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## Climatology of sea ice changes attributed to cyclones, fronts, and cold-air outbreaks

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Rapid changes in the sea ice cover are commonly attributed to periods of strong winds, which in turn are often associated with cyclones and their fronts. In addition to geographically redistributing sea ice, and thereby potentially increasing its export from the Arctic, cyclones also transport moist warm air masses into the Arctic which can lead to local sea ice melt while the cyclone's cold sector might lead to freezing and sea ice formation. Furthermore, cold air outbreaks associated with the withdrawal of cold air masses over the open ocean usually lead to sea-ice formation. The relative contribution of these competing effects of weather events on the sea ice is so far poorly understood.

We climatologically assess these competing effects of cyclones on sea ice using detected cyclones, fronts, and cold-air outbreaks in the coupled ECMWF CERA-SAT reanalyses. We then decompose the climatological sea-ice increases and decreases during the different seasons into the components that occur in the vicinity or at larger distance from the different weather events. Preliminary results indicate that the amplitude of both positive and negative sea ice changes increases around cyclones, with an overall net effect of reducing sea-ice concentration during most seasons. Thus, the effect of the wind and warm intrusions within cyclones dominates over the effect of the cyclone's cold sector. In contrast, cold-air outbreaks are associated with sea-ice growth at any time of the year, but exhibit a clear seasonality in their frequency of occurrence.