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Minor species variations in the deep atmosphere of Venus using a passive transport scheme in the LMD-GCM.

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Variability of minor species in the deep atmosphere has been shown using near-infrared spectroscopy from both Earth – SpeX/IRTF – and space – VIRTIS/Venus Express, Tsang et al. (2008), Marcq et al.(2008). In particular, CO and OCS exhibit anti-correlated latitudinal variations at least between $60°$S and $60°$N, with CO being more abundant at higher latitudes. The usual interpretation of these variations is linked to the general circulation and more precisely to its vertical component since vertical gradients of CO and OCS are of opposite signs in the probed altitudes (30 to 40 km). Our purpose is to test the qualitative interpretation with a quantitative model embedded in the LMD-GCM from Lebonnois et al. (2008), using a simple passive tracer scheme with chemistry being simplified to relaxation to a prescribed vertical profile $q_0(z)$ within a characteristic time $\tau(z)$.

Our major first result is our ability to reproduce the observed latitudinal variation pattern of OCS quantitatively for both abundance and vertical slope of the gaseous profiles. This yields strong constraints on τ and q_0 that may help in understanding the chemistry of the lower atmosphere. Similar work for CO is still in progress and yields the expected qualitative trends, yet an order of magnitude too small when compared to the observations. This discrepancy may be due to an excessive simplification of the tracer's chemistry.