investigated. Reanalyses data are sometimes used to calculate the surface heat budgets over polynyas to estimate ice production in polar/sub-polar oceans. In particular, the near surface air temperature and wind fields, which are difficult to observe using satellites or with in-situ measurements, are key parameters for estimating turbulent heat fluxes. If the sea-ice concentration and SST in reanalyses are not treated appropriately, careful attention is needed when using the resultant air temperature for such calculations.

P 052 IMPROVED FORECASTS OF WINTER WEATHER EXTREMES OVER MIDLATITUDES WITH EXTRA ARCTIC OBSERVATIONS

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Recent cold winter extremes over Eurasia and North America have been considered to be a consequence of a warming Arctic. More accurate weather forecasts are required to reduce human and socioeconomic damages associated with severe winters. Uncertainty in predicted atmospheric circulation at midlatitudes sometimes stems from large uncertainty in initial conditions over the Arctic region, partly because of a sparse observing network. Here we show that additional Arctic radiosonde observations from the Norwegian young sea ICE cruise project 2015 drifting ice camps and existing land stations during winter improved forecast skill and reduced uncertainties of weather extremes at midlatitudes of the Northern Hemisphere. For two winter storms over East Asia and North America in February 2015, ensemble forecast experiments were performed with initial conditions taken from an ensemble atmospheric reanalysis in which the observation data were assimilated. The observations reduced errors from uncertainty in initial conditions in the upper troposphere over the Arctic region, yielding more precise prediction of the locations and strengths of upper troughs and surface synoptic disturbances. Uncertainty of predicted upper troughs at midlatitudes would be brought with upper-level high potential vorticity (PV) intruding southward from the observed Arctic region. This is because the PV contained a “signal” of the additional Arctic observations as it moved along an isentropic surface. This suggests that a coordinated sustainable Arctic observing network would be effective not only for regional weather services but also for reducing weather risks in locations distant from the Arctic.

P 053 INFLUENCE OF OCEANIC HEAT ANOMALIES IN THE BARENTS SEA ON WINTERTIME CLIMATE VARIABILITY IN MIDDLE LATITUDES

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There is a growing evidence that wintertime extreme weather events and climate variability over Eurasia are related to anomalies of the sea ice cover in the Barents Sea. A signal in the wintertime sea ice cover to which the atmosphere could respond may come from oceanic forcing. Our earlier studies indicate that about 70% of the interannual variance of the total wintertime sea ice area in the Barents and Greenland Seas can be explained by Atlantic water temperature (AWT) anomalies at the entrance to the Barents Sea in the preceding summer. This presentation is mainly intended to summarize our recent findings, most of which have been already published in Climate Dynamics (2016), about remote atmospheric teleconnections to oceanic variability in the Barents Sea. We will show, using oceanic observations and atmospheric reanalysis data from the period 1982-2006, that summertime AWT anomalies in the Barents Sea are significant precursors of the large-scale atmospheric variability in winter. Positive AWT anomalies precede westerly wind anomalies in high latitudes and easterly wind anomalies in middle latitudes. Near-surface easterly wind anomalies over Eurasia are locally deflected southward, maintaining cold spots near mountain chains when a warm anomaly is forced over the Barents Sea. An Eulerian analysis of synoptic variability will be used to demonstrate that the AWT-related climate teleconnections involve reorganization of mid-latitude storm tracks. In particular, the AWT anomalies explain about 60% of the variance in the storm track activity at the tropopause level averaged over Eurasia and North Pacific from 35° to 55°N. The AWT-related wintertime atmospheric anomalies are uncorrelated with the concurrent anomalies related to the North Atlantic Oscillation, which increases the potential for seasonal prediction of wintertime climate variability in middle latitudes based on summer AWT anomalies. Finally, preliminary results on the persistence of these relationships after 2006 will be presented.

P 054 POSSIBLE ROLE OF ELECTRIC-FIELD GRADIENTS IN BROMINE ACTIVATION DURING POLAR BOUNDARY LAYER OZONE DEPLETION EVENTS

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Emission of bromine from sea-salt aerosols, frost flowers and snow results in nearly complete removal of surface ozone during springtime in the polar regions. Despite the wealth of information, bromine activation, namely the origin of the seed bromine that becomes amplified by HOBr-driven bromine explosion reactions is still not clear, as well as role of environmental conditions and substrates of ozone depletion events (ODE) initiation. The proposed hypothesis attempts to explain some experimental data that cannot be fully understood by taking into account the influence of electrical phenomena on the snow surface. Author suggests that ODEs may be initiated by the electric-field gradients created at the sharp tips of ice formations as a result of the combined effect of various environmental conditions. According to the author’s estimates, these electric-field gradients may be sufficient for the onset of point (corona) discharges followed by generation of high local concentrations of the reactive oxygen species and initiation of free-radical and redox reactions. This process may be responsible for the formation of seed bromine which then undergoes further amplification by HOBr-driven bromine explosion. The proposed hypothesis may explain a variety of environmental conditions and substrates as well as poor reproducibility of ODE initiation observed by researchers in the field.

According to the author’s estimates, high wind can generate sufficient conditions for overcoming the Rayleigh limit and thus can initiate “spraying” of charged aerosol nanoparticles. These charged aerosol nanoparticles can provoke formation of free radicals, turning the ODE on. One can also envision a possible emission of halogen ion as a result of the “electrospray” process analogous to that of electrospray ionization mass-spectrometry.