



## **Martian atmospheric thermal structures and dust distributions during the global dust storm and the regional dust storm of MY 34 from ACS TIRVIM observations onboard ExoMars TGO**

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# Martian atmospheric thermal structures and dust dis during the global dust storm and the regional dust s from ACS TIRVIM observations onboard ExoMars TG

**Pavel Vlasov** et al.

## Abstract

Martian dust particles play an important part in radiative processes in Martian atmosphere, being invol on Mars [1]. The most significant manifestations of such cycles are dust storms which last severa thermal structure of Martian atmosphere [2]. In addition to regular storms, global dust storms (herein: in several Martian Years (hereinafter MY) and cover the entire planet for months. GDS still remain studies [3]. The latest global dust storm occurred in MY 34 and has been simultaneously monitored ExoMars Trace Gas Orbiter (TGO) [4].

In this paper we present results of analysis of thermal emission spectra of Mars measured with a Fou TIRVIM onboard TGO [5]. The main scientific goal of TIRVIM is long-term monitoring of temperatures a distribution in Martian atmosphere in nadir mode of observations in the 5–16  $\mu\text{m}$  spectral range [6]. obtained in MY 34: the first one covered the first month of the GDS in a period from 26<sup>th</sup> of May 20: season  $L_s = 182.2^\circ\text{--}211.7^\circ$ ), the second one lasted from 22<sup>nd</sup> of December 2018 till 18<sup>th</sup> of March 201 covered the regional dust storm (C-storm).

Retrieval of temperatures, dust and ice content from the thermal emission of Martian atmosphere in 15 a number of previous similar experiments [7, 8, 9]. We use iterative retrieval algorithm based on opt With TIRVIM spectral resolution  $\Delta\nu = 1.17\text{ cm}^{-1}$ , temperature profiles may be retrieved from the surf: the vertical resolution in the order of few kilometers in the lower atmosphere. Spectral range from 78 absorption lines and is suitable for retrieving the temperature of Martian surface and column abundar ice contents are defined as optical depths at wavelengths of local maxima of their spectral extinction cr

We have obtained the thermal structures of Martian atmosphere at various local times during the first and during the whole regional storm. We have compared temperature fields in the nighttime and d observed storms with structure of the pure from dust atmosphere. Asymmetric heating with dust parti

is clearly seen in **Fig. 1**. Diurnal contrasts of temperature between nighttime and daytime are represented by excellent agreement with co-located MCS/MRO measurements [12], with the account for a worse vertical profile with TIRVIM.

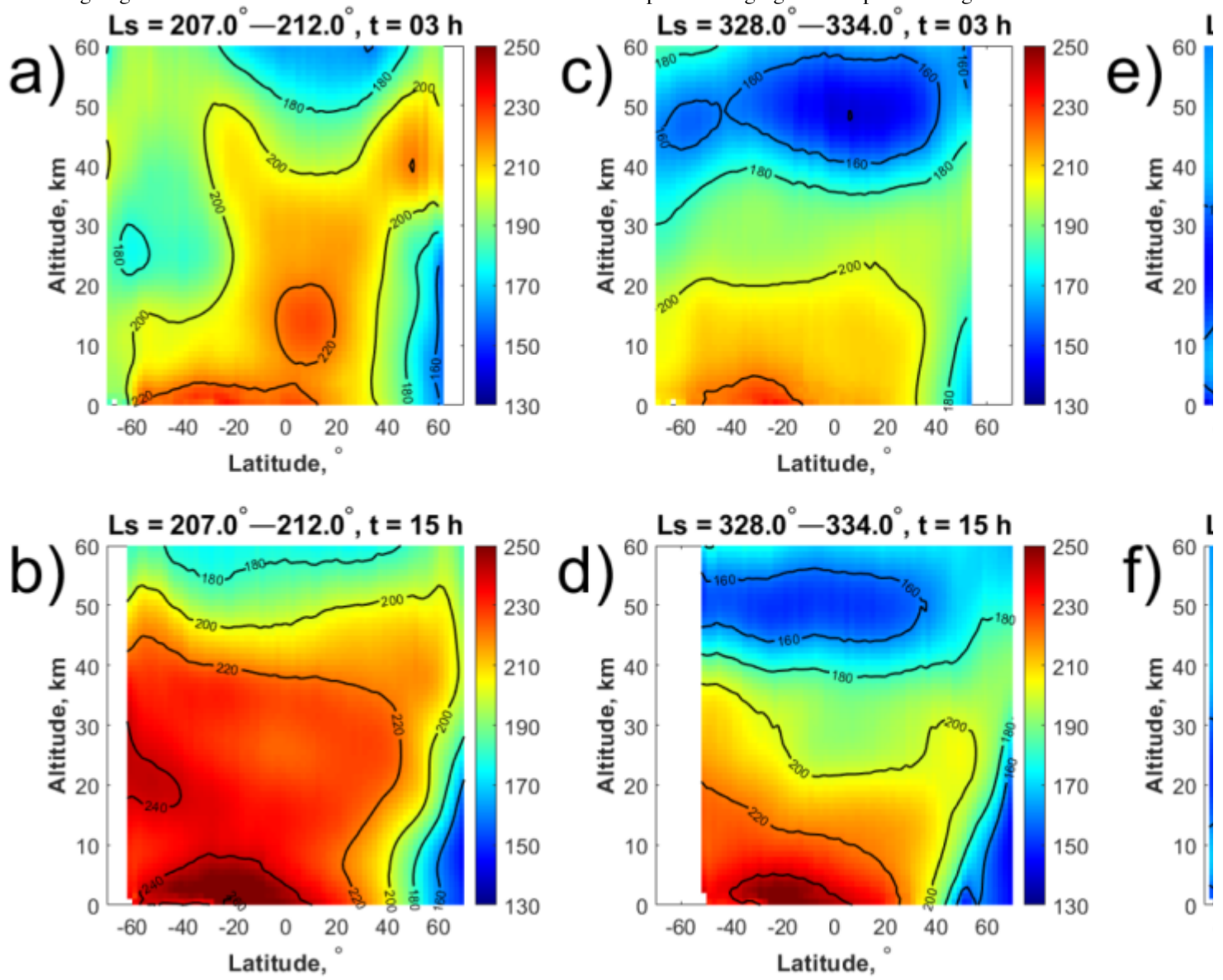
Along with the temperature field we also consider the variability of dust distribution during the distributions of dust in terms of column optical depth at  $1075\text{ cm}^{-1}$  at the peaks of the global dust storm. These are shown in **Fig. 3**. Due to unavoidable degeneracy of the dust and ice retrieval problems at some temperatures, there are also unreliable high and zero values of optical depth, which are to be filtered out.

