

Studying the air composition changes during the passage of atmospheric fronts

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Global climate change is one of the problems recognized by the whole world community. Increasing anthropogenic emissions of greenhouse gases is one of the major driving forces of the observed changes. Fossil fuel combustion significantly affects the air quality as well.

Here, we present some results of the study of changes observed in the concentration of O_3 , CH_4 , CO_2 , CO , SO_2 during the passage of atmospheric fronts based on the measurements carried out at TOR-station during the period of 2015-2016. This station is located in the eastern suburbs of Tomsk city (West Siberia, Russia). A frontal passage time was derived from the analysis of surface and upper-air synoptic charts, as well as continuous measurements of meteorological variables performed at the station.

Since the frontal section is a complex object accompanied by changes in cloudiness, precipitation in the prefrontal and postfrontal areas, sharp temperature changes, wind strengthening and convergence, whereas measurements are carried out hourly, we used data of hourly measurements obtained during 5 hours before and 5 hours after the frontal passage. During the period under study, 167 cold, 145 warm, and 128 occluded fronts passed through the station. It was found that when a warm front passes through, the concentrations of CH_4 , CO_2 and CO decrease. And in contrast, during the cold frontal passage through the observational site, the concentration of the above trace gases in the air increases. Changes in O_3 concentration during the front events is opposite to carbon-containing gases. During the passage of the occluded front, two processes take place that are individually observed in the warm and cold fronts. A sharp change in the air composition in the frontal zone also affects the content of one or another trace gas species in the air masses, which are separated by fronts.

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