Influence of anthropogenic nitrogen oxides on surface ozone content at stagnation periods

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It is known that increase of nitrogen oxides concentration in the near-ground layer of the atmosphere leads to decrease of surface ozone concentration in conditions of low UV radiation. This phenomenon must be strengthened at weak air transport processes when the chemical processes are mainly important in the establishing of small gaseous components composition.

This assumption is confirmed by observations carried out at the atmospheric station of PGI in Apatity at summer 2000. Concentrations of ozone and nitrogen dioxide together with wind speed in the near-ground layer were registered. Typical observed situation is such: increase of nitrogen dioxide concentration in several ppb is accompanied by sharp and considerable (near 10 ppb) decrease of surface ozone concentration at stagnation periods duration from one to some hours. Wind is absente or very weak at stagnation period. This correspondence of observed concentrations is greatly weaker in windy conditions. Observed variation may be explained by formation of air cavity in stagnation conditions; nitrogen oxides by anthropogenic origin accumulate at this cavity and destroy ozone. At windy conditions the cavity does not be formed and the correspondence of concentrations loses a local character.

The transition to stagnation is accompanied by negative variation of surface ozone concentration in regions with the atmosphere polluted by nitrogen oxides. These regions are industrial ones or near motorways with intensive traffic. At this point of view the observations of the surface ozone and wind carried out in Barentzburg (Spitsbergen) at 2000 are very significant. It is found that the surface ozone experiences considerable negative variations during stagnation periods. It gives evidence that the Barentzburg's atmosphere is appreciable polluted by nitrogen oxides.