Estimates of the relationship between the atmospheric pressure variability and the frequency of hospitalizations

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Weather, climatic and environmental factors affect the conditions (health) of people with an abnormal level of functioning of the adaptive system and increased meteosensitivity, patients with chronic diseases, including hypertension and coronary heart disease. An analysis of the relationship between the frequency of emergency hospitalization of meteosensitive patients and the atmospheric pressure variability was carried out. In this case, data on hospitalizations at the Central Clinical Hospital of the Russian Academy of Sciences (CCH RAS) in Moscow and data on atmospheric pressure fluctuations were used [1]. Atmospheric pressure fluctuations in [1] were determined from measurements with a liquid microbarograph with a time step of 0.5 sec. and meteorological barograph.

The monograph [1] presents the data on emergency hospitalizations in the CCH RAS of more than 6 thousand weather-dependent patients for the period from the beginning of 2009 to the end of 2012. Patients were diagnosed with a myocardial infarction, angina pectoris, hypertensive crisis, extrasystole, acute violation of cerebral circulation, cerebrovascular disease. Some patients respond to a decrease in pressure, some to an increase. Different types of dependence of the number of patients on the rate of pressure change, on acceleration and on the absolute level of atmospheric pressure were manifested.

Figure 1 shows local coherence of the frequency of hospitalizations in the CCH RAS with the atmospheric pressure according to daily data during 04.08.2009-29.10.2009. For the entire analyzed period, there was a significant coherence for the longest-term variations - with a period of about a month or more. Until the second decade of September 2009, there was also coherence for variations with periods of more than a week – up to two weeks. The change in coherence is affected by the change in weather and climate conditions, including autumn regimes such as Indian Summer.

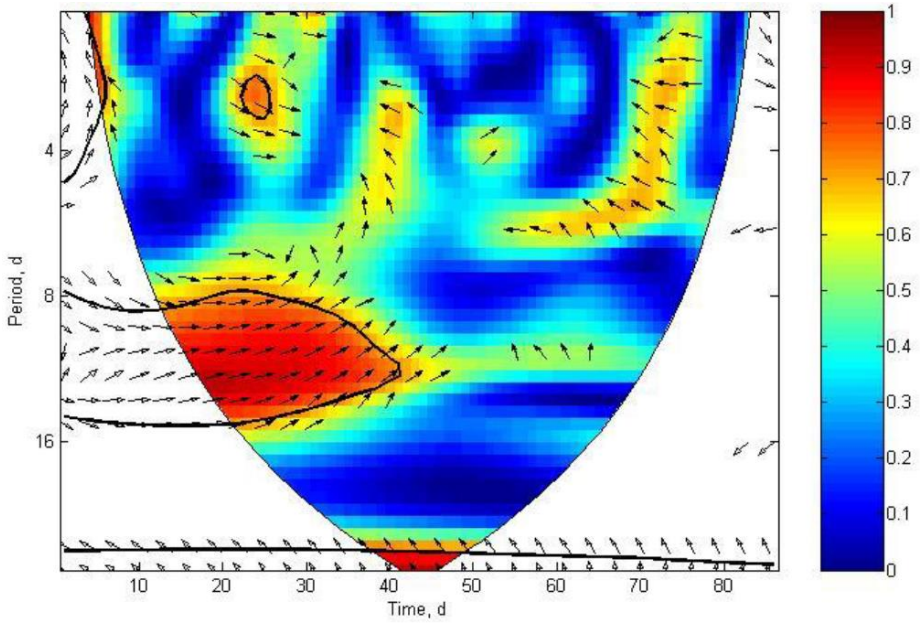

Figure 1. Local coherence of the frequency of hospitalizations in the CCH RAS with atmospheric pressure by daily data during 04.08.2009-29.10.2009. Regions of significant coherence (at the level of 95%) are highlighted; the arrows show the phase shift (arrow to the right denotes in-phase, to the left, antiphase); regions of boundary effects are also indicated.

An extreme weather and climate regime under conditions of atmospheric blocking formed in the European part of Russia in the summer of 2010 with record heatwave, forest fires, haze, and air pollution, which caused huge social, environmental, and economic losses [2,3]. Figure 2 presents local coherence of frequency of hospitalizations in the CCH RAS with atmospheric pressure by daily data during July 2010.

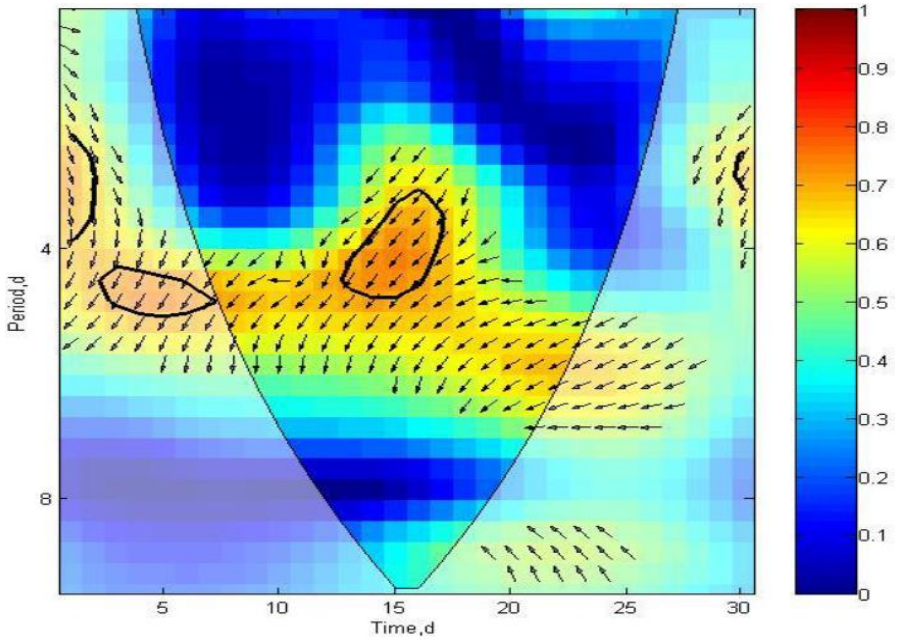

Figure 2. Local coherence of frequency of hospitalizations in the CCH RAS with atmospheric pressure by daily data during July 2010.

Figures 1 and 2 display different connections of frequency of hospitalizations in the CCH RAS with atmospheric pressure during 04.08.2009-29.10.2009 in July 2010. The figures demonstrate the differences both for periods of significant coherence and for phases between pressure fluctuations and frequency of hospitalizations. According to [1] in the summer of 2010 in Moscow, due to record heatwave and air pollution, the frequency of strokes, hypotension, respiratory diseases, in contrast to cardiovascular diseases, increased significantly.

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References

1. Health of the Population of Russia: The Impact of the Environment in a Changing Climate. Moscow, Nauka, 2014, 428 p. (in Russian)
2. The State of the Air Basin of Moscow in Extreme Weather Conditions in the Summer of 2010. All-Russian Meeting. Moscow, A.M. Obukhov Institute of Atmospheric Physics RAS, 2010, 100 p. (in Russian)
3. Analysis of Abnormal Weather Conditions on the Territory of Russia in the Summer of 2010. Moscow, Triada LTD, 2011, 72 p. (in Russian)