



Phase Variability of the Recent Climate in the North Atlantic Region

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The atmospheric pressure and near-surface temperature differences between the Azores High and the Icelandic Low for the period of 1900-2012 within the spatial-temporal average-out (20° latitude, 20° longitude and 12 years) were considered. The secular term of phase states of the system under consideration was found to divide into three non-intersecting subsets. Each of that was put in consequence with one of three climatic scenarios related to the periods of 1905-1935 (relatively warm phase), 1940-1970 (colder phase) and 1980-2000 (warmer phase). A life time of such a scenario lasted about 20-35 years, and the transition from one scenario to another covered 4-6 years, i.e. it run comparatively quickly. The revealed non-overlapping sub-aggregates of the thermodynamic indices related to each particular climate scenario gave an idea to follow the circulation peculiarities and the interrelated temperature differences within the limits of the Northern Atlantic ocean-atmosphere regional system. The results of this analysis bear evidence that the most probable intermittent strengthening and weakening of Hadley and Ferrell circulations occurred there in coincided phase. The analogous character of the climate system behavior was also detected in some other regional atmospheric activity centers that can be considered as a witness on the global nature of the detected phase type of modern climate inter-decadal variability. Hence, we have the grounds to suppose that mentioned above the short-period inter-decadal excitations of the modern climate have a global nature and appears everywhere. Finally, the attention was paid to the fact that at the early XXI century the thermodynamic state of the Northern Atlantic regional climate system has shown a tendency to face towards the situation, similar to the cooler scenario of the 1940-1970.

We used the heat content of upper 700m Atlantic Ocean layer data from NODC to calculate its anomalies for the periods of 1955-1970, 1980-2000 and 2000-2012. The results shown that during the 1980-2000 period the heat content in the region (50°-60°N; 60°-30°W) was lower than in the 1955-1970, but higher in (30°-40°N; 60°-30°W) region. The data on sea water temperature, obtained as a result of numerical calculations based on the Ocean General Circulation Model (INM RAS), were used for estimate of ocean specific heat. The model is based on a complete system of nonlinear (primitive) equations describing ocean hydro- and thermodynamics in the Boussinesq approximation and written in a spherical σ -coordinate system. Numerical calculations were carried out with horizontal resolution (0.25°x0.25°) and time step 1 hour. Boundary conditions on surface were taken from data array of CORE. Anomalies of specific heat relative to the mean annual variation in the layer from ocean surface up to 700m depth in North Atlantic region, calculated on model data and averaged for each period of (1959-1974), (1975-1999), (2000-2006), are in very close accordance with the results based on the accepted Levitus' data.