

论文

高纬电离层气候学特征研究——EISCAT雷达观测及与IRI模式的比较

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摘要: 利用1988~1999年欧洲非相干散射EISCAT (European Incoherent Scatter) 雷达观测数据, 对不同太阳活动周相、不同季节的极光椭圆区电离层F区电子密度进行统计分析, 研究其气候学特征, 并与IRI 2001模式比较. EISCAT观测到的电子密度显示出显著的太阳活动高年“冬季异常”和太阳活动低年半年变化等现象. EISCAT实测电子密度随时间和高度的平均二维分布和500 km高度以下总电子含量TEC, 从总体来看与IRI 2001模式预测结果符合较好. 但高年在TEC达到最大值前后, IRI 2001模式预测的电子密度高度剖面与EISCAT观测结果有显著差别: F₂峰以上IRI 2001模式预测的电子密度过大, 造成TEC明显高于雷达观测值. 另外, 在太阳活动下降相, EISCAT观测显示出明显的半年周期季节变化特征, 但IRI 2001模式未能预测出此下降相季节变化.

关键词: 极区电离层 气候学特征 冬季异常 电离层模式

Climatologic characteristics of high latitude ionosphere ——EISCAT observations and comparison with the IRI model

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Abstract: With EISCAT (European Incoherent Scatter) radar observations during 1988~1999, the climatologic features of electron densities in the auroral ionospheric F region have been investigated statistically and compared with the IRI 2001 model for different seasons at different phases of the solar cycle. The electron densities from EISCAT observations show obviously the well known winter anomaly in solar maximum and a semiannual variation in solar minimum. The averaged 2-D distributions of EISCAT N_e versus t UT and height H, as well as diurnal variations of TEC up to 500 km, are reasonably consistent with those predicted by the IRI 2001 model as a whole. The height profiles of N_e, however, are remarkably different between the IRI model and the EISCAT observations around the time when the TEC reaches its maximum. In this case the electron density above F₂ peak is too large in the IRI 2001 model, causing higher TEC than EISCAT observations. On the other hand, EISCAT observations show obviously characteristics of a semiannual variation at the fall phase of solar activity, however, the results of IRI 2001 model show no evidence of that.

Keywords: Polar ionosphere Climatologic characteristics Winter anomaly Ionospheric model

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