

# T-1 Annual and Semiannual Oscillations in TIE-GCM and WACCM-X

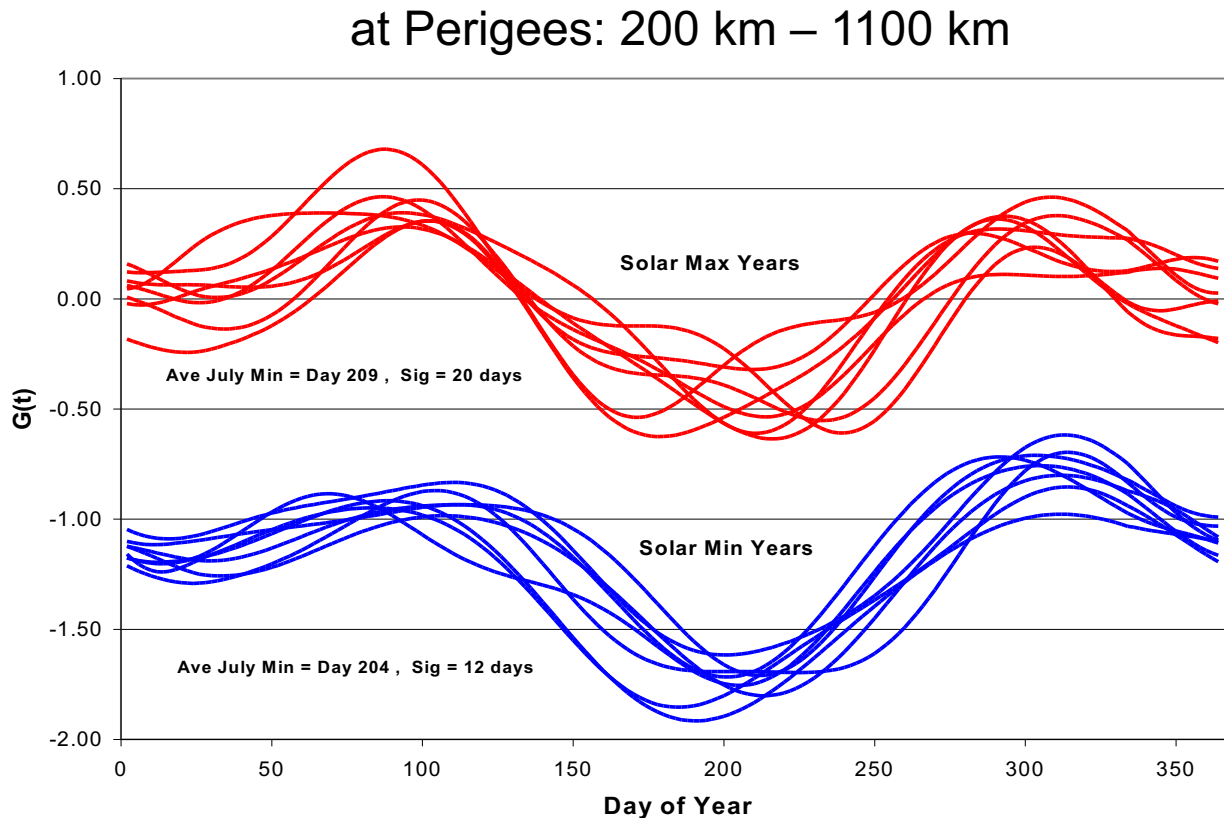
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# Annual/Semiannual Variation in the Thermosphere

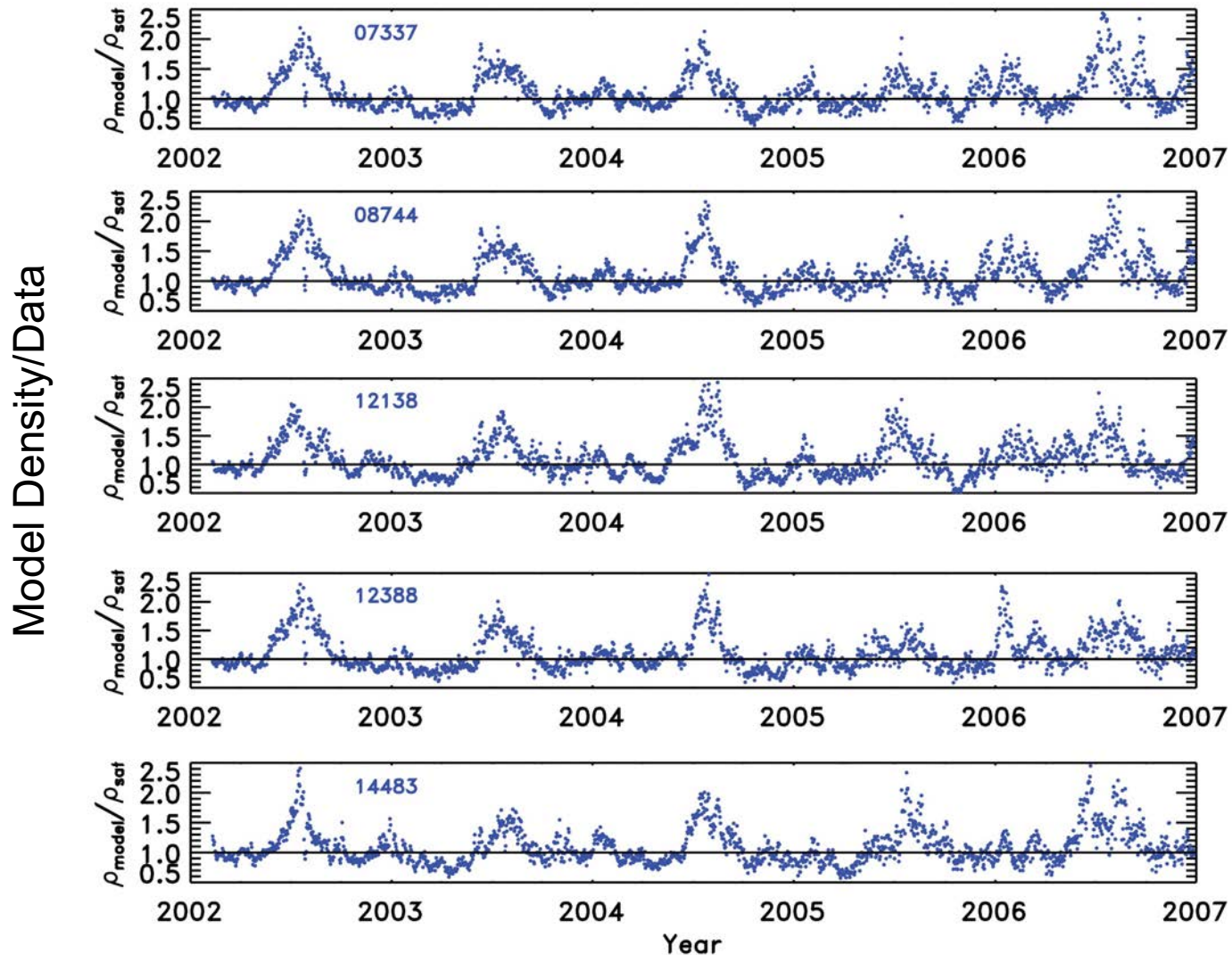
– Neutral Density, Satellite Drag Data

Normalized Seasonal Variation of Density



Bowman, 2004.

