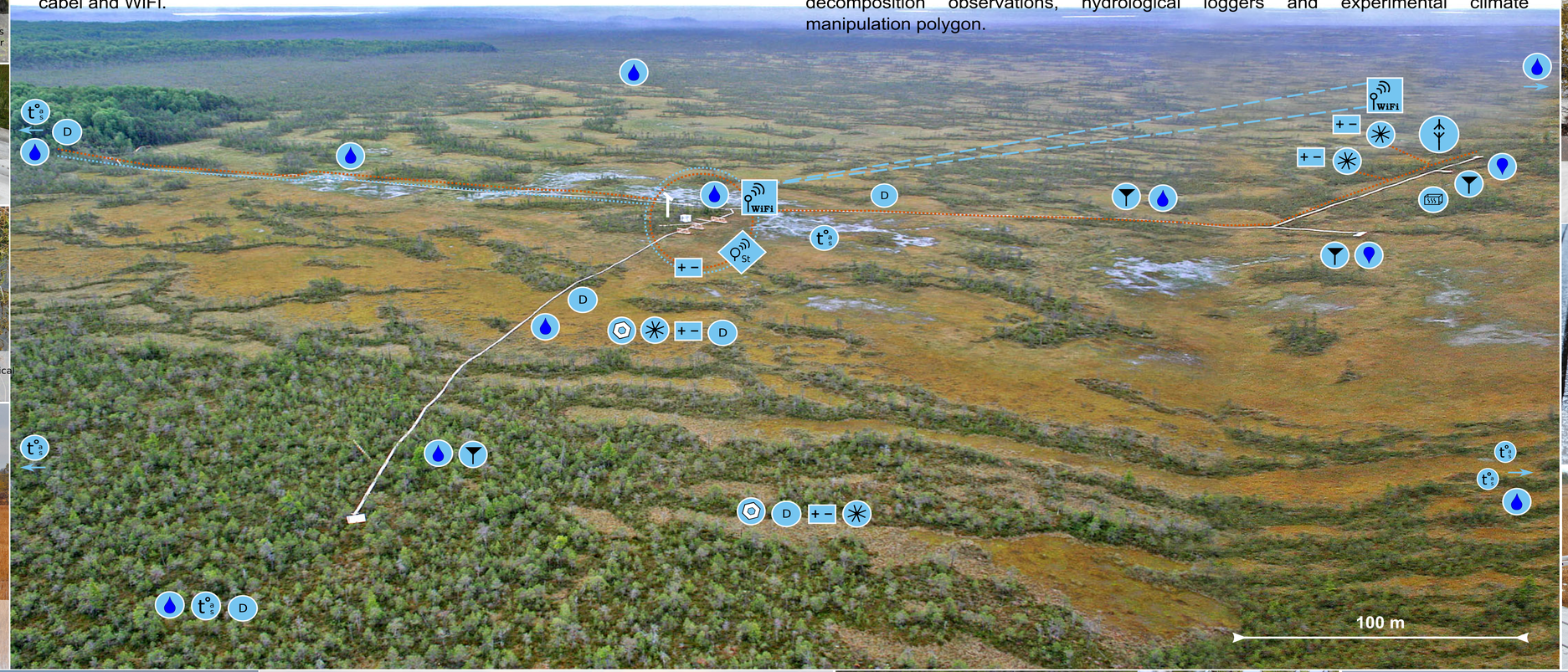
Mukhrino field station **research infrastructure**

The research infrustructure located in Mukhrino bog and nearby forests in about 3 km radius from the house. The site is equipped with about 2 km long wooden boardwalks making non-destructive access to the research polygon. The system of alternative energy supply located in the central part of the polygon and provides energy for research equipment. The site connected to the Internet through the satellite connection, cabel and WiFi.

