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火星大気大循環モデルを用いた火星大気中へのダスト巻き上げに関する研究
The study of the dust lifting into the Martian atmosphere using Mars general circulation model

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Airborne dust plays an important role in the Martian climate system. Aerosol particles absorb and scatter the solar flux, and therefore, atmospheric temperature is strongly affected by temporal and spatial distributions of dust. The latter is supplied from the ground, and especially strong dust lifting occurs during socalled dust storms. Depending on the size and duration of the storms, they can be divided into three types: local, regional and global (planet-encircling). Numerous observations show that dust storms are generated mainly in the southern hemisphere every Martian year, although not every dust storm develops into global one. Implementation of the dust cycle in general circulation models (GCM) is highly important for simulations of the Martian climate system. Many existing Martian GCMs employ the observational data in order to evaluate the seasonal dust distributions in the atmosphere. We developed a dust lifting scheme, and implemented in into the GCM. The scheme accounts for dust particles lifting if the near-surface wind exceeds a certain threshold, their transport by the local wind, and sedimentation. The scheme is interactive in the sense that the simulated dust distributions affect radiative calculations, and ,thus, provide the feedback to the atmospheric wind and temperature. The scheme currently undergoes an extensive validation and sensitivity tests.

The simulated vertical flux of dust particles on the surface is seen that strong dust lifting occurs near 30S, in a good agreement with observations. Some patterns like global dust storm are simulated. In case of the strong dust lifting, opacities go up more than 0.3 for infrared wavelength. The southern summers of opacities are good agreement with the observations comparatively. Otherwise the northern winter ones are much lower.
Keywords: Mars, dust storm, Mars general circulation model