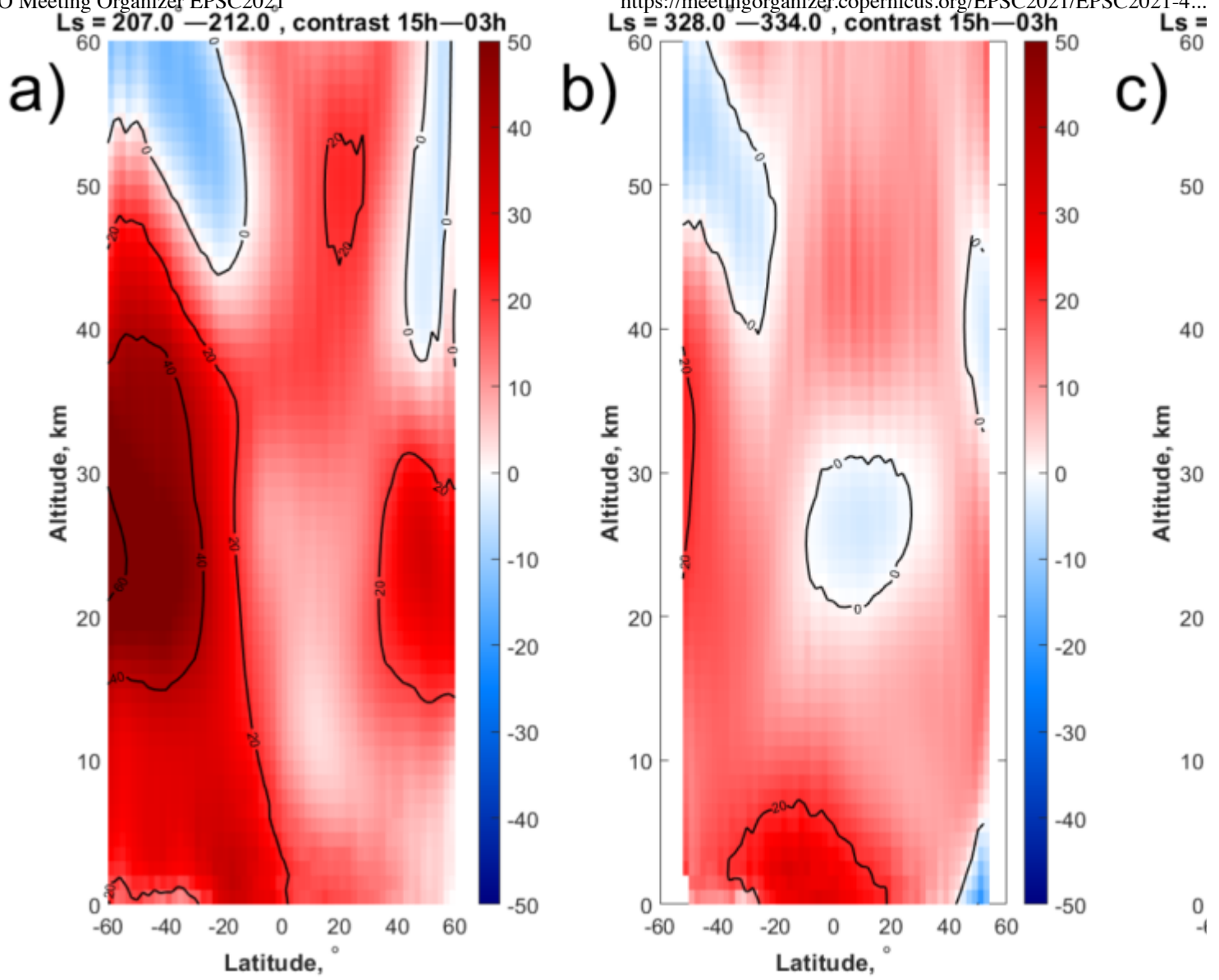
## Acknowledgements