The research focus in Mukhrino is oriented on the impact of climate change on carbon cycle, hydrology and biodiversity. Research projects include permanent monitoring by station' staff and temporal short-term projects accomplished by station' visitors. Permanently installed equipment includes automatic weather stations, eddy covariance towers, automatic flux chambers for emissions measurements, primary production and decomposition observations, hydrological loggers and experimental climate manipulation polygon.



Rain gauges

Two automatic rain gauges Hobo RG3 installed in the bog and measure summer precipitation. Winter measurements made manually by Tretyakov rain gauge (automatic winter rain gauge in plans).

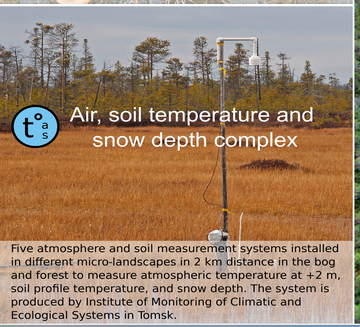
Piezometers

A network of 11 piezometers with pressure-loggers (Mini-Diver D1501) installed at representative locations since 2008.The air pressure recorded with a pressure-sensor (Baro-diver).

Lysimeters

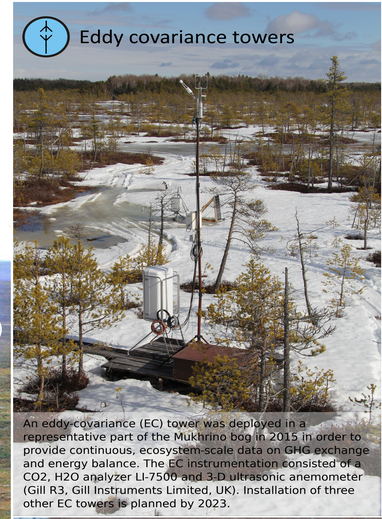
Four lysimeters has been installed in 2015 from standard open top containers (Russian traditional hydrometeorological equipment GGI-3000) with pressure-loggers (Mini-Diver D1501).

Air, soil temperature and snow depth complex



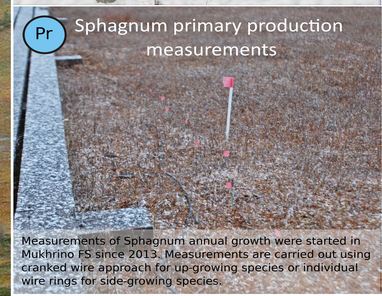
Five atmosphere and soil measurement systems installed in different micro-landscapes in 2 km distance in the bog and forest to measure atmospheric temperature at +2 m, soil profile temperature, and snow depth. The system is produced by Institute of Monitoring of Climatic and Ecological Systems in Tomsk.

Eddy covariance towers



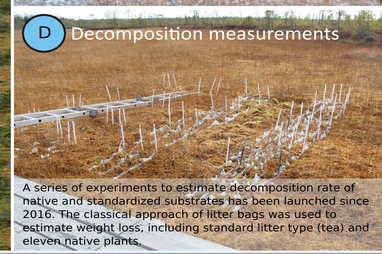
An eddy-covariance (EC) tower was deployed in a representative part of the Mukhrino bog in 2015 in order to provide continuous, ecosystem-scale data on GHG exchange and energy balance. The EC instrumentation consisted of a CO2, H2O analyzer LI-7500 and 3-D ultrasonic anemometer (Gill R3, Gill Instruments Limited, UK). Installation of three other EC towers is planned by 2023.

Pr Sphagnum primary production measurements



Measurements of Sphagnum annual growth were started in Mukhrino FS since 2013. Measurements are carried out using cranked wire approach for up-growing species or individual wire rings for side-growing species.

