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Session 9B Paper 3
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Selection of an Atmospheric Reference Model and Branching Ratios for Numerical Modeling of Gravity Wave-Airglow Interactions

Airglow emissions depend on the number density of the light-emitting species, so it is important to select an atmospheric reference model that accurately represents the initial state of the atmosphere in numerical studies for gravity wave-airglow interactions. Previous simulations results using chemistry dynamics numerical models show that the airglow emissions magnitude, shape, and wave-induced response also vary with different branching ratios.

We assess the effect of the atmospheric reference model in numerical studies and conduct a virtual experiment to investigate the Volume Emission Rates (VER) of O(1S) greenline and O2(0,0) atmospheric band when using different branching ratios for their productions. The branching ratio, alpha, determines the O(1S) VER production whereas the branching ratios, epsilon and alpha, determine the O2 atmospheric band VER production.

Using a numerical optimization approach, we match the simulated VERs to the measured VERs from WINDII observations to determine optimal branching ratios.

We present and discuss the results of our 2-dimensional, nonlinear, time-dependent numerical models, Multiple Airglow Chemistry Dynamics (MACD) and OH Chemistry Dynamics (OHCD) when using different atmospheric reference models and the computed branching ratios.