Variations in the ground ozone concentration during passage of cold fronts over the Kola peninsula

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Using synoptical maps for the period 2001-02, we have identified evens, when there are passed cold fronts. The surface ozone concentration (SOC) concentration measurements revealed some regional particular features of variations in the ground ozone concentration during the passage of cold fronts in winter. While studies, conducted in other regions indicated that the SOC normally decreases at the passage of a cold front, observations in the Kola peninsula prove opposite the concentration of ozone unambiguously increases. This is due to the fact, that the cold arctic air intruding just following the cold front, is characterized by a great deal of instability, whereas just prior to the passage of a front a stable stratification is observed as well as ground inversions of considerable thickness (hundreds of meters). The passage of cold front in those conditions results in a stronger than usual turbulent exchange in the vertical direction, as a consequence of which an increase of ground ozone concentration is observed.
The detected effect is evidently not typical for other regions of Russia's European part, since its instability quickly decreases as the Arctic sea air advances to southern regions.
The passage of cold front in summer period affects the SOC differently, depending on the stratification of an air mass being replaced. If it is not stable, the cold front passage results in the destruction of stability and growth of the SOC (it is revealed very clearly at the front passage in the night time, when an inversion is set in the ground layer). If the replaced air mass is stratified unstably, the passage of the front leads to a certain decrease of the SOC. Intrusions of the continental Arctic air, formed over the icy spaces of Kara and Barents seas and characterized by considerable stability, always result in the decrease of SOC.

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