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Discussing the confidence in the identification of Martian CH_4 using TES data

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Abstract.

In their work of 2010, Fonti and Marzo analyzed, using a statistical clustering technique, about three million of Thermal Emission Spectrometer (TES) spectra, spanning three Martian Years. They found that the methane content in the Martian atmosphere exhibits a seasonal variability cycle and a recurrent spatial distribution. The temporal variability seemed to have interesting correlations with the annual cycle of other atmospherical components, such as water vapor and dust load, but the temporal sampling of TES data required a substantial increase to characterize the temporal behavior of CH4 in sufficient detail. This, in turn, required a deep revision of the TES clustering done by Fonti and Marzo (2010), which evidenced that their analyses may be ambiguous in associating the clusters with CH_4. To reduce this ambiguity, we developed several pre-processing steps that have been applied to the TES data, but unfortunately they did not succeed in removing from the dataset all the possible source of error (Fonti et al. 2015). The results of applying the pre-processing procedures to the dataset Ls = 180° ± 5° of MY24 have been compared to synthetic spectral calculations for a Martian atmosphere containing 0 and 33 ppbv of CH_4 (Liuzzi et al. 2015). This comparison suggests that the variability in the TES spectra, in the region where the CH_4 feature occurs, remains greater than the spectral feature associated with 33 ppbv CH_4, preventing the possibility to successfully address the issue of Martian CH_4 abundances, reaching an higher confidence in the variability of Martian methane.

References

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