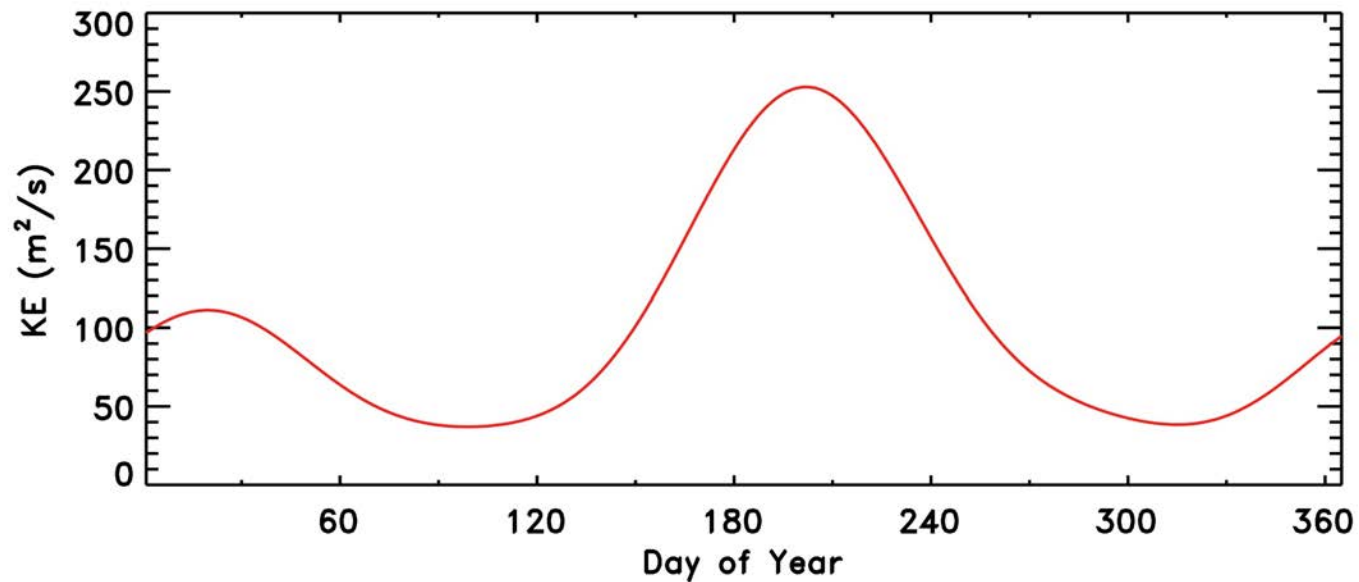
# Comparison of TIEGCM Neutral Density to Satellite Drag Data



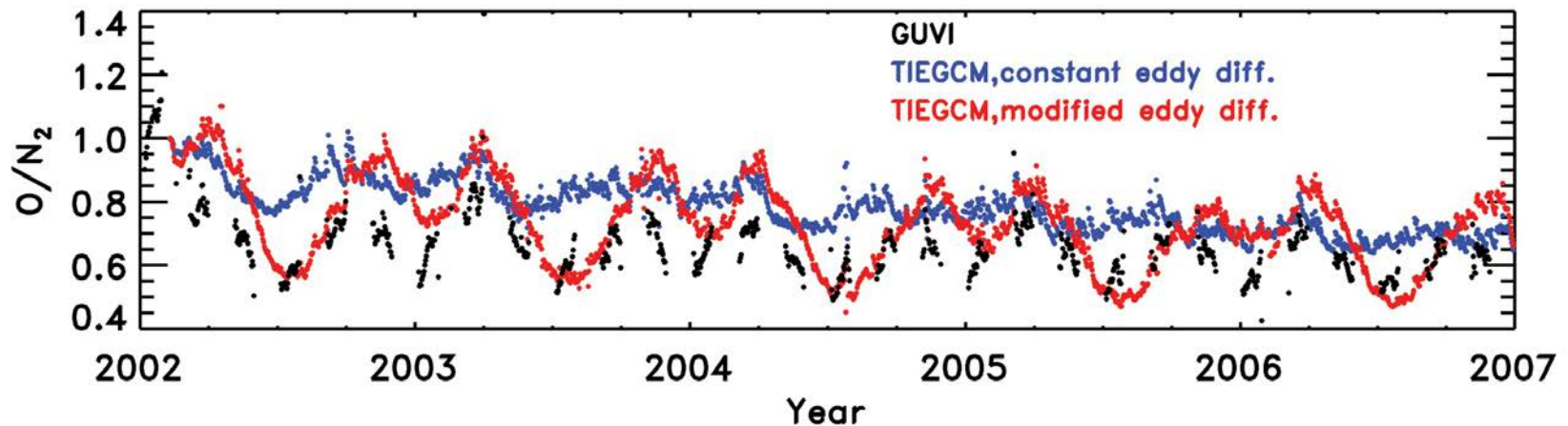
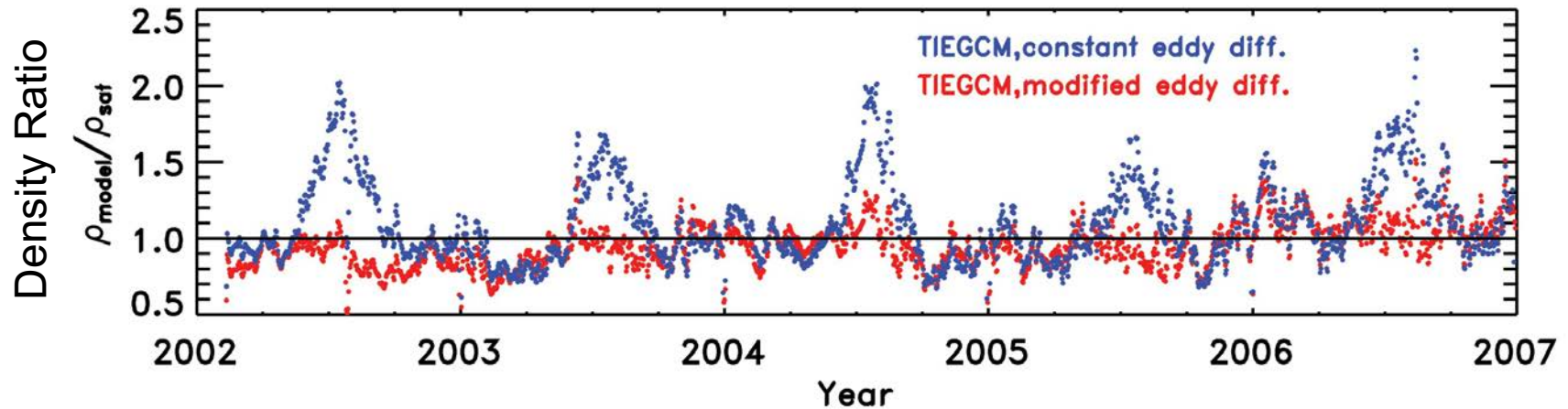
# Estimated Seasonal Variation of Eddy Diffusivity in MLT

