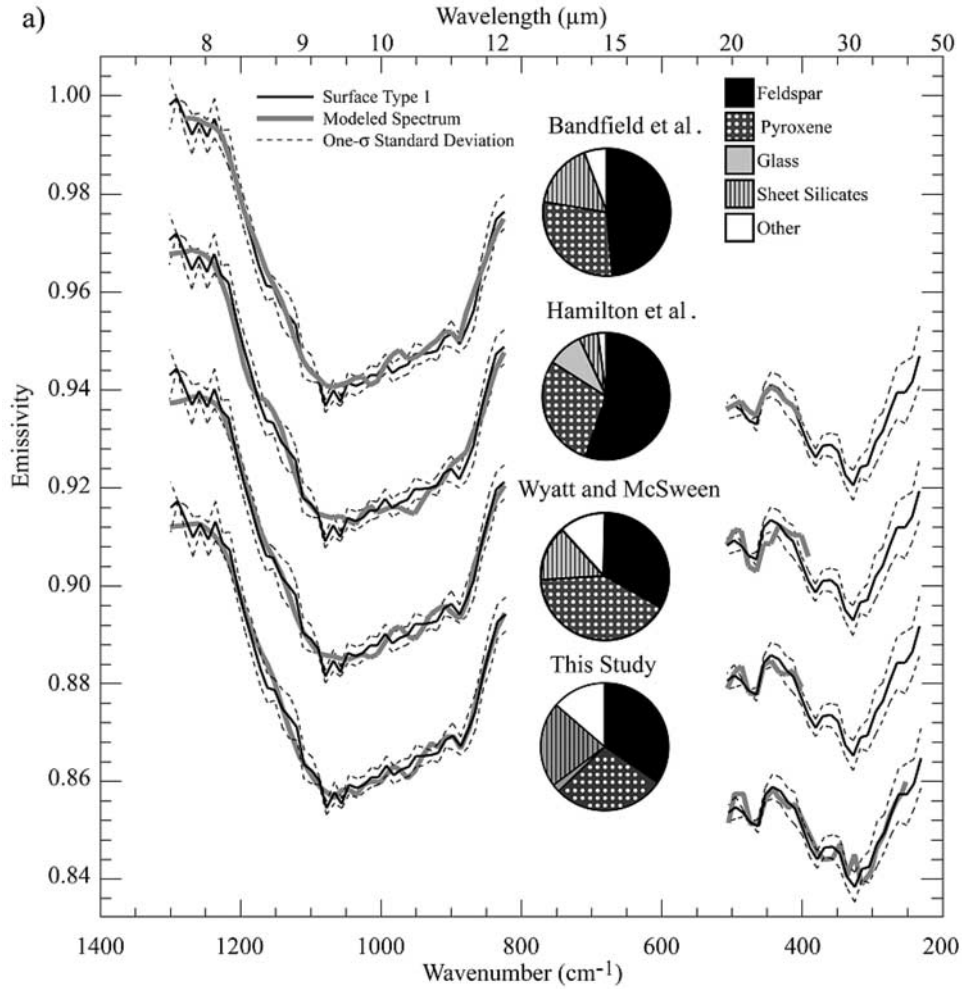

Figure 7. Comparison of TES spectra for (a) surface type 1 and (b) surface type 2 with modeled spectral fits (offset by 0.028 emissivity for clarity) and mineral abundances produced by linear deconvolution from *Bandfield et al.* [2000], *Hamilton et al.* [2001], *Wyatt and McSween* [2002], and this study (Table 3). Mineral abundances for surface type 1 are consistent with basaltic rocks, whereas surface type 2 abundances are consistent with either andesite or partly weathered basalt.

densities to constrain the density (and hence composition) of the Martian crust.

3. Crust Geochemistry From Thermal Emission Spectra

3.1. Background and Method

[26] Volcanic rocks are commonly classified by their chemical compositions because their modal mineralogies are not always diagnostic. TES is a mineralogical tool, but it can also provide a means of estimating chemistry. *Hamilton and Christensen* [2000] demonstrated that the chemical compositions of laboratory-analyzed rocks can be accurately calculated from deconvolved modal mineralogies by combining the compositions (wt.% oxides) of the spectral end-members in proportion to their relative modeled abundances. *Wyatt et al.* [2001] further quantified the uncertainties in derived chemical compositions and demonstrated their use in correctly classifying volcanic rocks. Errors for most oxides, as determined from the *Wyatt et al.* [2001] study of terrestrial volcanic rocks, are ± 5%. Derived chemical abundances from thermal emission spectra are thus a recasting of rock compositions into a form which complements modeled mineral abundances.

[27] *Hamilton et al.* [2001] convolved laboratory spectral data (2 cm^{-1} spectral sampling) of rocks from *Wyatt et al.* [2001] to the lowest spectral resolution of the TES instrument (10 cm^{-1} spectral sampling) and showed that derived bulk rock chemistries were not significantly degraded. These results demonstrated the feasibility of using similar techniques and classification schemes for TES spectral resolution data. *Hamilton et al.* [2001] also derived chemical compositions of the surface types 1 and 2 global spectral units and classified them as basalt and andesite, respectively. However, their spectral end-member set was optimized for igneous rocks.

[28] Here, we estimate and compare surface type 1 and 2 chemical compositions derived from three previously published modal abundances deconvolved using spectral end-member sets that include a broad range of igneous and