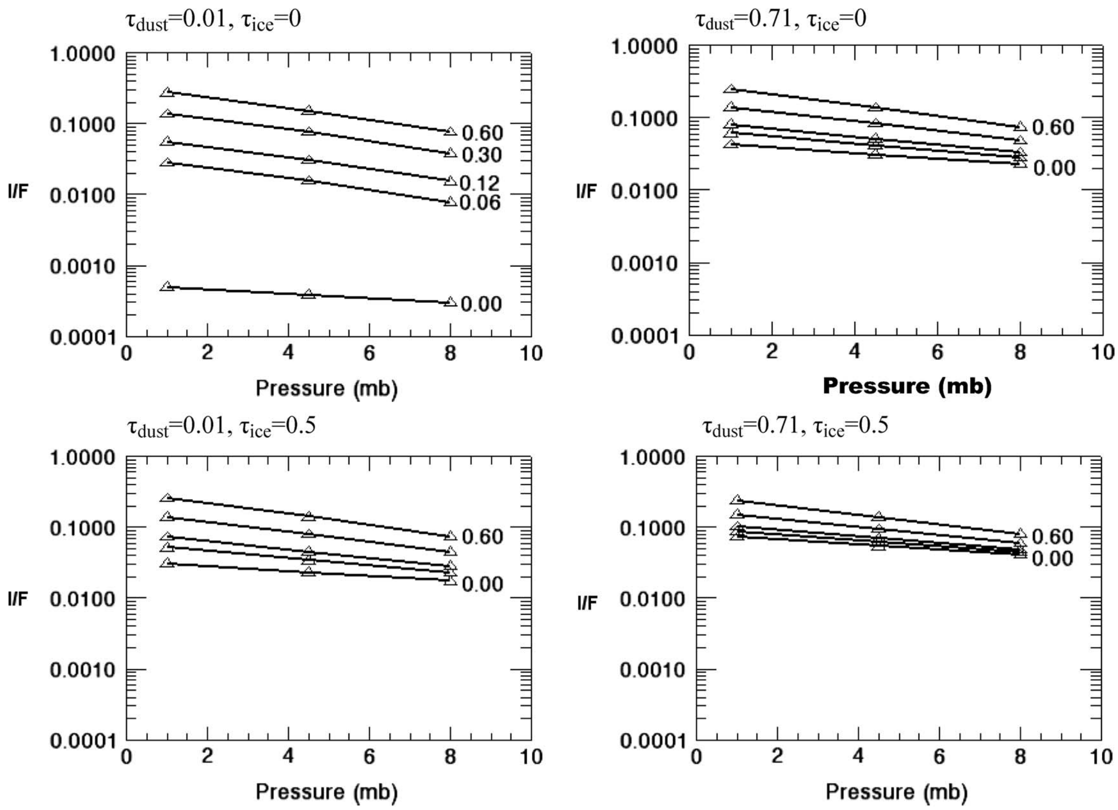

Fig. 3. We plot the dependences of I/F on surface pressure in semilog plots, in order to show a portion of the internal structure of the ADR-AC LUT, for $\lambda = 2.007$ μm. These dependences are given for five different values of Lambert albedo $(A_L = 0.0, 0.06, 0.12, 0.30, 0.60)$ and four different sets of dust and ice aerosol optical-depth values. The indicated aerosol optical depths are for the MGS-TES reference wavelength. The straight-line semilog dependences suggest an exponential dependence, as is confirmed by detailed forward calls to DISORT (not shown here). The wavelength $\lambda = 2.007$ μm is deep in the CO_2 gas band. These dust and ice optical depths are the values at 2.007 μm, not the values for dust and ice optical depth at the mid-infrared reference wavelengths. For the input data axis of surface pressure, we find that three grid points form adequate sampling intervals from 1 to 8 mbars of surface pressure, but only if we use exponential interpolation for this data axis.

accuracy provides sufficient flexibility and robustness for the creation of the set of global map tiles of Lambert albedo for Mars.

As we will discuss in the next section on climatology, we use the estimates for the dust and ice aerosol optical depths from the TES instrument on MGS as inputs to the DISORT-based ADR-AC LUT in order to estimate the Lambert albedo spectra from the I/F spectra. However, the MGS-TES instrument measures the optical depths of the dust and ice aerosols at mid-infrared wavelengths: at the wavelengths of 9.3 μm for dust aerosols and 12.1 μm for ice aerosols. We have employed a Mie-scattering approximation (assuming spherical aerosols) [58] in order to convert the extinction cross sections of the aerosols at MGS-TES mid-infrared wavelengths to the extinction cross sections at CRISM wavelengths (0.362–3.92 μm).[20] This normalized extinction cross section is used multiplicatively to convert the aerosol optical depths measured at TES wavelengths to the aerosol optical depths measured at CRISM wavelengths. In order to generate scattering properties, for ice aerosols, we use the formulation from Warren [60] with $\mathrm{R}_{\mathrm{eff}} =$ 2.0 μm and variance $= 0.1$ μm, and for dust aerosols, we use $R_{\mathrm{eff}} = 1.7$ μm and variance $= 0.4$ μm (for further discussion, see the work of Clancy *et al.* [11]).

IV. Pressure, Temperature, and Aerosol Climatology

In order to serve as our initial inputs to the DISORT-based Lambert albedo retrieval system, we are using the climatological records of aerosol optical depths and temperature from MGS-TES [47], as well as the surface altitudes from laser altimetry by the MOLA instrument [45], which is also on MGS. The MGS-TES climatology is in a LUT called "Ancillary Data Record—Climatology" (ADR CL), and for our initial work, we are using the MGS-TES climatology from Mars years 24 and 26 (1999–2000, 2003–2005).[21] The MOLA altimetry is given for each pixel in the TRDR in a separate derived data record (DDR).

The MGS-TES surface temperature is used as an input to query the DISORT-based ADR-AC LUT in order to retrieve

[20]The extinction cross section is defined as being the sum of the absorption cross section and the scattering cross section. The cross section of a particle is roughly equivalent to the effective area (i.e., of scattering or absorption) that a particle or a molecule presents to an incoming photon.

[21]The use of Mars years 24 and 26 is part of the ADR_CL operating mode named "Year of Best Data Quality". Mars year 24 has the best data quality for TES, but Mars year 24 starts at $L_s = 103°$. The data prior to $L_s = 103°$ are coming from Mars year 26, since Mars year 25 had a dust storm.