Method to Forecast Cloud Cover for WRF-ARW Model

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The report presents new method to forecast cloud amount for Weather Research and Forecasting â˜ Advanced Research WRF model. It has been found that internal methods for cloud cover calculation included to Unified Post Processor produce insufficient forecasts of clouds amount for tepid latitudes of Far East.

This method is based on the Sundqvist parameterization for stratiform condensation (Sundqvist 1989). The basic idea of the Sundqvist scheme is that condensation start if relative humidity r in a grid cell reaches a threshold value r_0. Let r_0 represents as a function of unknown cloud amount b and parameter r_{00}, thus independent of cloudiness. r_{00} is a set of constants for various vertical layers of atmosphere.

Simulated cloud cover badly aligned with satellite-derived data if specified kind of r_{00} is used. The goal of this study was to develop optimal type of r_{00} as a function of model vertical structure, thus r_{00} has to be acceptable for physical-geographical conditions of specified area.

Qualitative selection of function types was conducted on comparison of cloud cover forecasts and satellite-derived cloud systems. Minimum of forecast mean error on observation cites is a condition to construct conclusive relation.

The power function is suggested for r_{00}. Values of Î·-levels and air temperature on every vertical layer are the arguments of proposed relation. Clouds do not appear if air temperature on Î·-level is lower that -40 C (based on comparison of simulated cloud-top temperature with observed data).

Sample calculations ware produced on domains of 5-15 km grid resolution with 31 vertical levels. Thomson, Ferrier, WSM5 microphysics parameterizations were tested. Trial period holds 150 days.

Proposed method is allowed to predict total cloud amount and cloud amount on specified levels for tepid latitudes of Far East. Parameterization scheme may implement to WRF-ARW as diagnostic procedure.