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2D and 3D modeling of Martian chemistry

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The 2D model of Moreau et al (1991) was the first and to present still the only published 2D model of the Martian atmosphere. This model had an elaborated online chemistry module with 19 species and 76 reactions. However at the time of publication, and not until more than a decade later, no observations of chemical compounds were available to validate the model.

When observations of the chemical composition of the Martian atmosphere did become available in the past few years, 3D Mars General Circulation Models (GCM) had well emerged. The Global Mars Multiscale Model (GM3) is one of the state-of-the-art 3D Mars GCMs with online chemistry [Moudden and McConnell, 2005]. For the present study it will be applied in a limited-chemistry mode with 11 species.

The zonal mean vertical distribution of several chemical species in the 2D and 3D models will be compared to each other and also to available observations, followed by a discussion of the differences between the 2D and 3D model results. The quality and performance of the early 2D Mars model will be assessed using models and observations from nearly 2 decades later.