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Arctic storm tracks and their relation to sea ice cover

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The distribution, frequency, and intensity of storm activity have a significant impact on the underlying sea ice distribution in the Arctic Ocean. Variability in storm track characteristics directly influences the ice pack through changes in wind stress, but may also alter the surface energy budget through changes to the overlying cloud cover, the advection of warmer air masses from lower latitudes, and through changes in precipitation. In turn, air-sea flux anomalies produced by changes in the sea ice distribution may influence high latitude storm tracks. Increased wintertime storminess at high latitudes has been suggested in studies of storm tracks derived from sea level pressure analyses. However, seasonal-mean anticyclonic circulation anomalies over the central Arctic Ocean in summer have been shown be present in recent years, and are thought to influence the ice pack through an enhanced downwelling solar flux from decreased cloudiness, increased poleward atmospheric energy transport, and by means of Ekman drift in marginal seas. Recent Arctic synoptic activity is examined here using the Modern Era Retrospective-analysis for Research and Applications (MERRA). The MERRA collection was made using the Data Assimilation System component of the NASA Goddard Earth Observing System, and covers the modern satellite era from 1979 to the present. Comparison of MERRA sea level pressure values with Arctic station observations indicate close agreement. High resolution fields from MERRA are used to assess cyclonic and anticyclonic variability using band-pass filtering and a tracking algorithm. The analysis contrasts the time 1979-2000 with the last six years 2005-2010 in which the September ice extent has been at least 17 percent below the average for the earlier period. Results indicate little change in conditions promoting cyclogenesis in coastal areas, but a marked decline in the number of central Arctic cyclones in summer due to directional changes in the storm track. Some questions of interest addressed by this study are as follows. - How do MERRA fields compare to other reanalyses in their depictions of Arctic atmospheric variability? - What are the mean characteristics of Arctic storm tracks over the period 1979-2000? - How have general characteristics of cyclogenesis, cyclolysis, cyclone frequency, and storm track path changed in the recent five year period, and are these changes consistent with previously described trends in Arctic general circulation?