Seasonal variability of water circulation in the deep Bering Sea

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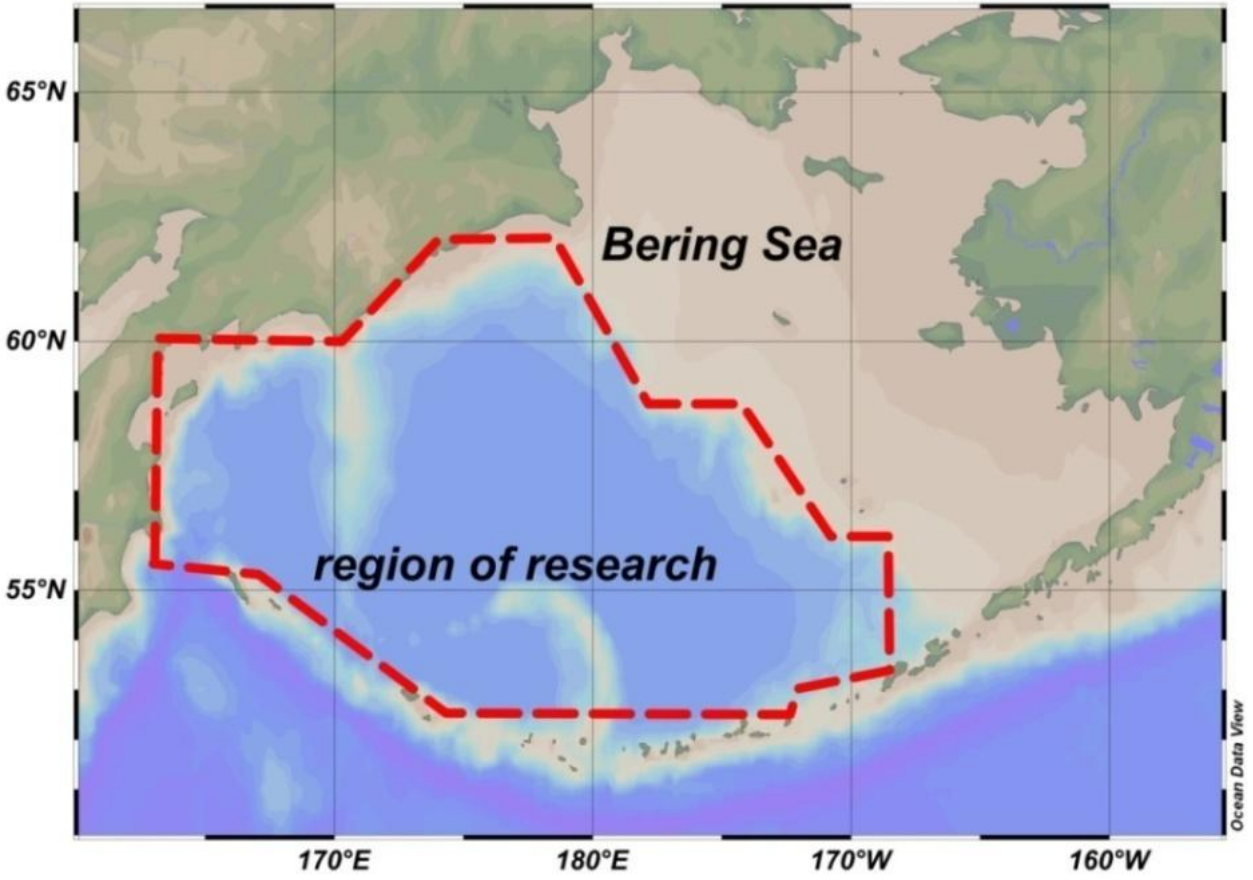


