



Numerical simulation study of polar low in Kara sea: developing mechanisms evaluation

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The study focuses on investigating the mechanisms of interaction between potential vorticity's anomalies and latent heat release as polar low development factors. The polar low observed in Kara sea 29th -30th September 2008 is analyzed using numerical modeling (WRF ARW model) and observational data (IR cloudiness and microwave water vapor and surface wind speeds from MODIS (Aqua)). Two numerical experiments with 5 km spatial resolution were conducted with microphysical scheme turned on and off to assess the role of latent heat on vortex intensification. The quality of modelling was estimated by comparing WRF output and the satellite data.

Based on reference experiment (with microphysical parameterization turned on) and observational data PL developed in vertically stable, non-baroclinic atmosphere and characterized by very low surface heat fluxes. «Dry» experiment results suggests that without latent heat source in the middle troposphere polar low intensifies slower, than in reality.

In order to divide low- and upper-level forcing within PL dynamics we used attribution concept based on the quasi-geostrophic omega-equation. To ensure that QG theory is applicable for this PL case, we estimate correlation between the modeled and QG vertical speed field obtained from omega-equation using finite-differences method.