buffer zone, providing a dampening "sponge" effect on the water redistribution within the river system. Large area covered by rivers and wetlands results in high rate of evaporation compared to any other large boreal watershed.

Contrasting processes are occurring in the Southern and Northern parts of the Western Siberian Plain. In the south, bogs are expanding in the taiga zone and there is progressive swamping which leads to forest death. These bogs act as a carbon sink due to carbon sequestration in their peat layers. Among the bogs of this part of Western Siberia there is the Great Vasyugan Bog - world's largest peatland with a total area of 6.78 million hectares. Bogs of Vasyugan have appeared about 10 000 years ago and since then are constantly growing. 75% of the actual surface of the Great Vasyugan Bog have appeared during the last 500 years.

The situation in the northern part (affected by permafrost) is different. The bogs there are reducing their surface and the forest-tundra regions are being subjected to thermokarst activity and colonisation of bogs by trees. Two contrast processes are observed here - a) increase of lake surface due to melting of lakes' coasts, and b) decrease of surface area or disappearance of lakes due to water drain downstream the hydrological network.

We combine in situ observations with satellite remote sensing to monitor hydrological regime of the Western Siberian wetlands. Radar altimetry (TOPEX/Poseidon, Jason-1, GFO, ENVISAT), radiometry (SMMR, SSM/I), optical data (Landsat) and space gravimetry data (GRACE) are used in combination with the in situ observations and the recent field studies done in the August 2008. We present the variability of water level (from radar altimetry) and surface properties (from altimeter waveforms parameters) for the region of Nadym, Pur and Taz rivers, as well as for Vasyugan bog. Seasonal and interannual variability of water abundance is studied using radar altimetry, radiometry, and gravimetry. We also use active and passive microwave observations (radar altimeters and radiometers) to analyse internannual variability ice formation and break-up dates along the Ob' river, which is frozen for more than 7 month in the north and for 5-7 month in the south.

This research has been done in the framework of the Russian-French cooperation GDRI "CAR-WET-SIB" and French ANR "IMPACT-Boreal" project.