

## **Analysis of Venus atmospheric dynamics with the LMD Venus general circulation model**

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For the last two years, we have been developing at the Laboratoire de Météorologie Dynamique a 3-dimensional General Circulation Model of Venus atmosphere, based on our experience of Earth, Mars and Titan models. The main feature of this model is the infrared radiative transfer module, which computes the temperature structure self-consistently. This module is based on a temperature-dependent Power Net Exchange matrix, computed with a Monte-Carlo model developed at the LAPLACE laboratory in Toulouse. The current version of the model is based on a 48x32 grid, on 50 levels from surface to roughly 95 km altitude. The clouds layers, atmospheric composition and surface interactions are not yet included in our computations. Clouds layers are fixed for radiative calculations, except for variation of the cloud-top altitude with latitude, which is taken into account.

We present here simulations made with this Venus General Circulation Model. Starting from rest, a satisfying super-rotation is developing, that is comparable to available observations. Topography has been included, and its role in the development of the super-rotation is discussed. The temperature structure obtained is close to the VIRA profile, though remaining difficulties, located above the clouds region, are discussed. Current analysis of Venus' atmospheric dynamics is presented: meridional and zonal winds, angular momentum transfer, waves activity. Two convective regions are obtained in the model in regions compatible with observations (20-30 km, and 50-55 km altitude), and waves are visible in the stable region in-between. The role of radiative transfer in this structure is explained, and its consequences on the atmospheric dynamics and angular momentum budget are detailed.