Characterizing Air-Sea Interactions near Cape Farewell, Greenland

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Introduction
In July 2004, a buoy was deployed on Irminger Sea, east of Greenland, to help our understanding of knowledge about air-sea interactions in that region.

Today, Irminger Sea is considered as one of main sources of open-ocean deep convection, which process is very important in global climate. Although this deep convection seems to occur by a phenomenon called Greenland tip jet, it is still remain uncertain that the characteristic of climate in this region under such tip jet events, and how they occur.

Directly measured climate data from deployed buoy in 2004 may provide a clue in these questions, and it is also useful to compare indirectly measured model data (ex. QuikSCAT, NARR, NCEP, etc).

Time Series Analysis of observed vs. model data
NARR model data and observed buoy data are compared using time series analysis. They seem to be in a good correlation, however, there exist some points which two data don’t agree. There may be many possible reasons, one possibility is that the model is wrong and the model may not fully catch chaotic behaviour of weather. The other possibility is that the buoy measured wrong data. Since buoy is placed on the ocean where high oscillation of ocean wave is present as well as very high wind speed, some of buoy’s device might be frozen and didn’t operate well.

Behaviour of Air Temperature Under High Wind Speed
One main focus of this project is that how air temperature changes under rapid high wind speed period such as tip jet events.

Computed mean air temperature for several high wind speed events shows that the general shape of air temperature graph under high wind speed looks like “V” shape. However there are couple of other kinds of graphs which exhibits high air temperature only before the event (centre point), and also high air temperature only after the event. Further investigation about these different scenarios are required for deep understanding of air-sea interaction in Irminger Sea.

Characterizing Tip Jet Events Using NARR dataset
Using North American Regional Reanalysis (NARR) dataset, observation of pressure gradient on the buoy location is performed under various high wind speed situations.

Taking snapshots of pressure gradients for every 12 hours, various movement scenarios of low-pressure gradient is observed. Two most typical scenarios are shown below.

In first case, low pressure region is going through the Greenland, and here Greenland behaves as a ‘barrier’. Second scenario is more common one, low pressure region is moving from south to northeast.

References
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