THE CURRENT STATUS OF THE UCL MARS THERMOSPHERIC MODEL.

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The UCL thermospheric model numerically solves versions of the time-dependant three dimensional momentum, energy and continuity equations. It has variable resolution in all three dimensions. The model uses a pressure level system instead of a height based system as this simplifies some of the maths involved in the equations. The lower boundary is currently set at a fixed temperature (145K) and has wind velocities set to zero. The lower boundary height is 60km (0.883Pa), a level thought to be above the dust storms which affect the thermal properties of the atmosphere. The model has three major constituents; CO_2, N_2 and O. Their transport is both molecularly and turbulently diffused throughout the atmosphere. The calculations of the wind velocities are generated by the momentum equation, this considers the forces that act to change the wind velocity, such as, the pressure gradient and the coriolis force. The energy equation is made up of a simplified energy model for the atmosphere, including solar heating in the EUV, UV and infrared regimes and infrared cooling by carbon dioxide. The EUV/UV heating is relatively simple to calculate compared to the infrared heating and emission. With the infrared heating and emissions complications occur due to the transfer from a local thermodynamic equilibrium region to a non local thermodynamic equilibrium region - which occurs at around 85km for the main CO_2 isotope. The equations used in the model are accepted parameterisations of the full nlte heating and cooling rates. Examples of heating rates and temperatures produced by the model are shown in the figures below. Comparison with data and other models will determine the realistic nature of the simulation.

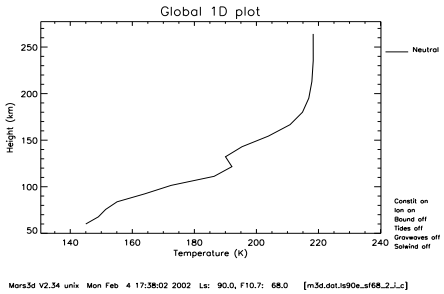

Figure 1: Northern summer solstice run: global temperatures plot

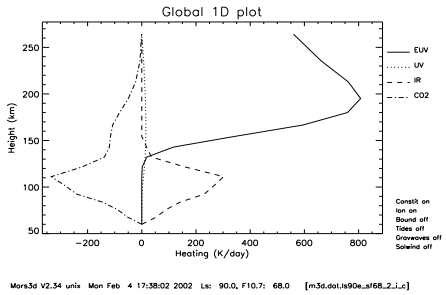

Figure 2: Northern summer solstice run: global heating and cooling rates plot

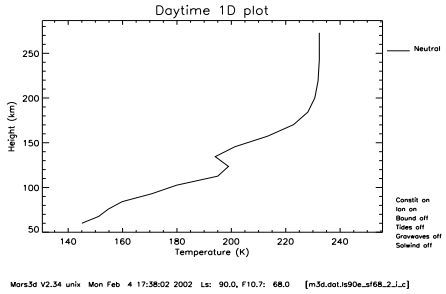

Figure 3: Northern summer solstice run: daytime temperatures plot

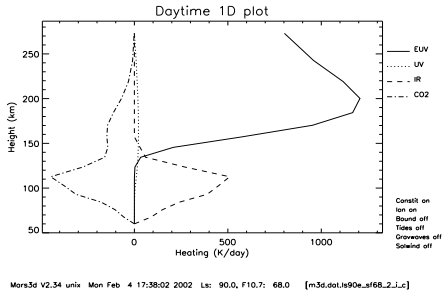

Figure 4: Northern summer solstice run: daytime heating and cooling rates plot

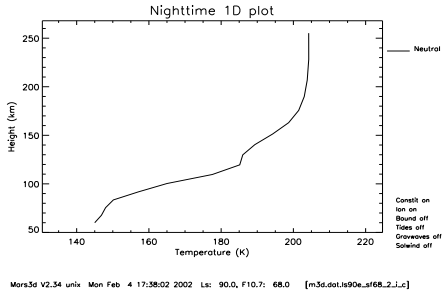

Figure 5: Northern summer solstice run: nighttime temperatures plot

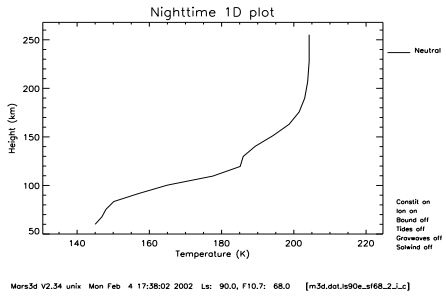

Figure 6: Northern summer solstice run: nighttime heating and cooling rates plot