**Observations:** seasonal variation of eddy diffusivity [e.g.: Fukao et al., 1994; Sasi and Vijayan, 2001]

**Modeling** (gravity wave breaking): consistent with observations [e.g., Garcia and Solomon, 1985]

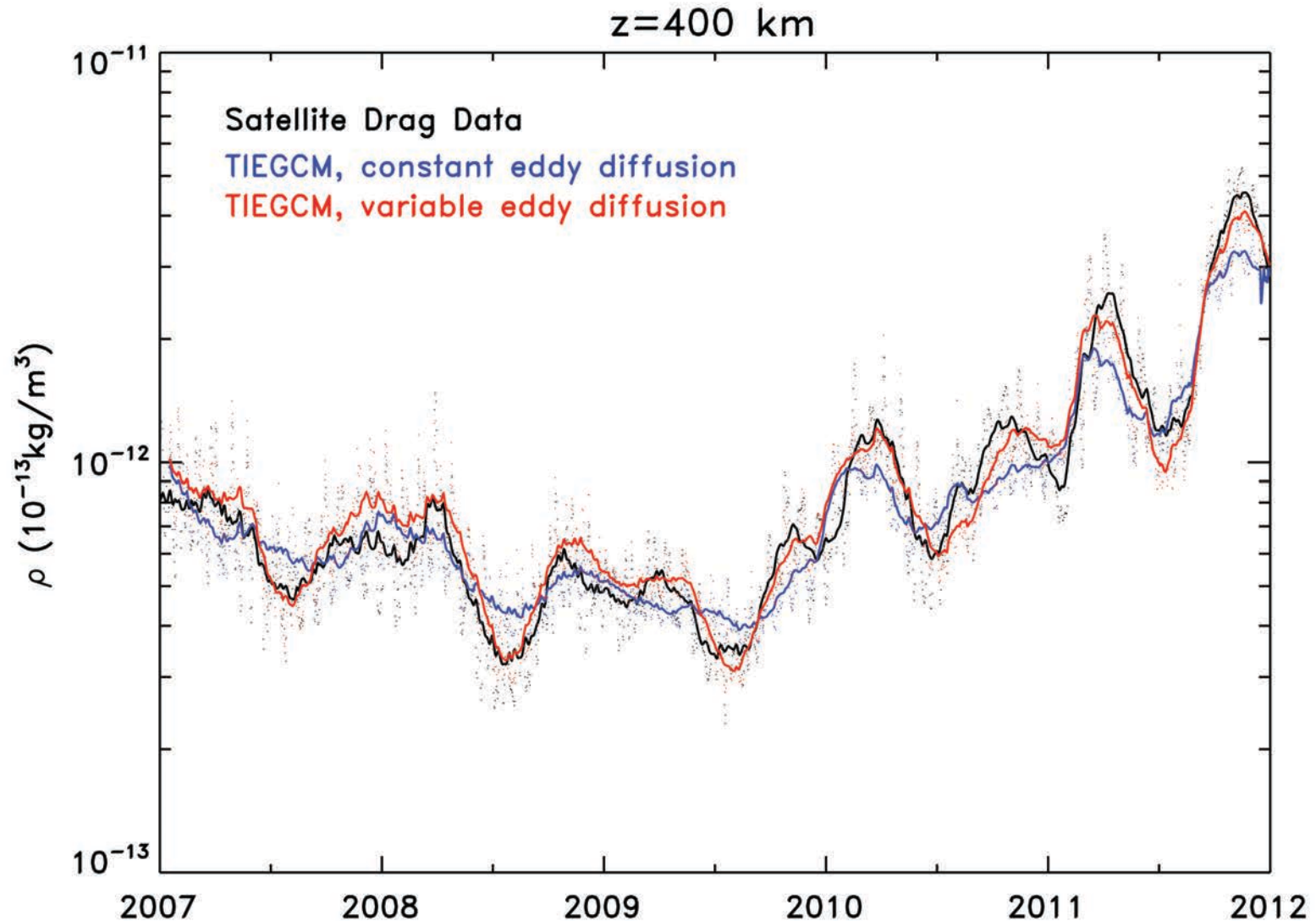


# New Comparisons of TIEGCM Simulations to Observations

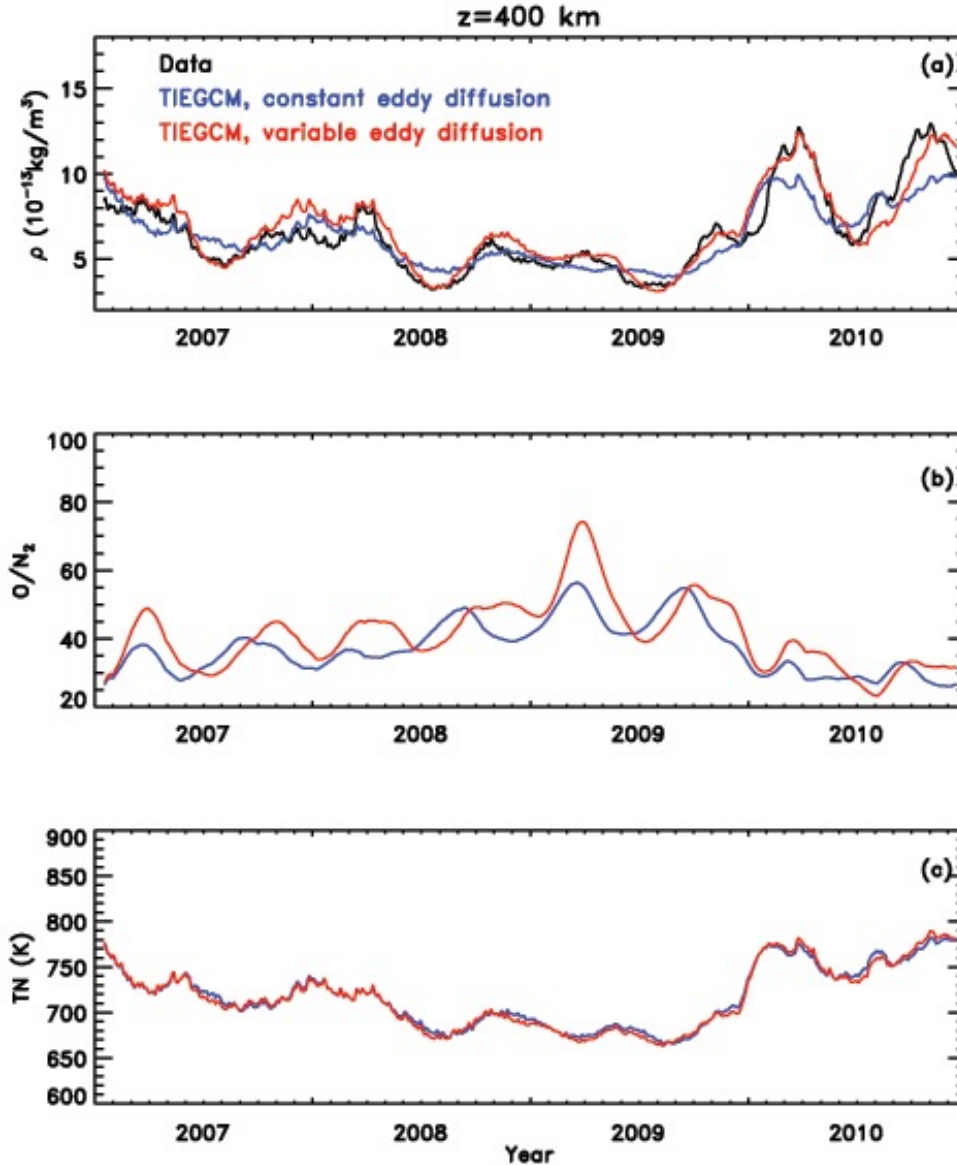


# Annual/Semiannual in TIE-GCM

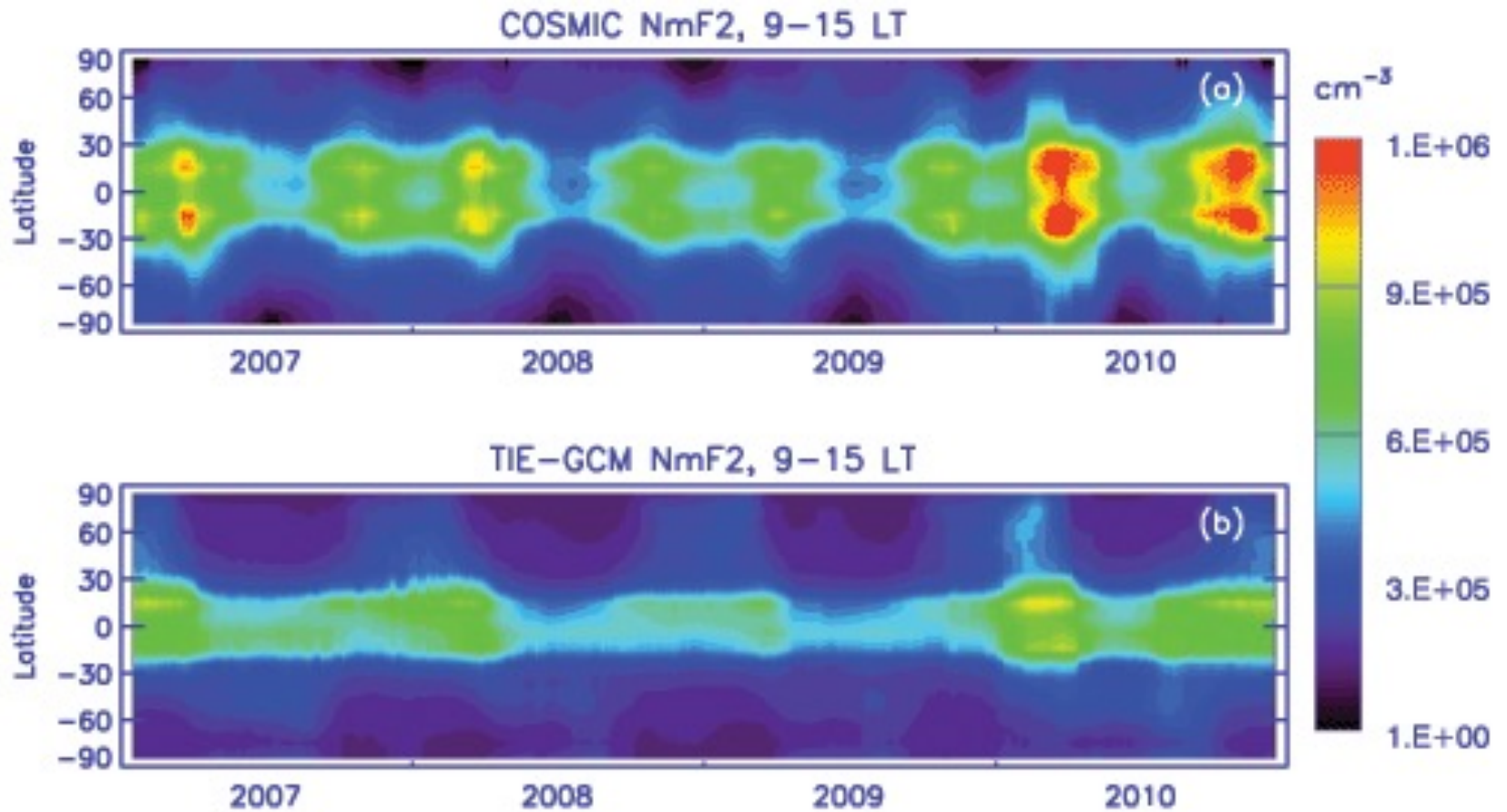
