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A MODELING STUDY ON THE INFLOW OF THE ATLANTIC WATER AT THE FRAM STRAIT

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The Atlantic Water is the warmest water and has a significant role on the melting of sea ice in the Arctic Ocean. The Atlantic Water enters the Arctic Ocean through the Fram Strait as the narrow (~ 20-30 km) West Spitzbergen Current (WSC). We focus on the interannual variability of infow of the Atlantic Water at the Fram Strait by using an ice-ocean general circulation model (called COCO). To explicitly reproduce the WSC and eddy activities (deformation radius is ~ 10 km) around the Fram Strait, the horizontal size of grid is set to 2-3 km around the Fram Strait. The WSC, which is not resolved by low resolution ocean models, is well simulated in our model. The increase of heat flux through the Fram Strait from 1990s to 2000s which is indicated by mooring observation (Schauer et al., 2008) is also reproduced. The observed eddy activity and meandering of sea-ice edge (Johannessen et al., 1987) are also well reproduced around the Fram Strait. Westward returning currents toward the Atlantic Ocean bifurcate from the WSC at several fracture zones. The westward bifurcations of the WSC have been inferred by hydrographic observations (Quadfasel et al., 1987). These eddy activities and bifurcations decrease the heat flux to the Arctic Ocean through the Fram Strait. The heat flux by bifurcated currents is enhanced by the cyclonic wind centered at the Greenland Sea. We confirmed that the wind stress does not interannually change the heat penetrating into the Arctic Ocean. The causes of this interannual variability are under investigation.

References

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