Operational forecast of the meteorological and turbulence characteristics of the boundary layer

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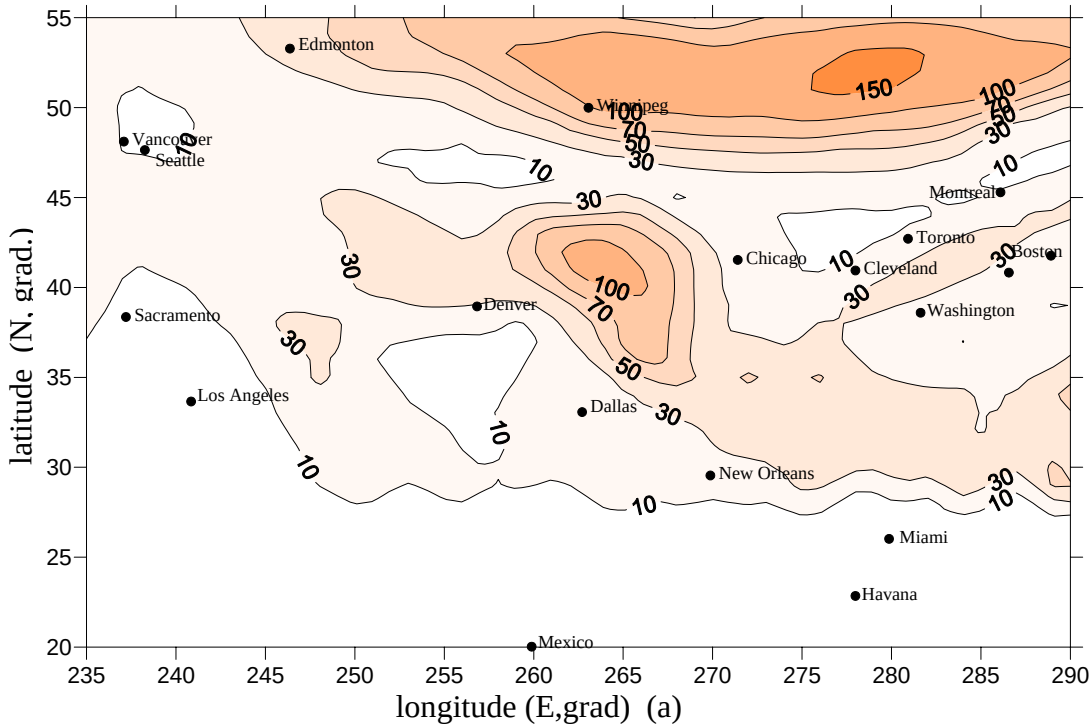
The coupled model for prediction of large and mesoscale atmospheric processes based on the hemispheric forecast model(HFM) and boundary layer model (BLM) described in[1,2] . Let's emphasis the improved two-equation closure scheme is applied in BLM. The operational objective analysis data are the initial for the meteorological variables in the coupled model. By using these data and the one-dimensional version of boundary layer scheme we restored the initial fields of turbulence and meteorological parameters. The implicit time integration scheme with the iterative cycle on each temporal step (approximately 5 iterations) is used in BLM and leap-frog scheme in HFM. The predicted lower and upper boundary conditions for BLM are calculated by HFM. These vertical boundary conditions and the implicit scheme allowed to get the real positive values of turbulent kinetic energy, dissipation rate and avoid the fictive solution that appeared without use of developed method. The turbulence coefficients and friction vertical velocity calculated in boundary model are transferred to HFM. On the pictures the example of the boundary layer parameter 42 hour forecast (noon, 25 July, 2004 in USA) of turbulent energy (m2/s2) increased in 100 times (a), turbulence coefficient (m2/s,c) on the level 100m (b) and friction vertical velocity (mb/ 12 h) on the top of boundary layer (c) is given.