## Mass Density



# Mass Density, Temperature, and Composition

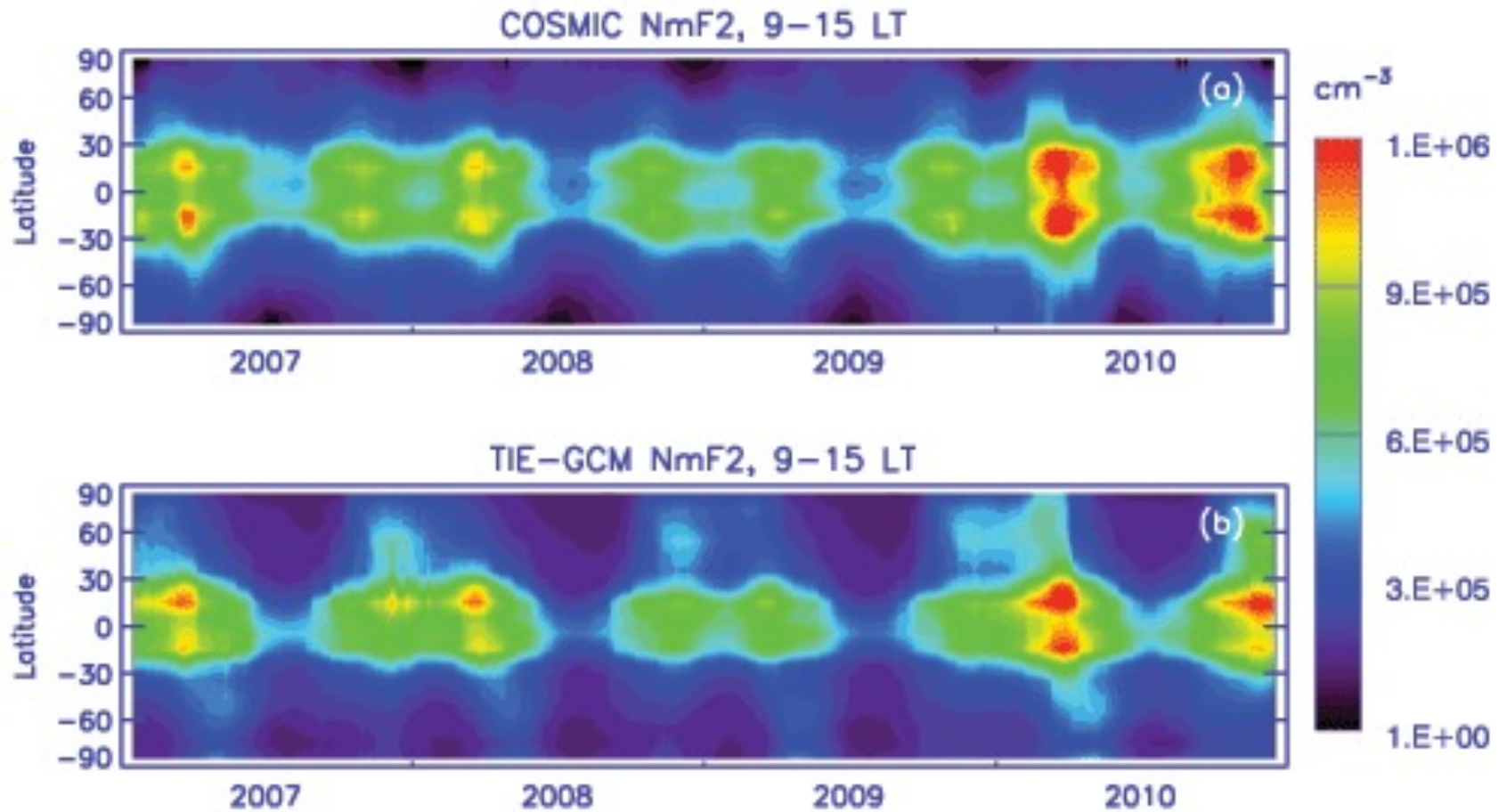


# NmF2

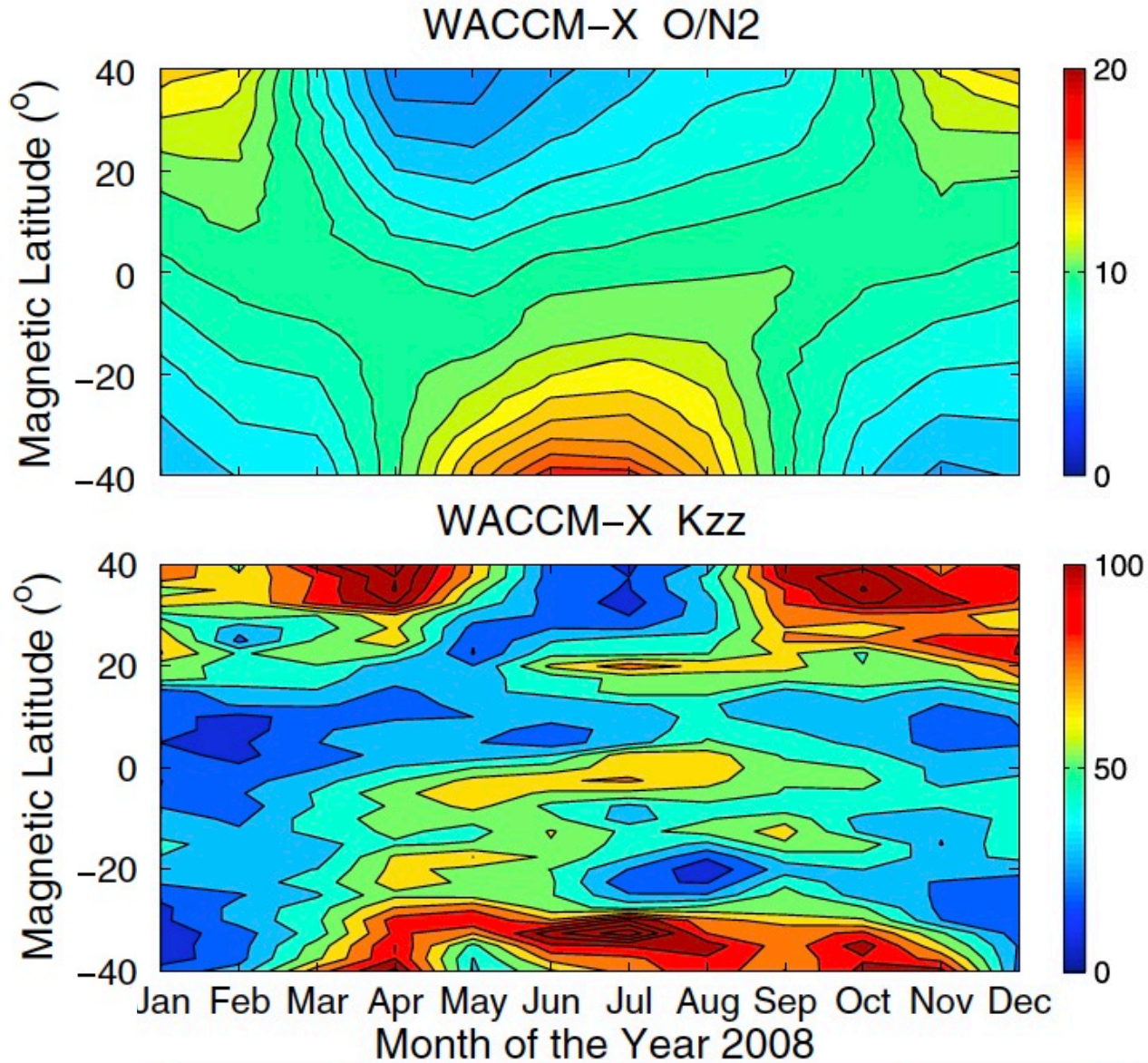




