

引用本文(Citation):

张碧辉, 刘树华, LIU He-Ping, 马雁军. MYJ和YSU方案对WRF边界层气象要素模拟的影响. 地球物理学报, 2012, 55(7): 2239-2248, doi: 10.6038/j.issn.0001-5733.2012.07.010

ZHANG Bi-Hui, LIU Shu-Hua, LIU He-Ping, MA Yan-Jun. The effect of MYJ and YSU schemes on the simulation of boundary layer meteorological factors of WRF. Chinese J. Geophys. (in Chinese), 2012, 55(7): 2239-2248, doi: 10.6038/j.issn.0001-5733.2012.07.010

MYJ和YSU方案对WRF边界层气象要素模拟的影响

张碧辉^{1,2}, 刘树华¹, LIU He-Ping³, 马雁军^{4*}

1. 北京大学物理学院大气与海洋科学系, 北京 100871;
2. 中国气象局国家气象中心, 北京 100081;
3. Department of Civil and Environmental Engineering, Washington State University Pullman, WA 99164, USA;
4. 中国气象局沈阳大气环境研究所, 沈阳 110016

The effect of MYJ and YSU schemes on the simulation of boundary layer meteorological factors of WRF

ZHANG Bi-Hui^{1,2}, LIU Shu-Hua¹, LIU He-Ping³, MA Yan-Jun^{4*}

1. Department of Atmospheric and Oceanic Sciences, School of Physics, Peking University, Beijing 100871, China;
2. National Meteorological Center, China Meteorological Administration, Beijing 100081, China;
3. Department of Civil and Environmental Engineering, Washington State University Pullman, WA 99164, USA;
4. Institute of Atmospheric Environment, China Meteorological Administration, Shenyang 110016, China

摘要

参考文献

相关文章

Download: PDF (1923KB) HTML KB Export: BibTeX or EndNote (RIS) Supporting Info

摘要 研究新一代中尺度气象模式WRF中两种大气边界层方案(MYJ,YSU)对沈阳冬季大气边界层结构模拟的影响,重点分析温度层结、低层风场、边界层高度等对污染物扩散有重要影响的气象要素,和观测数据的比对表明WRF基本能够模拟出温度风速的日变化特征,但模拟风速偏大.YSU方案由于模拟的边界层顶卷挟和边界层内混合作用较强,夜间接地逆温强度低于MYJ方案,逆温维持时间比MYJ方案短4小时,同时模拟边界层高度也高于MYJ方案,有利于污染物垂直扩散.边界层高度的3种计算方法中,湍流动能方法计算的边界层高度最高,Richardson数方法次之,位温方法得到的高度最低.Richardson数方法对临界值的选取较敏感.

关键词 大气边界层方案, 温度层结, 风速, 边界层高度, 整体Richardson数

Abstract: This study analyzed the effects of two difference boundary layer schemes in the Weather Research and Forecast (WRF) model on the simulation of meteorological factors related to pollutant dispersion over Shenyang China in winter. The performance of WRF was evaluated against observation data with statistics. It was revealed that WRF underestimated the temperature and overestimated the surface wind speed which may be attributed to the outdated land use data. The Yonsei University (YSU) scheme simulated higher air temperature and weaker nocturnal surface-based inversion layer than the Mellor-Yamada-Janjic (MYJ) scheme, due to the stronger entrainment at the top of the boundary layer and vertical mixing in YSU. The duration of inversion layer was 4 hours longer in MYJ than YSU. The temperature difference between the two schemes was highest before sunrise, after which the surface heating weakened the difference. The surface wind was not sensitive to the boundary layer schemes and both MYJ and YSU simulated north wind with the highest frequency and speed, agreed with observation. The boundary layer height was also higher in YSU than MYJ, favoring the vertical dispersion of pollutant. Among the three methods determining the boundary layer height, the TKE (Turbulent Kinetic Energy) method led to the highest values, while potential temperature method led to the lowest. The bulk Richardson number method was sensitive to the critical value.

Keywords Boundary layer scheme, Vertical temperature structure, Wind speed, Boundary layer height, Bulk Richardson number

Received 2011-03-22;

Fund: 国家公益性行业(气象)科研专项(GYHY200806020)和国家自然科学基金(40875004)资助.

Corresponding Authors: 刘树华, 教授, 博士生导师, 从事大气边界层物理和区域气候变化的教学和研究. E-mail: Lshuhua@pku.edu.cn Email: Lshuhua@pku.edu.cn

链接本文:

Service

- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- Email Alert
- RSS

作者相关文章

- 张碧辉
- 刘树华
- LIU He-Ping
- 马雁军

