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Transient wave behaviour in the Martian atmosphere in an assimilation of three Martian years of Mars Global Surveyor/Thermal Emission Spectrometer data

S. R. Lewis (1), L. Montabone (2), P. L. Read and P. Rogberg (3)

(1) Department of Physics and Astronomy, CEPSAR, The Open University, UK (2) Laboratoire de Meteorologie Dynamique du CNRS, Paris, France (3) Atmospheric, Oceanic and Planetary Physics, University of Oxford, Oxford, UK (s.r.lewis@open.ac.uk)

The Thermal Emission Spectrometer (TES) aboard Mars Global Surveyor (MGS) has produced an extensive atmospheric data set, both during the initial aerobraking hiatus and later from the scientific mapping phase of the mission which lasted almost three complete Martian seasonal cycles. Thermal profiles for the atmosphere below about 40˜km, and total dust and water ice opacities, have been retrieved from TES spectra. This paper discusses the analysis of these data by assimilation into a Mars general circulation model (MGCM). The assimilation procedure combines information from thermal profiles with dust optical depths, for example, making use of a model forecast containing information from the assimilation of earlier observations, to obtain a global, time-dependent analysis of all atmospheric variables.

One major motivation for using assimilation techniques is in order to investigate the transient wave behaviour on Mars, which is difficult to interpret when the observations are made asynchronously from a single orbiting spacecraft. This paper reviews in particular the time-dependent wave behaviour in the seasonally-evolving, global Martian data set which has been produced by assimilation of TES data over the length of the MGS mission. Prospects for future improvements to the assimilation technique and for the dissemination of results will also be discussed.