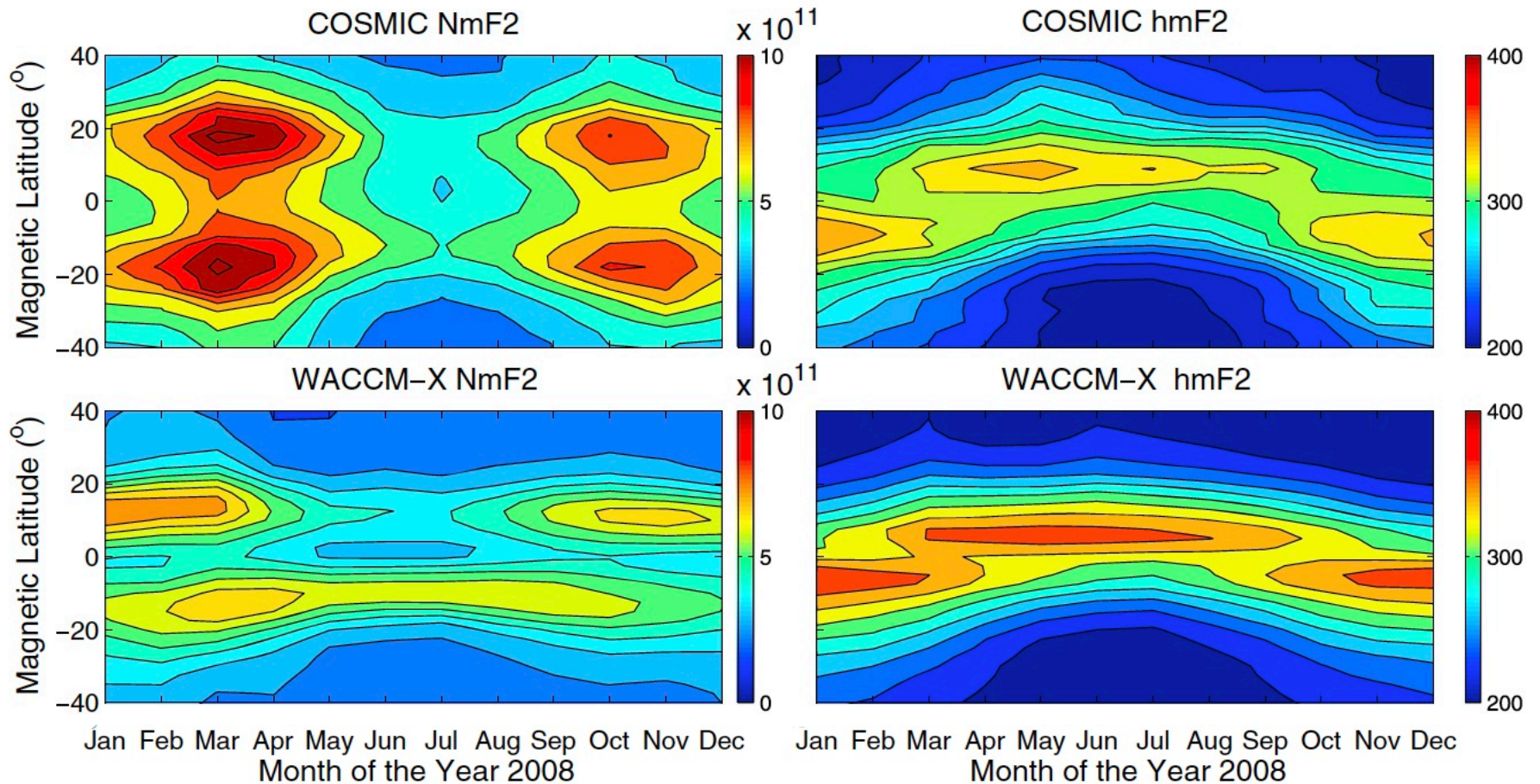
# NmF2



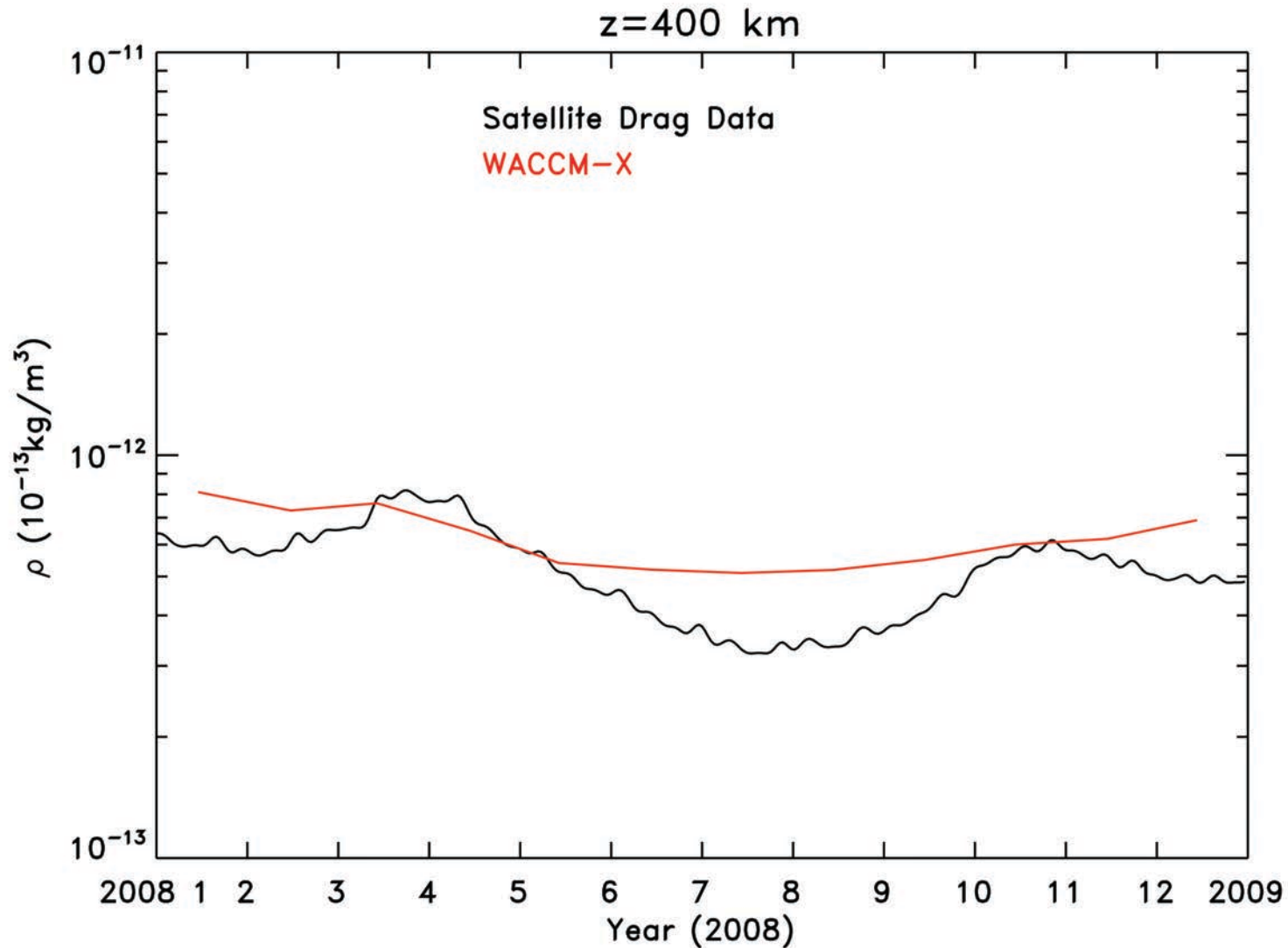
# WACCM-X: Composition and Kzz



# WACCM-X: Ionosphere

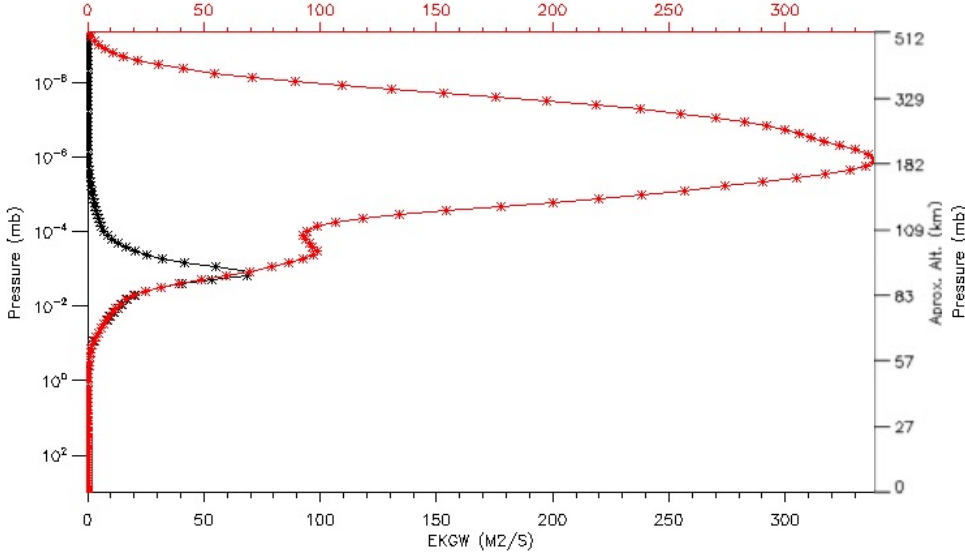


