

Causes and Consequences of Decadal Sea Level Changes in the Arctic Ocean in 1954-2016

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Sea level (SL) time series from coastal stations in the Siberian Seas (Kara, Laptev, East Siberian and Chukchi) for the period of 1954-2016 are analyzed to investigate the major features of Arctic sea level variability at decadal time scales. The estimated rate of SL rise for these stations over the 1954 - 2016 is 2.52 ± 0.35 mm per year (after correction for glacial isostatic adjustment, GIA). Until the late 1990s, the SL time series correlate relatively well with the AO index and with the inverse of the sea level atmospheric pressure (SLP) at the North Pole, but then due to sea ice melt, warming of surface layers and persistent anticyclonic winds, the sea level regime changed. Consistent with these influences, sea level dropped significantly after 1990 and reached a minimum in 1996-1997 when the circulation regime changed from cyclonic to anticyclonic. In contrast, from 1997 to 2006 the mean SL has generally increased while the AO and SLP remained more or less stable. After 2008, sea level has had a decreasing tendency, showing no apparent correlation with the AO nor SLP at the North Pole. Since sea level change exhibits large interannual variability and is the net result of many individual effects of environmental forcing, it is difficult to evaluate the significance of the change in relative terms. Although not statistically robust, the changing tendency toward decreasing SL rise may be due to steric effects associated with some stabilization of surface ocean warming and its freshwater content.

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