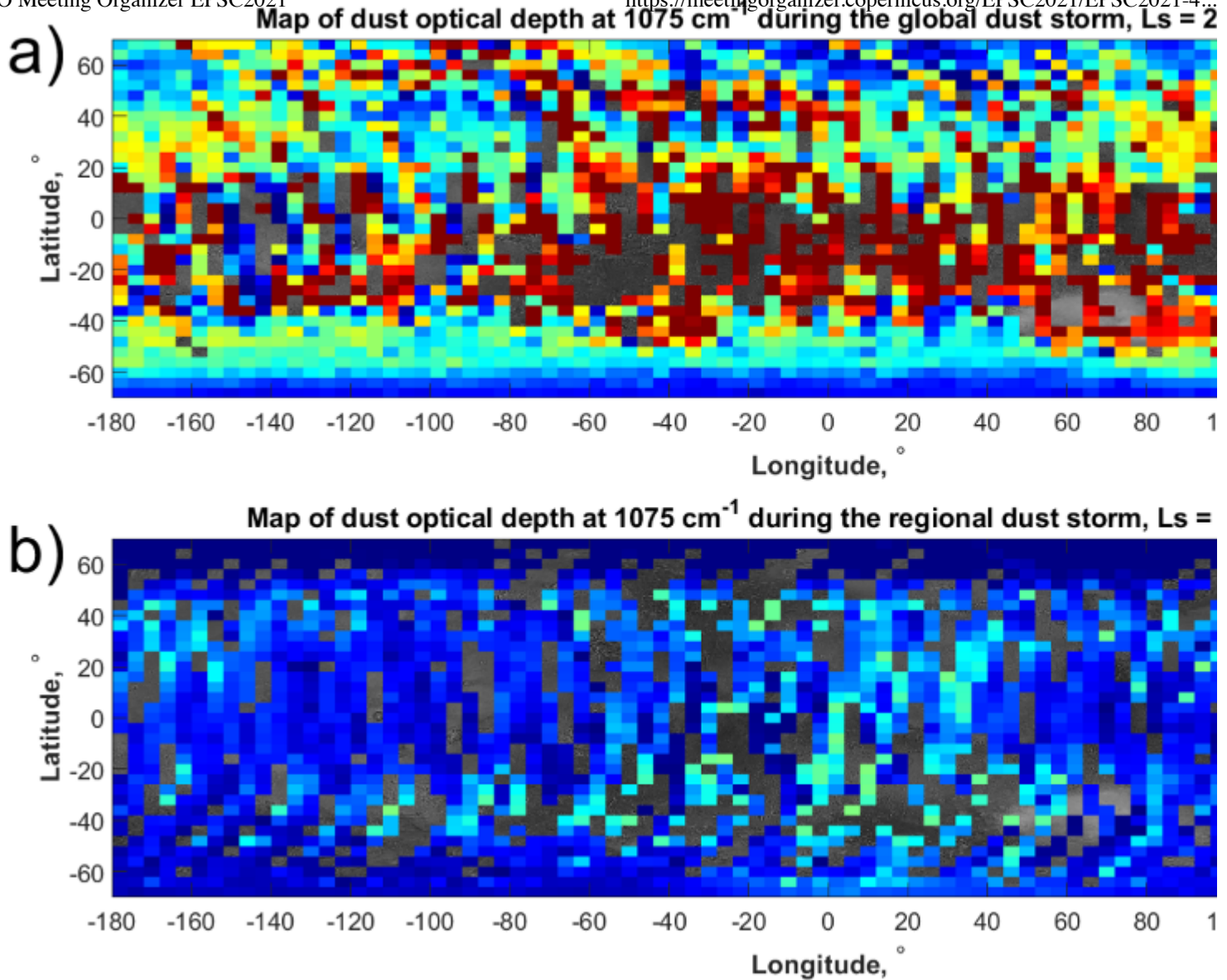
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