# WACCM-X: Mass Density

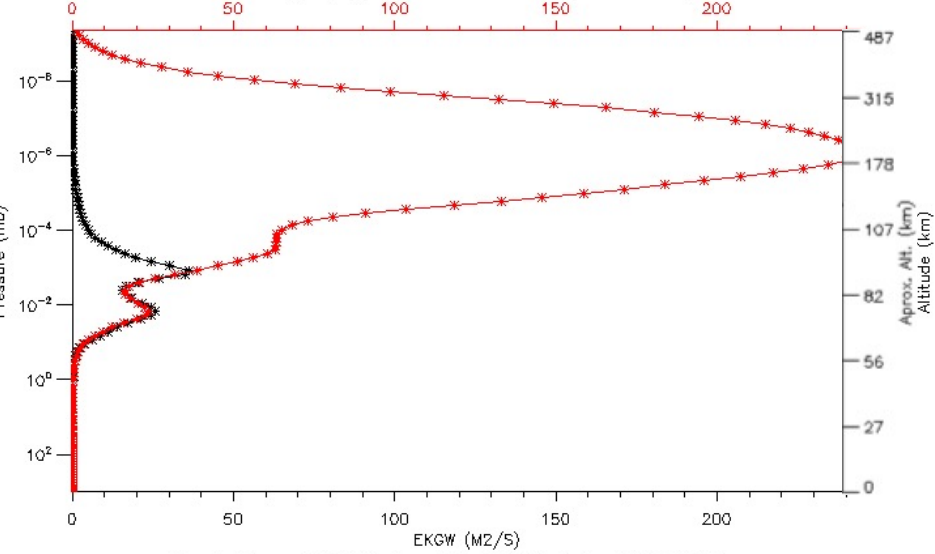


# Model Biases and Uncertainties: Mixing by Subgrid Scale Waves

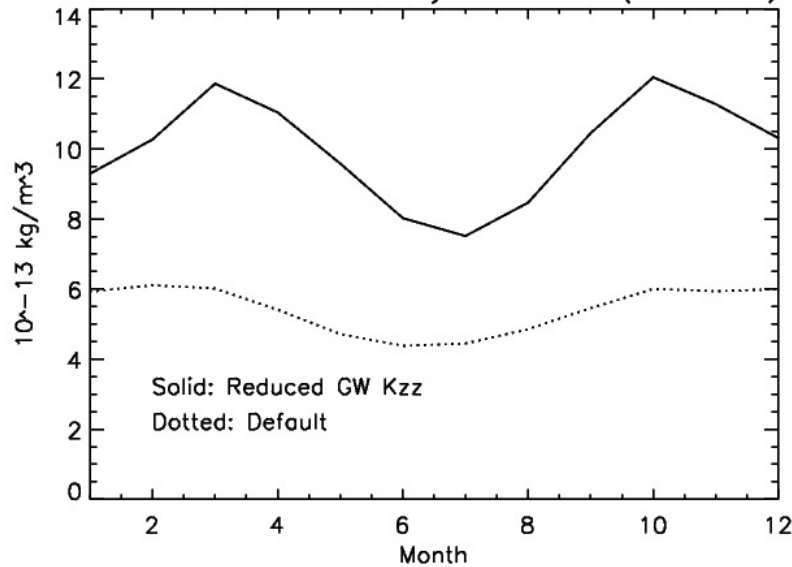
EKGW [M2/S], 01Apr2008 00:00, global average



