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Results of long-term sodar measurements of wind profiles above Moscow city

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The measurements of wind profiles in the air layer from 40 to 500 m are carried out continuously at the Meteorological observatory of the Moscow University during last six years since 2004. The Doppler sodar "MODOS" produced by METEK firm (Germany) is used. Monthly-averaged values of wind speed in the air layer from 40 to 200 m consist of nearly from 4 to 7 m/s. Their annual course is connected with large-scale atmospheric circulation in mid-latitudes: the average wind speed is more as a rule in winter when Central Russia is situated inside gradient zone at the baric field between two main centers of action: Island low and Azores high. However, even in winter wind speed may be extremely low – especially in cases of strong frosts when a ridge of Siberian high comes to Moscow region from the East. Close to calm wind conditions may be observed as well in summer – as a rule in periods of hot weather when a ridge of Azores high exists above Moscow. The highest values of wind speed in Moscow in average of 10 min in the air layer up to 500 m height are equal to 34-35 m/s. These cases of extremely strong winds are observed very seldom, as a rule – at night and on a height more than 400 m. They are connected usually with periphery of deep and vast cyclones at the baric field and, at the same time, with an existence of low-level jet at wind profile.

A total statistical distribution of wind speed is close to logarithmically normal law and characterized by clear positive skewness which is stronger in spring and in summer and weaker in winter. The mode is equal to 4 m/s; it indicates the most often wind speed value in average of a year. The most often wind direction in Moscow is South-Western; the rarest one is North-Eastern.

Cases of the most quick wind turning are connected usually either with passing of atmospheric fronts, or with passing of ridge axis or an anticyclone centre above a site of sounding. At the former case wind turning as a rule is clockwise in time at any height whereas at the latter case it may be both clockwise and anticlockwise.

Wind speed as well as the thermal stratification of ABL clearly influences on the ground concentrations of minor atmospheric gases. The special Ecological station in Moscow was founded by common efforts of Obukhov Institute of the Atmospheric Physics and of Geography Faculty of Moscow University. This station operates since 2002 at the area of Meteorological observatory on a distance of 70 m from the “MODOS” sodar. Accordingly to the ground ozone measurements and to the sodar data, extremely low concentrations of the ground ozone (close to 0 ppb) are observed as a rule at nocturnal time in conditions of strong surface inversion and extremely light wind speed close to calm.