Geophysical Research Abstracts
Vol. 14, EGU2012-671, 2012
EGU General Assembly 2012

Application of WRF-ARW Model to Short-Range Prediction of Squalls in Transbaikalia Region of Russia

S. Romanskiy (1) and E. Verbitskaya (2)

(1) Far Eastern Regional Hydrometeorological Research Institute, Department of Hydrometeorology Research and Predictions, Khabarovsk, Russian Federation (khvstas@gmail.com), (2) Far Eastern Regional Hydrometeorological Research Institute, Department of Hydrometeorology Research and Predictions, Khabarovsk, Russian Federation (werba@gmail.com)

More than 30 squalls, including severe events whose wind speed increases a value of 25m/s and above, take place in Transbaikalia region of Russia on warm season yearly. Majority of these occurrences has a frontal origin.

The Advanced Research Weather Research and Forecasting Model (WRF-ARW) is used as the prognostic base for prediction of squalls. Forecast area consists of two nested domains with 9km and 3km grid resolutions. External domain covers roughly 2500km $\times$ 2000km region centered on lake Baikal. Forecast period is up to 30 hours.

One of the goals of research is estimating general impact of various physical parameterizations to squall origin. To pursue this aim 4 different variant of WRF-ARW configurations were created and run for 25 cases. For each case, two convection treatments (Kain-Fritsch and Betts-Miller-Janjic schemes) and two various pairs of surface and planetary boundary layers parameterizations (Mellor-Yamada-Janjic and Yonsei University non-local-K schemes) were used. Parameterization of convection was always switched off inside inner domain.

Squall forecasts were compared with observations over a period of 2010 to 2011. A forecast considered as successful if wind speed at a height of 10m has reached the threshold value within a circle of 30km radius centered about observing site for one minute or more (up to 3 hours). Total number of estimated observed squalls is 38.

Results show that convection parameterizations in external domain had no an influence on squall origin. Major contribution to forecast is made by surface and planetary boundary layers parameterizations. Particularly, Mellor-Yamada-Janjic scheme overstates wind speed if a deep convection has place that means nonexistent squalls may appear.

It used information about the magnitude of surface temperature tendency and vertical speed of wind up to a height of 3000m to separate nonexistent squalls and improve squall prediction (define wind speed and time of appearance more accurately). As a result, maps of probability of squalls and wind speed are made.

Results and discussion of squall prediction in Transbaikalia Region of Russia will present on the address.

References

[1] Koch S. E., 1985: The Role of an Apparent Mesoscale Frontgenetic Circulation in Squall Line Initiation. Mon. Wea. Rev., 112, pp. 2090—2111.

[2] Vasil'ev E. V., Alekseeva A. A., Peskov B. E., 2009: Conditions for formation and short-range forecasting of severe squalls. Russian Meteorology and Hydrology, 32, pp. 1—7.

[3] Skamarock W. C., Klemp J. B., 2007: A time-split nonhydrostatic atmospheric model for research and NWP applications. J. Comp. Phys., special issue on environmental modeling, pp. 3465—3485.