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New results from the Oxford Venus GCM

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Venus models are at the stage of evolving from simplified General Circulation Models (SGCM) towards more complete and physically-based ones. The process is complex and challenging due to difficulties in reproducing the physical and dynamical conditions in the global atmosphere of Venus in a realistic numerical approach. The circulation of Venus' atmosphere is well known to exhibit strong super rotation and a variety of enigmatic features which remain poorly understood.

Here we present a new version of our Venus GCM that uses a complex radiation scheme for solar and thermal spectra interacting with time-variable cloud cover. This new radiative parameterisation is more complete than previous works (Lebonnois et al 2010; Yamamoto et al. 2010), and uses different approaches in the two main wavelength bands: solar radiation (0.1-5.5μm) and thermal radiation (1.7-250 μm). The solar radiation calculation is based on the δ-Eddington approximation (two-stream-type), with an adding layer method and a correlated k-distribution that represents absorption and scattering of sunlight by gas molecules and aerosols. For the thermal radiation case, we use a code based on an absorptivity/emissivity formulation (neglecting scattering).

Our Venus GCM uses the new radiation codes in conjunction with the cloud transport model implemented by Lee 2006 and Lee et al 2010. These features allow the time variability in the cloud to interact with the radiative budget calculation.

In the poster that we are presenting, we will show some preliminary results of our Venus GCM using this new radiative-cloud variability parameterisation, including a brief schematic explanation of this new formulation.

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