



Arctic Ocean Oscillation Index (AOO): interannual and decadal changes of the Arctic climate

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The major goals of this presentation are to (i) update information about the Arctic Ocean Oscillation Index (AOO) and its relations with a set of different Arctic system environmental parameters, and (ii) demonstrate how the AOO reflects recently observed changes of the Arctic climate. In 1995, Proshutinsky and Johnson employed a 2-D coupled ice-ocean model to simulate circulation of sea ice and ocean forced by NCAR/NCEP winds, river runoff and sea level difference between the Pacific and Atlantic Oceans for the period of 1946-1993. The analysis of modeled sea levels and ice drift patterns indicated that wind-driven motion in the Arctic Ocean alternated between anticyclonic and cyclonic, with each regime persisting for 5-7 years. Anticyclonic motion in the central Arctic appeared during 1946-1952, 1958-1963, 1972-1979, and 1984-1988, and cyclonic circulation dominated during 1953-1957, 1964-1971, 1980-1983, and 1989-1993. To determine the variability of the Arctic Ocean's wind-driven circulation, the sea level slope near the center of the Arctic Basin was used as a measure of cyclonicity and anticyclonicity by calculating the difference between the sea level at the center of a closed circulation cell and the sea level at the periphery of this circulation. The second, more objective method of AOO index calculation was based on EOF analysis of annual sea surface heights (SSH) in the model domain. The first EOF mode of these fields describes 37% of SSH variability and is used as the AOO index. Updated AOO time series show that the cyclonic type of circulation dominated over the Arctic in 1989-1996 and the anticyclonic circulation was observed during 1997-2008. Interestingly, the anticyclonic circulation regime that persisted through 2008 lasted at least 12 years instead of the typical 5-7 years discussed above. In 2009, the wind-driven circulation regime was characterized as a cyclonic but in 2010 it changed back to an anticyclonic type of circulation. Correlations and differences among AOO, AO and NAO indexes will be also discussed.