Chilean Jack Mackerel Workshop

Inter-annual and seasonal variability of oceanological conditions in the Southern Pacific Ocean in connection with the pelagic ecosystem structure

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The water structure and dynamics in the Southern Pacific Ocean was studied as the basic factor determinative the pelagic ecosystem structure in the area, including South Pacific jack mackerel *(Trachurus murphyi)* populations.

Material that were used:
- data of the World Atlas of Oceanological observations (ed. S.Levitus, 2006);
- data of the drifting buoys obtained under Argo project (2003-2008);
- average monthly fields of atmospheric pressure in cross-points of 5-degree strata (NCEP/NCAR January 1960-March 2008), sea surface temperature in cross-points of 1-degree strata (IGOSS, November 1981-March 2008), sea-level anomalies in cross-points of 1-degree strata based on the results of measurements from satellites TOPEX/POSEIDON, ERS1, ERS2, ENVISAT, JASON (AVISO, October 1992-March 2008);
- data of hydrobiological and ichthyological observations;
- bibliography data.

The following methods were used in analysis:
- method of geostrophic water circulation calculation;
- estimation and analysis of the researched principle components (PC) fields;
- cluster analysis of the researched parameters fields and spectral analysis of oceanological data series;
- discriminant analysis;
- regression analysis of multidimensional measurements.

The following results were obtained:
- on the average long-term schemes of geostrophic circulation in the upper 200-m layer, relatively isolated anticyclonic circulations were detected in the eastern, central and western parts of the Southern Pacific Ocean, where zones of high biological productivity were observed and South Pacific jack mackerel occurred at all life cycle stages (eggs, larvae, juveniles and adults);
- cluster analysis of the principle components fields (atmospheric pressure, sea-surface temperature and sea-level anomalies based on altimetric data) allows to identify 5 classes of areas in the Southern Pacific Ocean, which differ in the seasonal and inter-annual variability patterns;
- spectral, inter-spectral and regression analysis of oceanological parameters series allows to assume series coherence at individual frequencies, as well as availability of frequencies typical to specific areas.

The basic result of the study:
Since the Southern Pacific Ocean has the more extended open boundary with Antarctica as compared to the Atlantic and Indian Oceans, the larger volumes of intermediate Antarctic water rich in nutrients penetrate into the temperate latitudes. Under the impact of anticyclonic circulations, appeared owing to hydrodynamic instability in the frontal zones of the ocean, these water masses are ascending to the surface, where relatively isolated zones of high biological productivity able to support individual South Pacific jack mackerel stock units are formed.