

Providing on-demand atmospheric data for users of MIRA

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Many users of the new Mars International Reference Atmosphere (MIRA) will want to know what the meteorological conditions (temperatures, winds, surface pressures, etc.) were on Mars at a given time and place. This information is difficult to obtain from the original archived spacecraft data (because of the irregular observing patterns forced by orbital mechanics and because the raw data are typically in the form of infrared radiances). This is the justification for the tabulated format of MIRA, but it should be supplemented with online available data assimilation products. These data assimilation results form a compact (about 50 kbytes per sol) summary of the Martian atmospheric state. They can be integrated forward on demand to calculate the meteorology at a specified time and location or averaged over an interval. The current results are based on Mars Global Surveyor Thermal Emission Spectrometer (TES) nadir and limb spectra, but can easily be extended to include the Mars Express Planetary Fourier Spectrometer and Mars Reconnaissance Orbiter Mars Climate Sounder when those datasets become publicly available. This will enable the online MIRA to keep current as new observations are made and will improve the calibration, validation, and temporal coverage of the full dataset. The root-mean-square residuals of the assimilated atmospheric temperatures (compared to the TES team retrievals) are 2 K, growing to 6 K when compared with fully independent radio occultation profiles. The online assimilated data can also reproduce the original spectra with a standard deviation of $10^{-7} \text{ W cm}^{-2} \text{ sr}^{-1} \text{ wavenumber}^{-1}$. Since the data assimilation process eliminates occasional anomalies in the original data, this assimilated spectral product can be regarded as a quality-controlled dataset of calibrated radiances.

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