

## **The structure of the winter troposphere during the catastrophically freezing rain (December 2010)**

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The atmospheric circulation conditions above Moscow, which led to the unprecedented freezing rain and to the glazed ice of strong intensity, were examined. It was shown, that the freezing rain related with the active warm frontal zone, which was situated between the surface positions of the polar and arctic fronts. At the same time the surface temperature inversion (to the height of 1500–2000 m) was accompanied by the specific humidity inversion and by the dew-point deficit values less than 2 degrees Celsius.

It was established, that together with the powerful advection of the warm and humid air on the frontal surface, the cold advection in the cold air mass above the front was observed. In other words, in the lower troposphere in the freezing rain zone, the double-layer advection was observed. As a result the air temperature at the ground surface was negative (−5...−7 degrees Celsius) during the freezing rain; and nearby the 850 hPa surface (1500 m) the temperature was positive (+2...+3 degrees Celsius).

The sketchy evolution of the phase of the widespread precipitation of the warm front above Moscow can be represented in the following way: the snow (over 2000–2500 m) → the rain (in the layer of the positive temperature on the altitude of 1000–2000 m) → the glazed ice on the ground surface. The strong glazed ice (the thickness is about 20–30 mm), formed in the result of the freezing rain, was observed in the Moscow region during two weeks!