



## **Arctic Ocean storm surges: origin, climatology, impacts, simulations and predictions**

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Like many other manifestations of climate change, sea level rise is already a problem in the arctic regions. Many scientists and engineers expect the effects of sea level rise to be profound and costly along the Arctic Ocean coasts. The current rate of sea level rise in the Arctic Ocean estimated based on nine tide gauge stations for 1954–2009 is  $2.57 \pm 0.45 \text{ mm yr}^{-1}$  (after correction for glacio-isostatic adjustment). The 2007 IPCC best-estimate scenario for the world's oceans projects a sea-level rise in the range of 18 to 38 cm by 2100, and likely to be substantially greater than the increase over the last century. With continuing arctic warming and sea ice declines it is expected that sea level will rise and storms with storm surges will be stronger and more frequent and coastal communities now struggling with erosion will see shoreline retreat accelerate. The shore of the arctic seas are generally of low relief and the combination of waves and high water levels during late summer and fall storms before the development of significant sea-ice cover can be particularly damaging to shorelines. Gravel barrier beaches can be overwashed and eroded while bluffs consisting of unlithified ice-bonded sediment and segregated ice can fail and retreat. The low-lying coast and delta plains are subject to extensive inundation causing, in some cases, severe environmental and economic impacts. The presence of sea ice significantly influences the origin, development and progression of storm surges and their effects on environmental and socioeconomic conditions. While coastal erosion from storms is limited during the winter season because of the protection from land-fast sea ice, storm surges of significance can occur even under conditions of complete ice cover. Ice roads and other temporary infrastructure utilizing the ice surface (e.g. hydrocarbon exploration equipment) are subject to damage during the winter surges. This presentation will focus on the description of arctic storm surge mechanisms, climatology of storm surge related sea levels, statistics of extreme storm surge events and their variability due to climate change. Specific attention will be paid to the techniques of arctic storm surge simulation, mechanisms of ice-tide-storm interactions and parameterizations, methods of sea level, ice drift, and water circulation prediction including extreme events.