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Surface release of methane into the atmosphere of Mars: A new model study

Sébastien Viscardy (1), Frank Daerden (1), Lori Neary (1), Antonio García Muñoz (2), and Ann Carine Vandaele (1)

(1) Belgian Institute for Space Aeronomy, Brussels, Belgium, (2) ESA/RSSD, ESTEC, 2200 AG Noordwijk, The Netherlands

In the past decade, the detection of methane (CH4) in the atmosphere of Mars has been reported several times (Krasnopolsky et al., Icarus, 2004, Formisano et al., Science, 2004, Mumma et al., Science, 2009, Fonti and Marzo, A&A, 2010 , Webster et al., Science, 2014). These observations have strongly drawn the attention of the scientific community and triggered a renewed interest in Mars as their implications for the geochemical or biological activities are remarkable. However, given that methane is expected to have a photochemical lifetime of several centuries, the relatively fast loss rates of methane estimated from Earth-based measurements remain unexplained (Lefèvre and Forget, Nature, 2009). Although this gave rise to objections against the validity of those observations (Zahnle et al., Icarus, 2011), recent in situ measurements (Webster et al., Science, 2014) confirmed that methane is being occasionally released into the atmosphere from an unknown source (possibly from the ground).
In this context, we aim to investigate the time and space evolution of methane after different surface release scenarios using a 3D Global Circulation Model (GCM) for the atmosphere of Mars (Daerden et al., 2015). This work continues on that of Mischna et al. (PSS, 2011). We specifically focus on the vertical distribution of methane in order to provide useful information for the highly sensitive NOMAD solar occultation channel (Drummond et al., PSS, 2011) on the future ExoMars Trace Gas Orbiter mission.