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The intersection of sea ice retreat and trends of storminess

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Coastal erosion rates in the Arctic are influences by the frequency and intensity of coastal storms, by the duration of a protective buffer of sea ice and, ultimately, by changes of sea level. Recent concerns about increasing rates of coastal erosion raise a fundamental question: What are the relative roles played by changes in storminess and sea ice in accelerating rates of coastal erosion? In a case study for the western and northern coasts of Alaska, we evaluate recent trends in the occurrence of coastal storms, stratified by the presence or absence of sea ice in the offshore coastal waters. Storm events are determined from the storm track database of the National Centers for Environmental Prediction, and the period of study is 1953-2010. When sensitivities to storm intensity thresholds and extent of open water are examined on a seasonal basis, the greatest increase of storm occurrence without a protective sea ice cover is along the northern coast of Alaska during the summer and autumn months. The increase of such events is primarily a function of the longer ice-free season. Overall storm frequencies show little trend south of the Bering Strait, where the loss of sea ice has been less and the incidence of ice-free storm events has shown a smaller increase. Nearly all storms affecting this region originate in middle latitudes. Conclusions about changes in storminess show some dependence on whether the criteria for storm events are based on sea level pressure centers or on gradient winds.