Monitoring of vegetation properties and greenhouse gas fluxes on carbon experimental sites in North Caucasus region

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Forest vegetation is an important element and one of the major contributors to carbon sequestration and greenhouse gas (GHG) uptake in terrestrial ecosystems. Information about forest species composition and biomass distribution is vital for the accurate estimation of GHG fluxes and carbon stocks, as well as deriving the possible influence of forests on climate. The Carbon research site network in Russia was organized to obtain new data on GHG fluxes and carbon sequestration in various terrestrial ecosystems. A critical scientific task of such centers is to develop innovative technologies for controlling GHG emissions and uptake in various natural ecosystems. One of the recently created carbon experimental sites is situated at the Alkhanchurt valley in the Chechen Republic in North Caucasus region. The vegetation in the study area is represented by young trees of different species (willows, tilia, and mulberries) planted in 2021. The total area of the carbon experimental site is about 0.225 km^2.

In order to accurately estimate the carbon stock in the area, the aggregated approach based on *in situ* and remote sensing data will be used. To obtain detailed information about vegetation (plant canopy structure, tree living conditions, etc.) and soil properties the aggregated information from multispectral sensor (RedEge-MX) and airborne LiDAR (AGM-MS1.200) installed on unmanned aerial vehicles (UAV) will be used. To analyze the vegetation properties, carbon stocks, and GHG fluxes from remote sensing data various techniques including modeling approaches based on machine learning techniques will be employed. The GHG fluxes on the experimental site will be measured using tower-based eddy-covariance and chamber systems equipped with CO_2, H_2O, and CH_4 infrared gas analyzers. The experimental data and modeling approaches developed within the frameworks of the research will be used in further studies of temporal and spatial variability of GHG fluxes and carbon stocks in different regions of the North Caucasus.

Keywords: Greenhouse Gas, Remote sensing, Monitoring, North Caucasus, Carbon sequestration