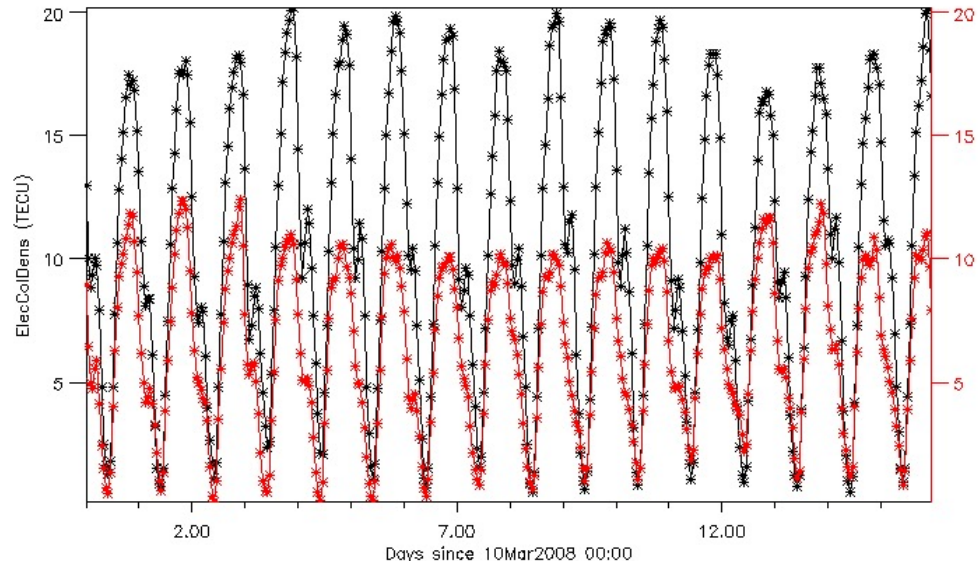
EKGW [M2/S], 01Jul2008 00:00, global average



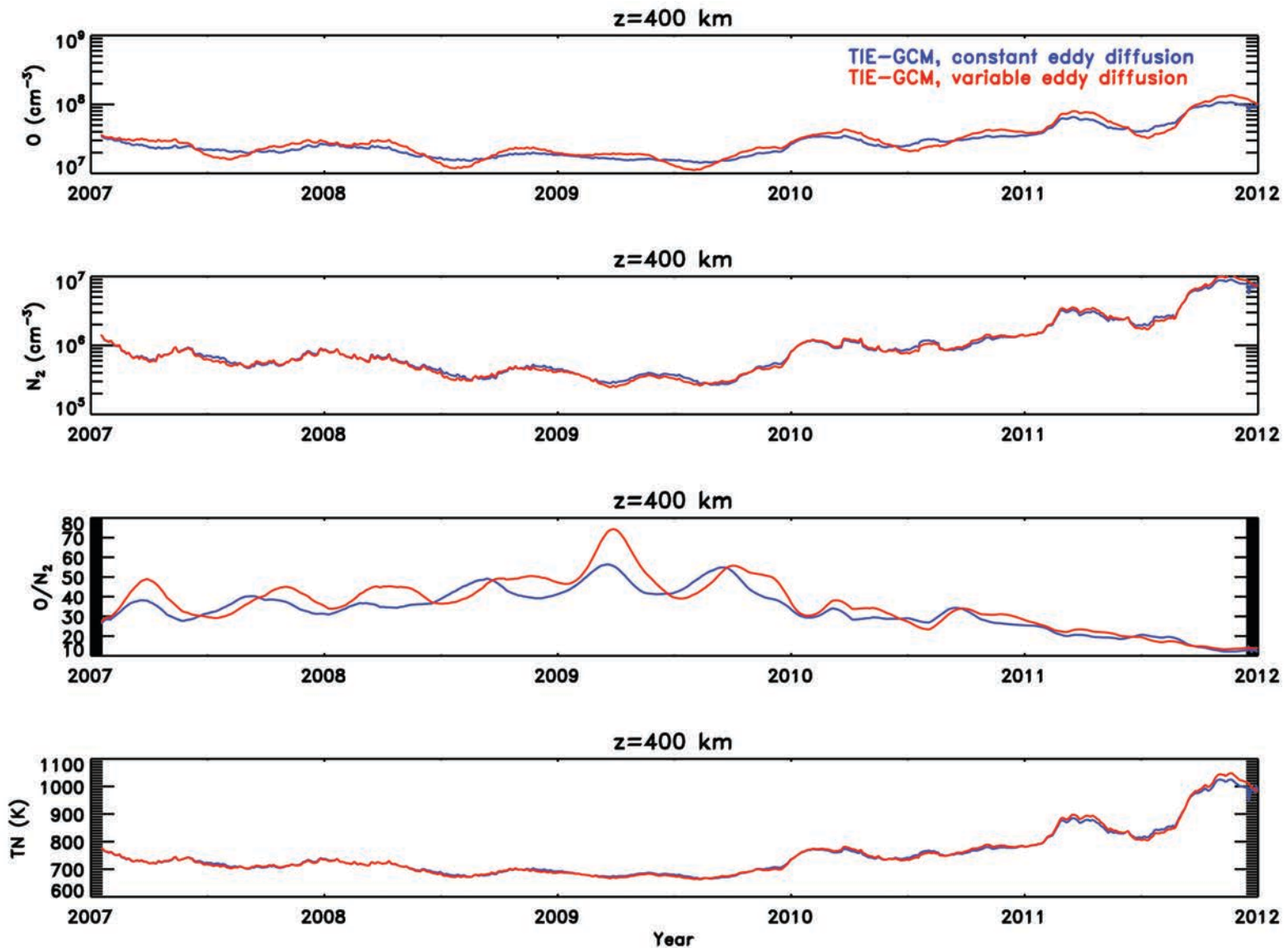
GLB mean mass density at 400km (F107=70)



ElecColDens [TECU], lon 282.50000, lat -12.315789



# Temperature and Composition on Fixed Altitudes



# Temperature and Composition on Fixed Pressure Surfaces