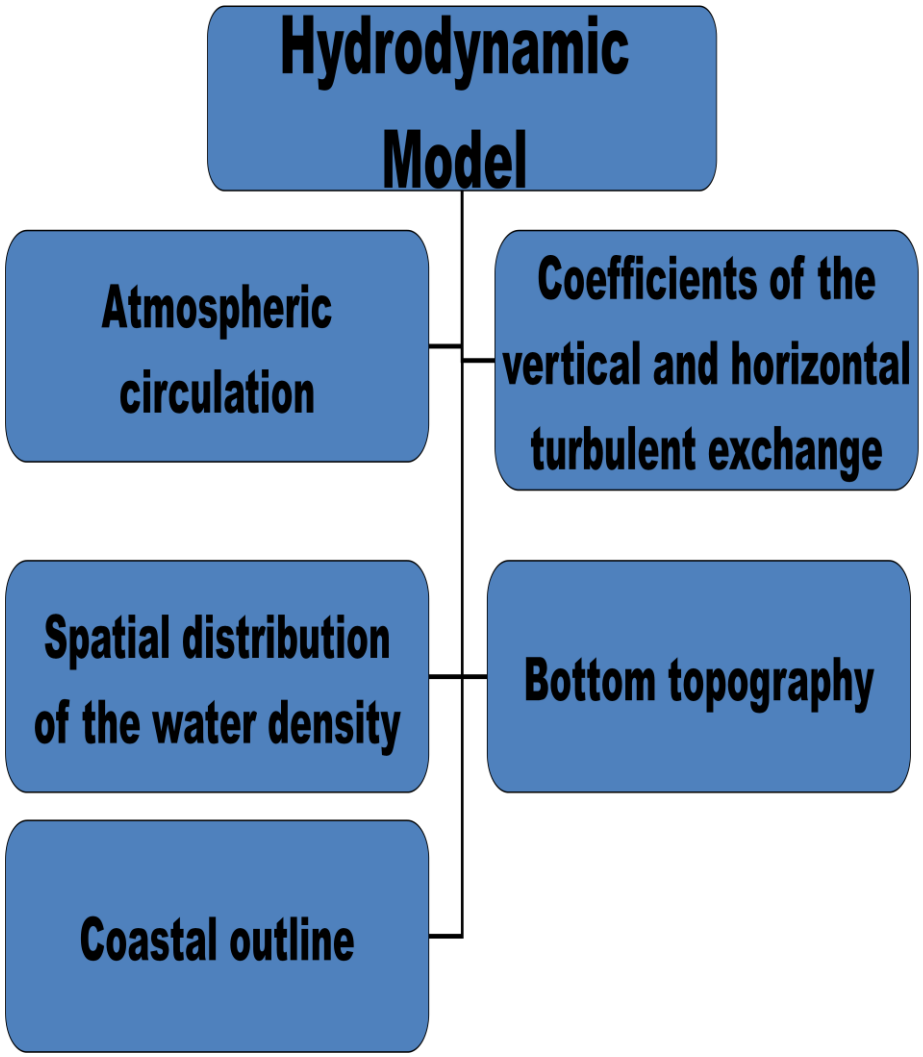
The map of the Bering Sea

Purpose:

Study of the water circulation in the Bering Sea by the hydrodynamic model under the influence of the season synoptic situations defined as types of air circulation.

Research task

- to calculate integral (from the surface to bottom) water circulation induced by “north-western” type of atmospheric processes in the winter (December) and summer (August) in deep Bering Sea on the basis of numerical modeling
- results discussion



The hydrodynamic model

There are used the quasigeostrophic numerical model with uniform grid of 30' x 30' at standard horizons.

