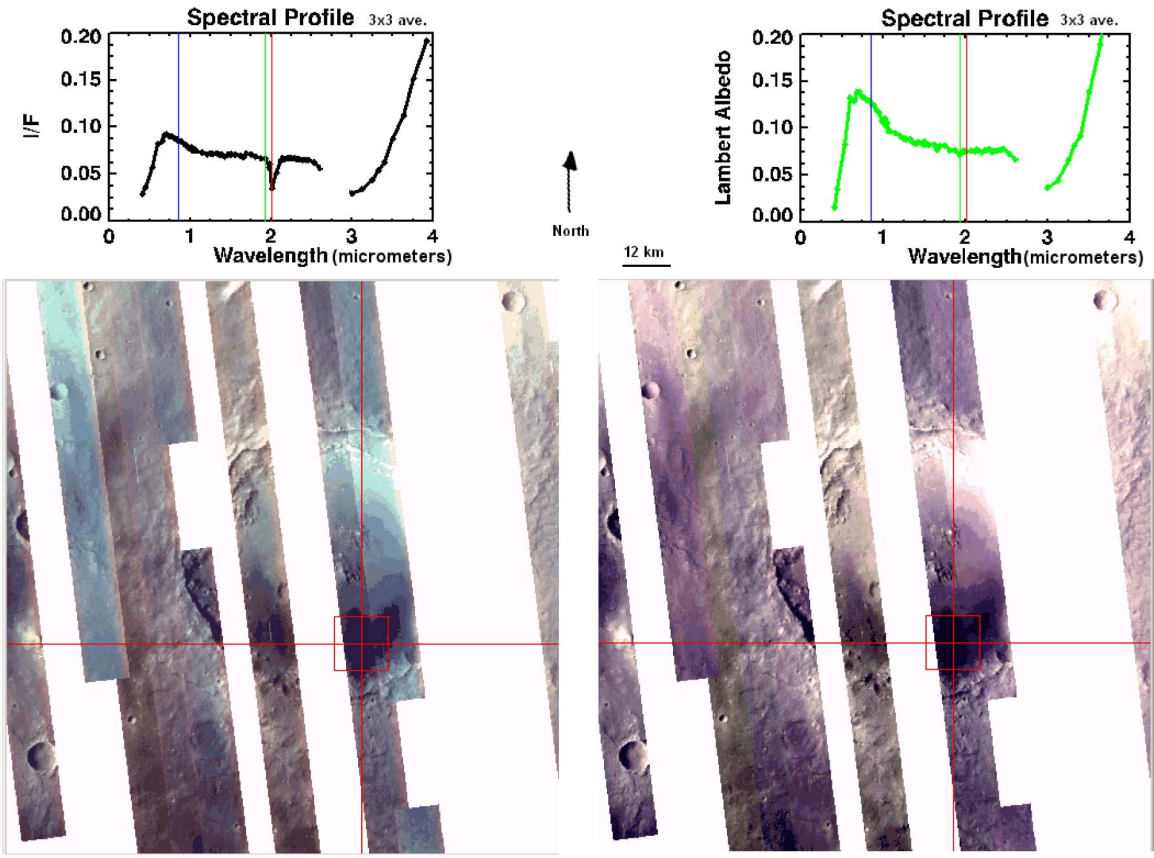

Fig. 9. CRISM multispectral map tile (with both the S and L detectors concatenated), T894, in the Tyrrhena Terra region, northeast of the Hellas basin, is shown, as corrected with the CRISM_LambertAlb DISORT-based software. On the left, we show a portion of the uncorrected I/F map tile and the spectrum. The lower left corner of this image is at 4.50° S, 96.88° E, and the upper right corner of this image is at 2.50° S, 98.69° E. On the right, we show the corrected version of the same map tile and spectrum, where we used standard pipeline processing and did not correct the photometric angles for surface slope. Thermal correction is not enabled here. North is upward in both images. Sun direction is somewhat variable, although a westerly incidence angle predominates. The bands shown here are $R = 2.01$ μm, $G = 1.92$ μm, and $B = 0.86$ μm. The stretching of the color space is min–max, with the bounding values chosen independently for each of the R, G, B planes for I/F and for Lambert albedo (I/F: R 0.032–0.086, G 0.066–0.155, and B 0.073–0.172; Lambert albedo: $R = G = B$: 0.10–0.30); the bounding values for the color stretching were not chosen to be the same for both I/F and Lambert albedo due to the change in range. The spectra shown are 3×3 pixel^2 spatial averages centered at the point indicated by the cross-hairs in each map tile. Note that the blue coloring dominates for several of the strips in the I/F version, whereas this blue coloring is much reduced after atmospheric correction. Also note that the reddish coloring is common near the edge of most of the strips in the I/F version, whereas this red coloring is much subdued after atmospheric correction. This reddish coloring at the edge of the strips is caused by an optical distortion (spectral smile) in the CO_2 gas bands, for which we are explicitly correcting. For clarity, known channels of particularly poor data quality (wavelengths of 0.97–1.05 and 2.66–2.80 μm) have been removed from these spectra.

have been described here. Soon, we will be completing the production of the 1894 CRISM multispectral map tiles that span the planet.

In Phase II of this paper, which is currently being completed, we will add the physical thermal-correction approach [24], [28] discussed in Section II. This improvement will allow more accurate correction at smaller spatial scales at wavelengths greater than 3 μm. Also, in Phase II, we will incorporate improved measurements of the aerosol scattering properties, as measured directly by CRISM [61]. This improvement will allow more accurate correction at wavelengths shorter than about 1 μm.

After having applied the Phase I + II CRISM_LambertAlb system to the multitudinous multispectral TRDR strips, these map tiles will have much less additional unwanted variability due to shifting observing conditions. Hence, the true spectral diversity and variability can be identified more easily, documented, and understood. Indeed, the I/F versions of the map tiles are now being used in order to provide more targets for the CRISM hyperspectral targeting mode.

In the phases beyond Phase II, we will consider incorporating the following:

1) improved correction in the carbon dioxide gas bands, by directly sensing the carbon dioxide column depth for each pixel, following the techniques of the OMEGA team [15], [50];
2) water vapor correction and carbon monoxide correction, either as a part of the pipeline processing or as a standalone tool;
3) correction for non-Lambertian effects, for example, by using the Lunar–Lambert model [29] or the Hapke model [22];
4) aerosol correction of the polar regions, by incorporating maps of the polar aerosols, as measured by CRISM emission-phase-function measurements [8].

As the Lambert albedo versions of the map tiles are completed, spectral ambiguities will become disentangled, which

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