Seeing through heavily polluted satellite imagery using QUAC

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Extremely thick haze caused by air pollution is observed in many satellite images of the earth, and in particular over eastern China. Standard image display software typically provides satisfactory visualization of the ground through automated or user-driven scaling to enhance contrast; however, it does not perform well with these highly polluted scenes, where the haze is spatially non-uniform. Furthermore, estimation of surface reflectance using standard atmospheric correction software is highly problematic under these conditions due to very low visible transmission of the haze coupled with lack of knowledge of its optical properties, which may not conform to the haze or aerosol models in the software. In this paper we show that a version of the empirical Quick Atmospheric Correction (QUAC) algorithm, adapted for spatially dependent scattering, produces visually satisfying imagery of the entire ground in multispectral satellite scenes containing thick haze, and that the output reflectance spectra appear to be realistic enough for performing basic surface classification. The QUAC algorithm is applicable to multispectral and hyperspectral imagery with any number of wavelength bands, including true color (RGB) imagery, and does not require radiometrically calibrated data.

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