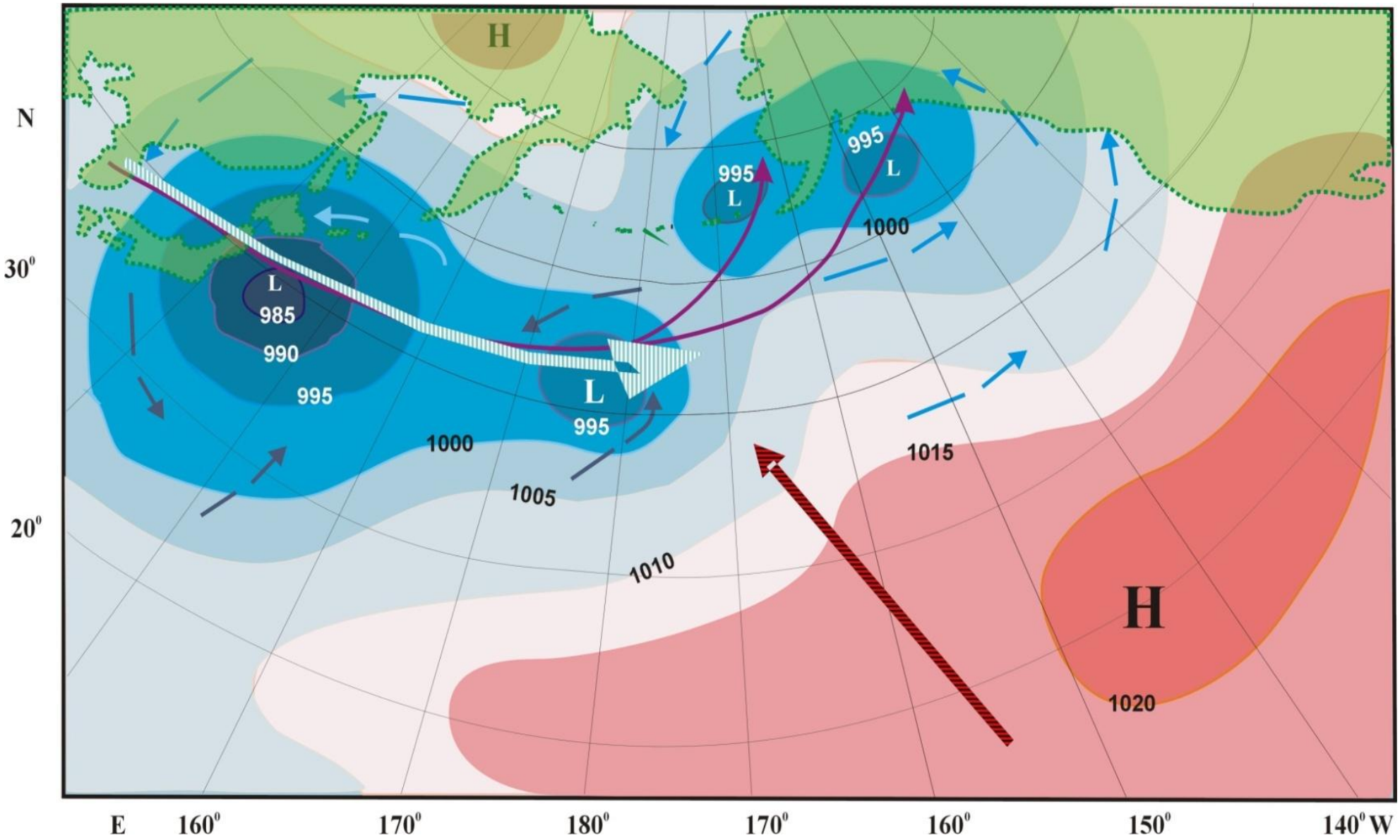
Input data:

- monthly temperature and salinity on 0 m, WOA13 (www.nodc.noaa.gov/OC5/woa13);

- the field of atmospheric pressure corresponding "to northwest type of atmospheric processes;

- vertical density distribution in the deepest part of the research region, WOD13 (www.nodc.noaa.gov/OC5/SELECT/dbsearc);

- bottom depths (GEBKO-01).

