Investigation of Januaries polar lows genesis conditions between 2003 and 2011 using Arctic System Reanalysis (ASR)

Radovan[1], S. Crewell[1], A. Rinke[2], E. M. Knudsen[1]

[1]University of Cologne, Institute for Geophysics and Meteorology, Pohligstr. 3, 50969 Cologne, Germany (email: aradovan@uni-koeln.de)

[2]Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Telegrafenberg A43, 14473 Potsdam, Germany

High latitude, intense maritime cyclones that bring heavy precipitation and whose wind intensity is above gale force are called polar lows (PLs). Due to these features, damage caused to coastal communities and offshore activates can be substantial. Still, their characteristically small horizontal scale (less than 1000 km) and short life time (sometimes only 3 h) makes them hard to predict. Therefore, better understanding of their developing mechanisms is of high importance. During the period of investigation (January, 2003 – January, 2011), 25 cases were reported. Here the Arctic System Reanalysis (ASR) has been used in order to investigate the PL genesis conditions that have a certain threshold (behaviour). Considering genesis conditions, variables taken into consideration are: temperature difference between surface and 500 hPa (T_{diff}), relative humidity, wind speed, lapse rate and geopotential height. These variables for some of the cases have not reached the threshold often found in the literature and usual behaviour (geopotential height) for a PL genesis has not been observed. Hence, we put the focus on determining which one of these variables has been of higher importance in triggering a PL formation. It was noticed that relative humidity averaged over 200 km radius at genesis point and time for some cases was close to 100 % below 2 km while the T_{diff} threshold has not been reached. It will also be presented how these are correlated with the integrated values of water vapour, liquid (rain + cloud water) and ice (ice + snow + graupel) that can have high values such as 8 kg/m^2, 0.07 kg/m^2 and 0.6 kg/m^2 respectively.