EMS Annual Meeting Abstracts
Vol. 15, EMS2018-667, 2018

Numerical Simulation of a Persistent Wintertime Inversion over Salt Lake City

Linbo Wei
Lanzhou University, College of Atmospheric Sciences, China (weilb@lzu.edu.cn)

An episode of persistent wintertime inversion over Salt Lake City, Utah and its vicinity from 1200 UTC 30 November to 0000 UTC 7 December 2010 is simulated using an advanced research version of the Weather Research and Forecasting model. Results indicate that the numerical simulation successfully reproduced the persistent inversion event. Except for some discrepancies near the surface, the simulation results agree well with the soundings. Due to simulation error in the near-surface atmosphere conditions, the inversion top from the simulation is lower than that from the soundings during most of the persistent inversion period. However, the trend of the time variations of the inversion top from the simulation is consistent with that from the soundings. Although the WRF model has problems identifying the type of inversion, the variation of inversion strength between the simulation and the observations is consistent most of the time. An inverse relationship is found between depth and strength from the soundings and the simulation. The characteristics of largescale environmental conditions and their interactions with local-scale processes are analyzed to understand the factors that influence the onset and evolution of persistent inversions. It is found that the inversion formed mainly because of the interaction between the heating effect from a high-pressure ridge in the mid-troposphere and a near-surface cold pool due to the effects of radiation. During the following six to seven days, the high-pressure ridge was maintained and vertical motion very weak, allowing a persistent inversion to become established. Finally, the cold effect from a low-pressure trough in the mid-troposphere, combined with mixing due to vertical motion, led to extreme weakening of the persistent inversion.