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ATMOSPHERIC RESPONSE TO ANOMALOUS SEA ICE IN THE SEA OF OKHOTSK

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Atmospheric variability associated with sea ice change of the Sea of Okhotsk in wintertime is investigated based on atmospheric reanalysis data. Regression analysis of the atmospheric reanalysis data onto inter-annual variability of the sea ice of the Sea of Okhotsk shows that increasing of the sea ice accompanies deepening of the Aleutian low at its northern part. Similar analysis is performed using data sets of AMIP-type simulation of atmospheric global circulation models (AGCMs) that participate CMIP5, where observed sea ice and sea surface temperatures are prescribed. Relationship observed in reanalysis data is observed only in part of these AGCMs. Furthermore, atmospheric response to sea ice reduction in a particular AGCM is investigated by performing AGCM experiments with sea ice of recent years and that of past years. The deepening of the Aleutian low in response to sea ice increase is also observed, but weaker.

In reanalysis data and AGCM simulations, surface turbulent heat flux from the surface to the atmosphere is reduced over the Sea of Okhotsk in conjunction with sea ice increase there. In contrast, the heat flux is enhanced over the western North Pacific just to the downstream of the Sea of Okhotsk in reanalysis data. This enhanced heat flux is observed, although not all, but most of AGCMs that show deepening of Aleutian low associated with sea ice increase. The enhanced heat flux downstream is balanced with cold advection by anomalous northerlies. The realistic enhancement of the upward heat flux downstream may be one of key factors that affect realistic atmospheric response to sea ice changes over the Sea of Okhotsk in AGCMs.

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