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Entitled

Generating Synthetic Satellite Images of Mars Dust Storms Based on Radiative Transfer Models, as a Follow-on Application of MarsWRF Dust Cycle Simulations

By

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Abstract

Dust is a fundamental component of the Martian atmosphere; it plays an important role in the planet's climate system and atmospheric variability. For these reasons, it is considered one of the important keys to understand the behavior of the Martian atmosphere. The dust events on Mars range from local/regional dust storms that occur every MY to global dust storm storms that have only been observed, on average, once every 3-4 MYs. The latter event has strong thermal and dynamic effects on the atmosphere. This project aims to convert MarsWRF output data into synthetic satellite images of Mars dust storms in different ranges by using the radiative transfer model DISORT. MarsWRF is a Mars version of the terrestrial numerical weather and climate model WRF (Weather Research and Forecasting Model) and part of the PlanetWRF models for planetary atmosphere research. The imagery is generated by passing selected variables from the MarsWRF output through DISORT model, which is used to compute the top-of-the-atmosphere reflectance for a given band. The main results are synthetic satellite images plotted in 670 nm with a grid resolution of 2° × 2° of different dust events during one year of the MarsWRF model run. The obtained results of this project are consistent with the real cases of satellite images of Mars dust storms, especially, with global dust storms that encircle the whole planet.

Keywords: Dust, Atmosphere, Storms, Mars, Images, Marswrf, Synthetic.