D Decomposition measurements

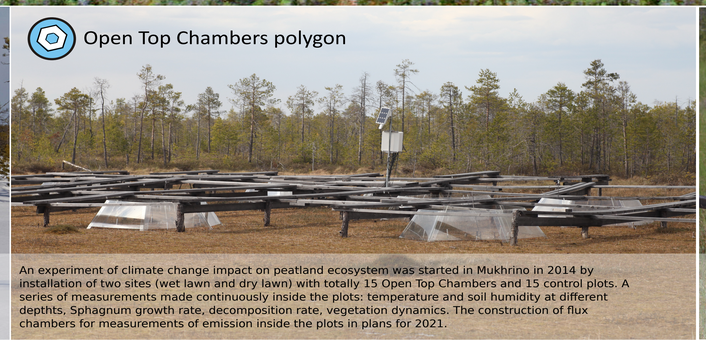


A series of experiments to estimate decomposition rate of native and standardized substrates has been launched since 2016. The classical approach of litter bags was used to estimate weight loss, including standard litter type (tea) and eleven native plants.

Automatic weather complexes

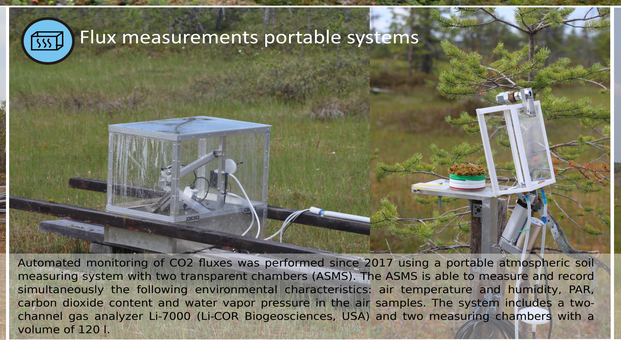
Data on air temperature, air humidity, atmospheric pressure, wind speed and direction, incoming and outgoing shortwave radiation, net radiation, and soil heat flux recorded at three automated weather stations (IN SITU INSTRUMENTS AB, Sweden). Two stations were located at a small pine-dwarf-shrub-Sphagnum ridge and one station at a Scheuchzeria-Sphagnum hollow.

Open Top Chambers polygon



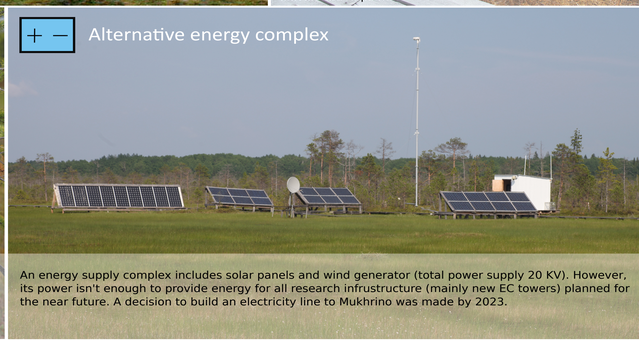
An experiment of climate change impact on peatland ecosystem was started in Mukhrino in 2014 by installation of two sites (wet lawn and dry lawn) with totally 15 Open Top Chambers and 15 control plots. A series of measurements made continuously inside the plots: temperature and soil humidity at different depthts, Sphagnum growth rate, decomposition rate, vegetation dynamics. The construction of flux chambers for measurements of emission inside the plots in plans for 2021.

Flux measurements portable systems



Automated monitoring of CO2 fluxes was performed since 2017 using a portable atmospheric soil measuring system with two transparent chambers (ASMS). The ASMS is able to measure and record simultaneously the following environmental characteristics: air temperature and humidity, PAR, carbon dioxide content and water vapor pressure in the air samples. The system includes a two-channel gas analyzer Li-7000 (Li-COR Biogeosciences, USA) and two measuring chambers with a volume of 120 l.

+ − Alternative energy complex



An energy supply complex includes solar panels and wind generator (total power supply 20 KV). However, its power isn't enough to provide energy for all research infrustructure (mainly new EC towers) planned for the near future. A decision to build an electricity line to Mukhrino was made by 2023.