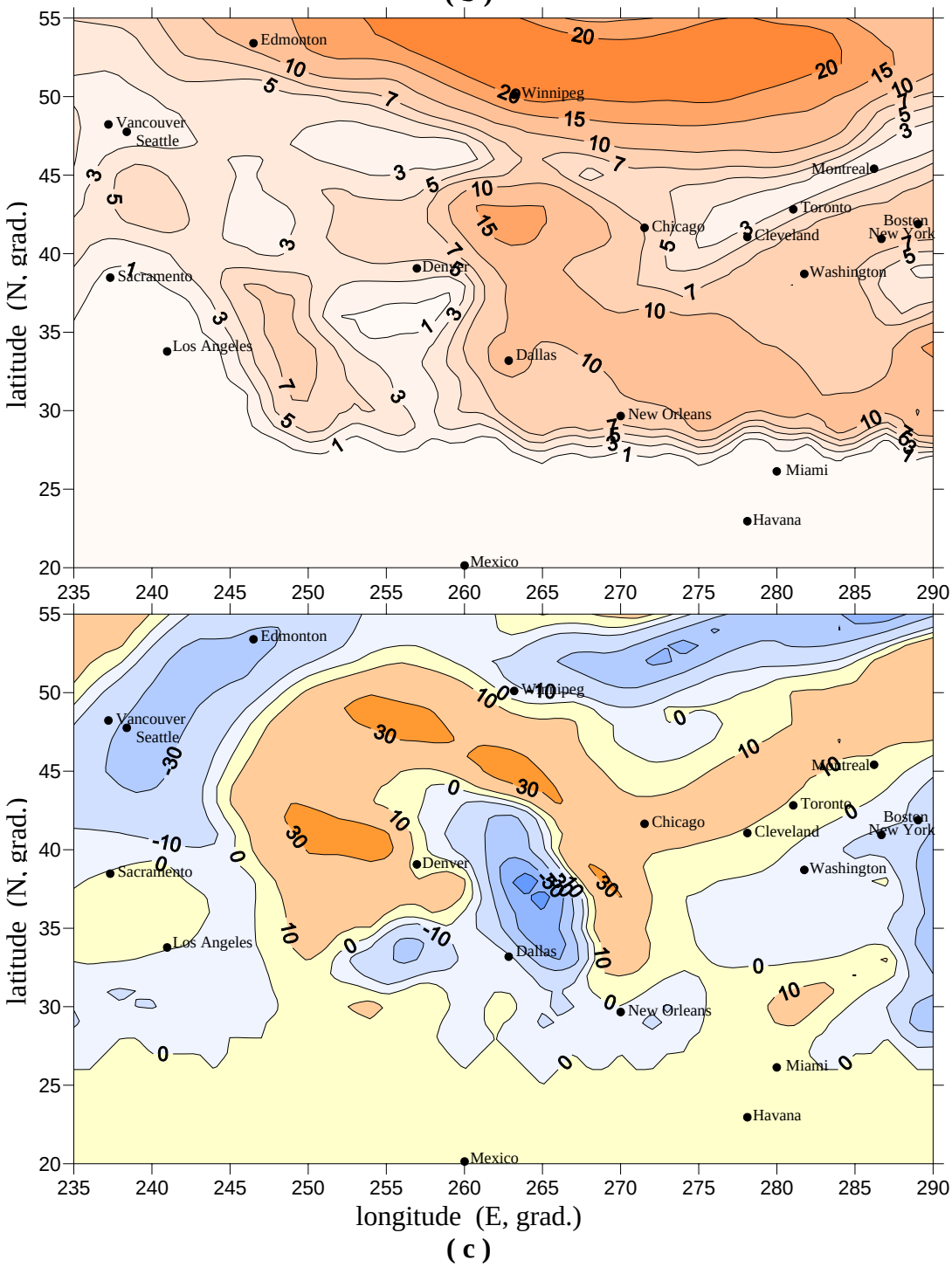
(a)



The problem of comparison of the predicted and high resolution actual meteorological variable vertical distribution and turbulence parameters require the special measurements which we didn't have in standard meteorological information. So we used the actual surface and 850 hPa level data on the prediction time as lower and upper boundary conditions and recalculated the boundary layer parameters which we considered as actual values.

Comparison of these values and the predicted ones showed the good agreement of the boundary layer parameters fields. The output of coupled model was compared with the local weather data. The verification of weather forecasts confirmed the high quality of the predicted information .It is a reason to insert the boundary layer model in the coupled model and to use the developed prognostic model for operational practice.

(b)



(c)

1.Berkovich L., Tkacheva Yu., The hydrodynamic short-range of local weather forecasting . Research Activity in Atmospheric and Oceanic Modeling, 2003,No 33, 5.1-5.2.

2.Shnaydman V.“ Improved hydrodynamical scheme of the turbulence description “ Research Activity in Atmospheric and Oceanic Modeling, 2004, No 34, 4.29 – 4.30.