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Global 3D modelling of Martian CO_2 clouds

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In the Martian atmosphere, carbon dioxide (CO_2) clouds have been revealed by numerous instruments around Mars from the beginning of the XXI century. These observed clouds can be distinguished by two kinds involving different formation processes: those formed during the winter in polar regions located in the troposphere, and those formed during the Martian year at low- and mid-northern latitudes located in the mesosphere (Määattänen et al, 2013). Microphysical processes of the formation of these clouds are still not fully understood. However, modeling studies revealed processes necessary for their formation: the requirement of waves that perturb the atmosphere leading to a temperature below the condensation of CO_2 (transient planetary waves for tropospheric clouds (Kuroda et al., 20123), thermal tides (Gonzalez-Galindo et al., 2011) and gravity waves for mesospheric clouds (Spiga et al., 2012)). In the last decade, a state-of-the-art microphysical column (1D) model for CO_2 clouds in a Martian atmosphere was developed at Laboratoire Atmosphères, Observations Spatiales (LATMOS) (Listowski et al., 2013, 2014). We use our full microphysical model of CO_2 cloud formation to investigate the occurrence of these CO_2 clouds by coupling it with the Global Climate Model (GCM) of the Laboratoire de Météorologie Dynamique (LMD) (Forget et al., 1999). We recently activated the radiative impact of CO_2 clouds in the atmosphere. Last modeling results on Martian CO_2 clouds properties and their impacts on the atmosphere will be presented and be compared to observational data.