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SENSITIVITY OF VENUS SURFACE EMISSIVITY RETRIEVAL TO MODEL VARIATIONS OF CO2 OPACITY, CLOUD FEATURES, AND DEEP ATMOSPHERE TEMPERATURE FIELD

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The Visible and Infrared Thermal Imaging Spectrometer (VIRTIS) aboard ESA's Venus Express space probe has acquired a wealth of nightside emission spectra from Venus and provides the first global database for systematic atmospheric and surface studies in the IR. The infrared mapping channel (VIRTIS-M-IR) sounds the atmosphere and surface at high spatial and temporal resolution and coverage. Quantitative analyses of data call for a sophisticated radiative transfer simulation model of Venus' atmosphere to be used in atmospheric and surface parameter retrieval procedures that fit simulated spectra to the measured data. The surface emissivity can be retrieved from VIRTIS-M-IR measurements in the transparency windows around 1 μm, but it is not easy to derive, since atmospheric influences strongly interfere with surface information.

There are mainly three atmospheric model parameters that may affect quantitative results of surface emissivity retrievals: CO_2 opacity, cloud features, and deep atmosphere temperature field. The CO_2 opacity with respect to allowed transitions is usually computed by utilizing a suitable line data base and certain line shape models that consider collisional line mixing. Both line data bases and shape models are not well established from measurements under the environmental conditions in the deep atmosphere of Venus. Pressure-induced additional continuum absorption introduces further opacity uncertainties.

The clouds of Venus are usually modeled by a four-modal distribution of spherical droplets of about 75% sulfuric acid, where each mode is characterized by a different mean and standard deviation of droplet size distribution and a different initial altitude abundance profile. The influence of possible cloud mode variations on surface emissivity retrieval results is investigated in the paper. Future retrieval procedures will aim at a separation of cloud mode and surface emissivity variations using different atmospheric windows sounded by VIRTIS-M-IR.

Another potential source of emissivity uncertainties is due to the deep atmosphere temperature field. It is usually considered to be independent on latitude below 32 km as described by the Venus International Reference Atmosphere (VIRA) model. Remote sensing of temperature fields down to the surface of Venus was never performed till now, and *in situ* measurements were mainly restricted to low latitudes up to about 30 degrees. Altitudinal and latitudinal deviations from the VIRA deep atmospheric temperature field may occur, however, and are in fact suggested by General Circulation Models.

The paper will discuss the impact of the recited atmospheric parameters on the retrieved surface emissivity both in terms of absolute values and uncertainties.

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