

Variations of CO₂ Mixing Ratios in the Air Near the Ground in the European Territory of Russia

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Presented are the measurement results of CO₂ vertical biogenic flux and mixing ratios obtained in the air near the ground near Valdai Lake (57.9°N, 33.3° E, 214 m above the sea level). The measurement complex (Campbell Scientific Inc.) is mounted on a mast of 42 m height making it possible to automatically observe parameters of the atmospheric boundary layer and the underlying surface. The data obtained (Fig. 1) demonstrate that in July of 2010 a constant increase of CO₂ in the air near the ground was registered. A growth of CO₂ (up to 400 ppm) was also registered on some days in August. The main explanation for such changes of CO₂ is in the blocking anticyclone existing at that time in the European Territory of Russia (ETR). It was formed in July 2010, stayed there for about 50 days, producing anomalous weather: the absence of precipitation and maximal temperatures exceeding all the known record values. High temperatures observed during a long time resulted in a perturbation of the biogenic cycle (photosynthesis-respiration) and a shortened CO₂ biomass sink (Fig.1) where the measurement of CO₂ sinks are shown. Also, at the end of July in the ETR, numerous forest and bog fires occurred that led to atmospheric contamination with burning products and, in particular, to a local CO₂ increase.

Figure 2 shows the results of CO₂ mixing ratios at Valdai Lake and in Obninsk (55.1° N, 36.9° E., 186 m above the sea level). In Obninsk the absorption spectroscopy method is used for determining CO₂ concentrations. The measurement complex includes a Fourier-spectrometer coupled with a multi-pass optical cell. As far as the observation sites are located in different latitudes, the seasonal variations of CO₂ in Obninsk and at Valdai Lake are in good agreement. The variations of CO₂ in July 2010 in Obninsk and at Valdai Lake are similar and show that the reason for the growth of the mixing ratio is the same as the whole territory was under the action of the blocking anticyclone.

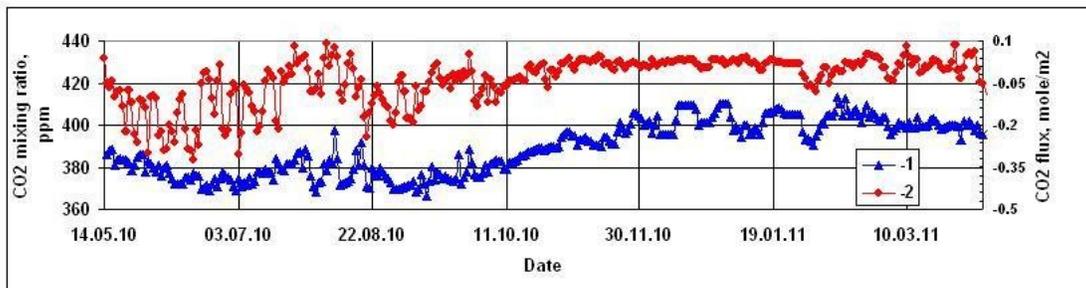


Figure 1. Measurement results CO₂ mixing ratio (1) and biogenic fluxes (2) on the Valdai Lake.

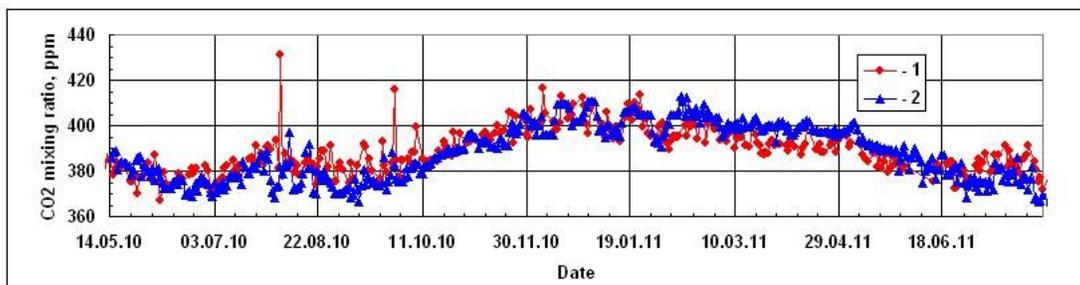


Figure 2. Measurement results CO₂ mixing ratio in Obninsk (1) and on the Valdai Lake (2).