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论文

热层风场的理论模拟与分析

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摘要： 通过求解中性大气Navier Stokes动量方程建立了一个时变的三维风场理论模式，利用目前新版的中性大气模式NRLMSISE 00及国际电离层参考模式IRI2000作为输入参数给出热层风场. 基于该模式，计算得到中等太阳活动年磁静日风场的变化形态及其受电场和离子曳力的影响. 同时，将Navier Stokes动量方程作不同形式的简化，并利用简化模式与本文的模式计算结果的对比，分析中性大气Navier Stokes动量方程中黏性项以及非线性项$(U \cdot \Delta)U$的作用. 结果表明，本文所建立伪三维风场模式给出的结果更为合理，而简化模式在某些地区尤其在低纬和赤道区不适用，黏性项及非线性项的作用不可忽略. 本文所建立的风场模式将对研究电离层动力学过程、电离层与热层的耦合过程以及空间天气学研究都有着重要意义.

关键词： 热层 热层风 电离层 数值模拟

THEORETICAL MODELING AND ANALYSIS OF THERMOSPHERIC WINDS IN IONOSPHERE

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Abstract: A theoretical thermospheric circulation model has been developed recently. In the model, in term of the operator splitting method, the Navier Stokes equations have

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been solved to derive horizontal neutral winds. The parameters of the atmosphere and ionosphere at present are taken from the latest atmospheric model (NRLMSISE 00) and International Reference Ionosphere Model (IRI2000). The variation of the thermospheric winds associated with height, latitude, season and local time can be investigated by using the model. In this paper, to seek for understanding the effects of electric fields, ion drag and the non linear term, results from our three dimensional model are compared with those from two simplified models. It is suggested that the non linear term effects and the viscosity effect must be taken into account in the neutral wind calculation, especially at low latitudes and in equatorial regions. Our model will be useful to understand the thermospheric neutral dynamics and the coupling between the thermosphere and ionosphere.

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