The Indian Ocean response to the El Niño effect

Byshev V.I., Neiman V.G., Romanov Yu.A., Serikh I.V., and Scherbinin A.D.

P.P.Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow, Russia
(navaga@public.free.net)

The joint analysis of the monthly-mean thermodynamic characteristics of the ocean and atmosphere (COAPS, MODAS, Climate Diagnostic Bulletin) indicated that equatorial part of the ocean-atmosphere climatic system in the Indo-Pacific region looks like a united coupled structure. It is characterized by two large Worker Circulation cells that contact each other in a common zone of convection located at the ocean's boundary. Because of this coupling, the quasi-periodic undisturbed states of the Pacific and Indian ocean climatic subsystems display their mirror (dipole) symmetry relative to each other. During an El Niño event the atmospheric pressure grows at that general boundary area. At the same time the united convection zone divides into two zones shifted along the Equator for several thousand miles to the East in the Pacific and to the West in the Indian Ocean. Such disturbance of the atmospheric pressure field initiates the sign change of the overturning circulation in the equatorial plane. As a result, each of these bordering oceans, as well as the atmosphere over them, form a dipole-type anomalies of the physical property fields. Thus, the El Niño phenomenon arises and develops as a united process involving the Pacific and Indian oceans simultaneously. Nevertheless, their responses to the El Niño effect, have a clear phenomenological difference caused by the strong monsoon impact upon the Indian Ocean which overcomes entirely other disturbing forcing in this region. As compared with the Worker Circulation mechanism, which is strongly influenced by the ENSO effect, the South-Asian monsoon forcing (permanently induced by the ocean-land thermal contrast) is rather more stable. So, the El Niño signal in the Indian Ocean region is shown to become apparent during the inter-monsoon seasons.

The work was supported by the Russian Foundation on Basic Research, grant #06-05-64634.