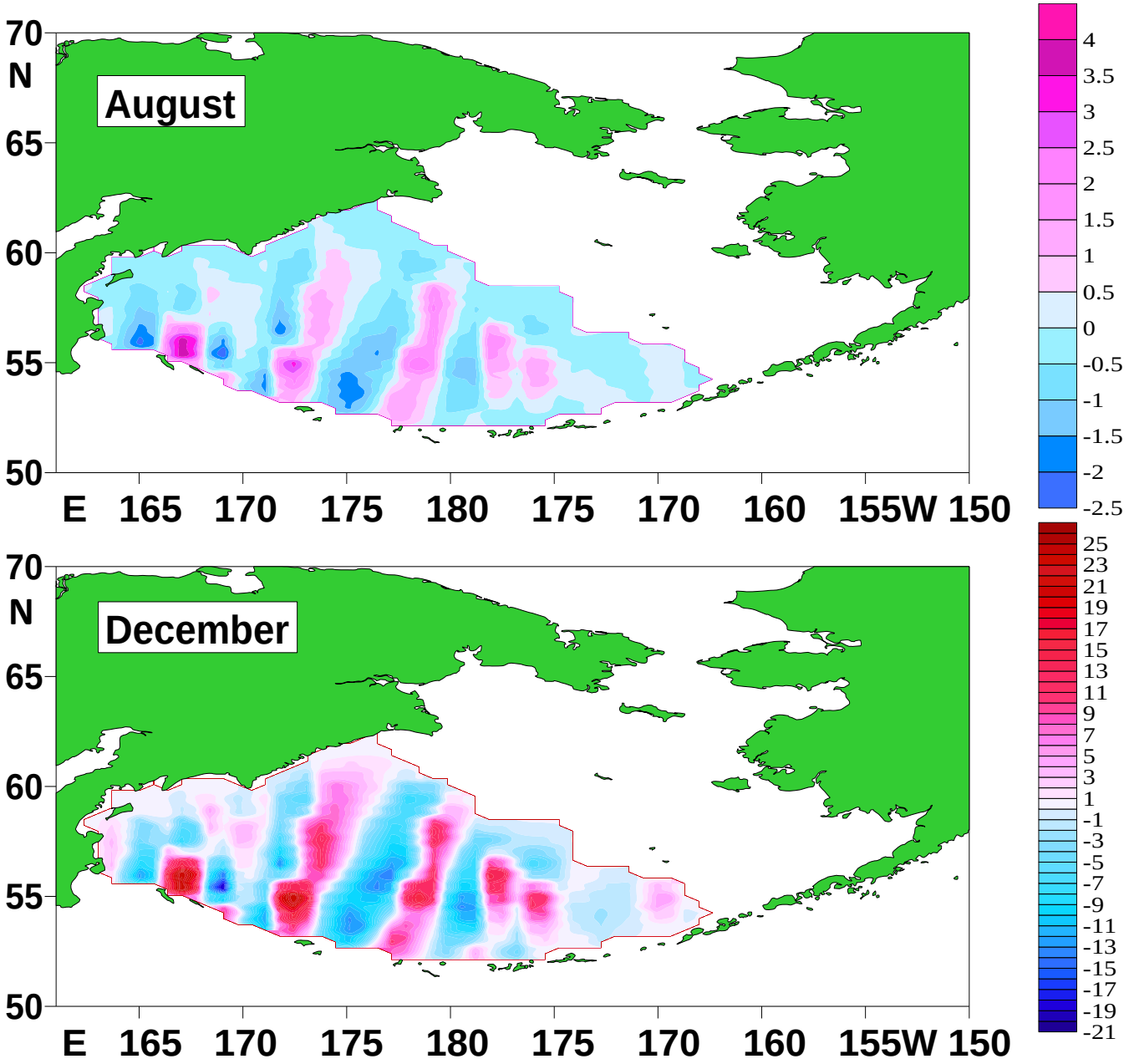


"North-western" type of the atmospheric circulation over the Northern Pacific (Polyakova, 1999)

“North-western” type of the synoptic processes

At action of "north-west" type of atmospheric processes the main trajectories of cyclones are located in NW Pacific. Cyclones move from Japan towards Aleutian Islands. Cyclones have the different intensity. The existence of the cyclones is 1-3 days. Maximum of cyclone intensity is observed in winter and autumn. In spring and especially in summer the processes and gradients of atmospheric pressure are the very weak.

There are two anticyclonic fields under action of this type. One anticyclone was located over the Far East, the other - above the SE of the North Pacific Ocean. The high pressure fields are extensive and quasi-stationary with one or more centers. They have significant seasonal and spatial scale variations.



Integral function of the stream (Sv) under influence “north-western” type of atmospheric circulation in August and December in Northern Pacific.

Conclusions: As a result of calculations the seasonal currents schemes were received with a mosaic of hydrodynamic structures of a different sign and scale.

In winter four large hydrodynamic structures were located in the investigated region: two - anti-cyclones and two - cyclones. The first deep cyclonic circulation was located in the center of the studied area and was limited to coordinates 53-61^{o} N and 174-179^{o} E (14 Sv). This cyclonic structure was surrounded two powerful anti-cyclones: from east side it was limited by coordinates 53-61^{o} N and 171-174^{o} E (22 Sv) and with western - 52-59^{o} N and 176^{o} E-180^{o} (14 Sv). The second deep cyclonic circulation was located near the western anti-cyclone with coordinates 52-58^{o} N and 179-178^{o} E (14 Sv). The local anti-cyclonic vortex (24 Sv) was observed in southwest part of the Bering Island. The small cyclonic vortex (18 Sv.) was located to the east of the Medniy island.

In summer, the scheme of the integral circulation from the surface to bottom in general was remained, but mostly dominated by cyclonic water motion. But, the water area occupied by hydrodynamic structures was reduced and a value of full streams was decreased. Deep cyclone was remained, but water discharge was estimated about 2 Sv, at the east anticyclone - to 3 Sv, and at the western anticyclone – to 2 Sv.