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Seasonality of sea ice deformation at MOSAiC

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Sea ice drift and deformation shapes the ice cover of the polar oceans, lead opening modulating heat transfer across the ice pack and deformation driven roughness changes affecting momentum transfer from winds and currents. Yet we do not fully understand the seasonal evolution of sea ice deformation. An array of >95 GPS drifting buoys and 11 ice stations was deployed as a Distributed Network around the MOSAiC Central Observatory, capturing scales of sea ice motion between hundreds of meters to up to 200 kilometers. The array drifted across the Arctic in the transpolar drift in less than a year, with an anomalous east-west sea level pressure gradient driving the fast drift. The buoys monitored horizontal deformation of the pack ice from freeze up north of the Laptev Sea to melt in the Greenland Sea. The deformation responds to inertial motion during the freeze up transition to a consolidated ice pack. The fractal dimension of the total deformation changes throughout the year. At smaller scales of about 10 km deformation becomes whiter during the growth season, once the ice pack is consolidated to the coast. There iis an increase in episodic events at the largest scales during the periods the ice pack is consolidated and where it becomes more tidally active during transition through Fram Strait. The MOSAiC distributed network brings improved understanding in the transition of sea ice deformation from freedrift to pack ice, and the response of the ice to changing momentum transfer from the wind and ocean across the Transpolar Drift. The MOSAiC campaign provides unprecedented information about the atmospheric structure and spatial distribution of winds, as well as near surface currents, from which we can deduce the affect of sub-mesoscale deformation in the wind field on the horizontal ice deformation.