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Thermal inertia index of the ocean layer of interaction with the atmosphere

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The ocean is one of the most important components of the climate system and one of the factors of long-term variations of climate. Huge heat capacity of the ocean are always determined by the dominance of the ocean in interaction between ocean and atmosphere. For global atmosphere the ocean can be both a source and sewer of heat.

The atmosphere is in contact only with the surface of the ocean, but thermal interaction takes place with the top mixed layer of the ocean that ranges from a few hundred meters to 1.5-2 km. The depth of this layer depends on the characteristics of domestic ocean processes at each place and from time. Mixed layer depth of Ocean determines the volume layer and its thermal capacity.

The ocean could take away heat from the atmosphere and can give it away. If the depth of the upper mixed layer of the oceans depends the thermal inertia, the depth of this layer can be a factor of long-term changes of climate. Modified inertia must also affect the amplitude and phase lag of seasonal temperature changes.

It is very important to assess changes in ocean mixed layer depth at each location for compare with climate changes. The change of the top ocean layer depth of ocean interaction with atmosphere can be measured by changes in lag of seasonal temperature changes. The report proposes an index of inertia (depth of layer) of the thermal interaction of the ocean with the atmosphere:

I=T2-T1 , were T2 – the average temperature of the ocean surface in the second half of the year (July to December), T1 is the average temperature of the ocean surface in the first half of the year (January-June).

The increase of index shows increased inertia of seasonal change that indirectly reflects the increase in depth of the top layer of the ocean involved into interaction with the atmosphere.

Analysis of the index changes has shown that in the 20th century was reduced the layer depth of the ocean interacting with the atmosphere. This may mean that in recent decades was decreased flow of heat from the atmosphere into the ocean. On this background, increasing of the greenhouse effect and global warming of the atmosphere appeared more strongly.

This means that the rapid warming of climate in the 20 century was partly due to the weakening of the heat stream from atmosphere into ocean.

Analysis of index for 4000 stations of the northern hemisphere has shown that reducing the index inertia in 80% of stations in the second half of the 20 century was accompanied by increased the extreme temperature. On the other stations the index increase was accompanied by a weakening of the extreme temperature.

The index is a characteristic of ocean effect for climate change and at climate extremity.