Lambert albedos for the thermal bands at wavelengths $> 3.0\ \mu$m. The optical depths for dust and ice aerosols are used by DISORT-based ADR-AC LUT to retrieve Lambert albedos for all spectral bands, but most of the effect is at wavelengths $< 1.2\ \mu$m. The MGS-TES temperature of the lower atmosphere is used together with the MOLA altimetry and a Viking-based climatological record of surface pressure [56], in order to estimate the surface pressure for each spatial pixel in the TRDR, for different locations on the planet at different times in the Mars year. The MGS-TES lower-atmospheric temperature is computed by averaging over the four lowest available MGS-TES levels (above the surface), which is equivalent to averaging over 1 atmospheric pressure scale height.

In Fig. 4, we show the MGS-TES climatological record of the surface pressure, the temperatures, the aerosols, and the water vapor, for two longitudes and three solar longitudes[22] as a function of latitude. This figure demonstrates the climatological spatiotemporal variability that is encapsulated in the ADR-CL LUT. Such variability implies two things: 1) Using a simple analytical or empirical model of most of these climatological variables is not sufficient for our purposes of retrieving Lambert albedos (hence, the importance of the ADR-CL LUT), and 2) with such past variability, it is unlikely that the ADR-CL LUT will always be correct (hence, the need for direct measurements of the climatological variables from the CRISM data). A secondary intent of this figure is to demonstrate that there is missing climatological data in the ADR-CL LUT. The absence of data is indicated in part by the dashed horizontal lines in these traces, particularly near the poles. The data value for the missing data locations and times is chosen to be the value for the nearest available location and time. Often, these nearest replacement values are inadequate for the accurate retrieval of Lambert albedos. This is particularly relevant for the missing aerosol values (i.e., near the poles). The aerosol values near the poles can be quite high and somewhat variable [34], [46], [47], [57], [62], and if their values are inferred from locations further from the poles, highly inaccurate retrievals of Lambertian albedos will ensue. Hence, we map the regions of missing aerosol data or poor aerosol data quality in Fig. 5. This map shows, for example, that the CRISM north polar mapping campaign will likely require, for accuracy, the direct retrieval of aerosol abundances instead of the nearest MGS-TES aerosol optical depths.

In the wavelength range of 1.2–2.6 μm, the surface pressure is the most crucial parameter for correcting the data. Moreover, there are subtleties in estimating the surface pressure climatologically [15], [47], [50], [56], hence the emphasis in the discussion in this section on the surface pressure. The aerosols are primarily active shortwards of 1.2 μm, but they do have low spectral-frequency effects at longer wavelengths, as well as interaction effects with the CO_2 gas bands at 2 μm. The aerosols are determined directly from the MGS-TES climatological LUT (ADR CL). Therefore, with the exception

[22]Solar longitude (L_s) ranges from 0° to 360° and represents the position of Mars with respect to the Sun. The solar longitude of $L_s = 0°$ corresponds to the spring equinox in the northern hemisphere on Mars.

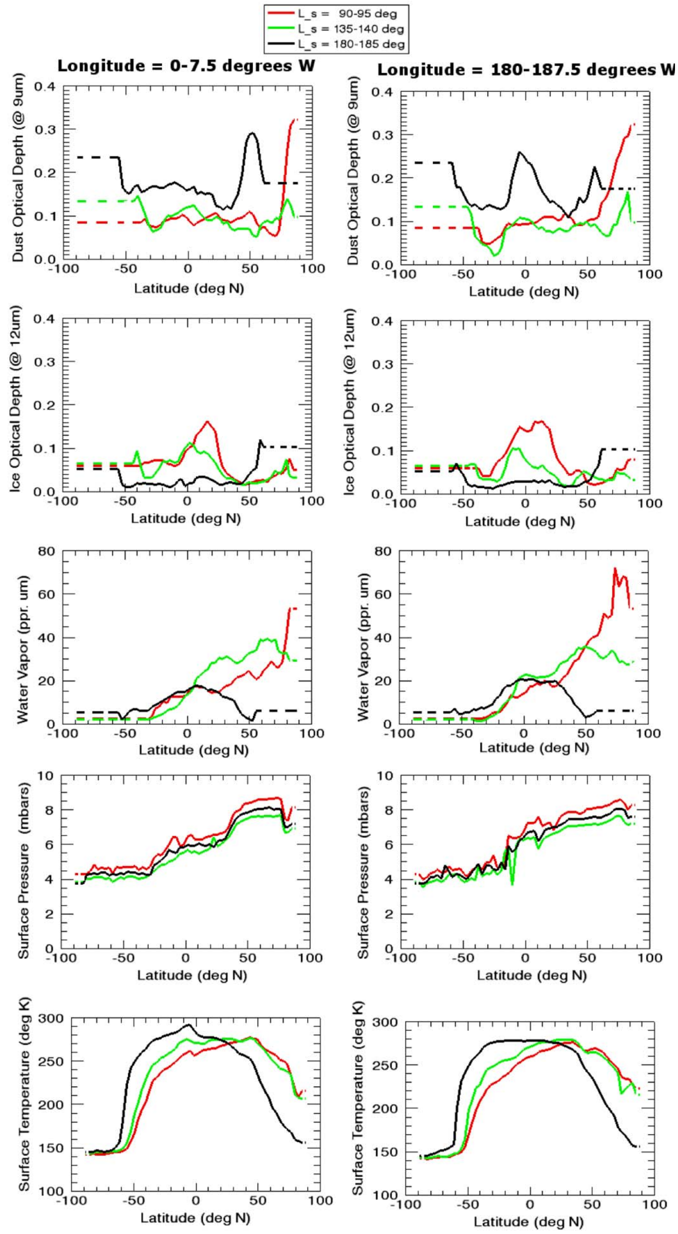

Fig. 4. ADR CL climatological profiles as a function of latitude for the indicated longitude ranges and the indicated solar longitude ranges. The dust and ice aerosol optical depths are shown at the mid-infrared MGS-TES reference wavelengths. Neither the ADR CL low spatial-resolution surface pressure nor the MGS-TES-estimated water vapor, both shown here, is used in the CRISM_LambertAlb system. We use the MGS-TES-estimated temperature of the lower atmosphere (not shown here), together with MOLA altimetry and Viking pressure climatology, in order to "algorithmically" estimate surface pressure at nearly the CRISM pixel scale. The MGS-TES-estimated surface temperature is used for the thermal correction for wavelengths $> 3.0\ \mu$m. The dashed horizontal line segments represent gaps in the data (due to missing data or suboptimal data quality) that are currently filled in with nearby data.

of the rescaling, as described by Wolff and Clancy [58], and the data quality constraints shown later in Fig. 5, we limit the amount of discussion here for the aerosols, which is relative to the amount of discussion for surface pressure. Surface temperature for thermal correction longwards of 3 μm is also given directly by MGS-TES climatology in the ADR-CL LUT. Surface temperature has similar data quality constraints as the