



Dust particle dynamics in atmospheric dust devils

Yulia Izvekova (1,2) and Sergey Popel (1,2)

(1) Space Research Institute, Russian Academy of Sciences, Moscow, Russia, Moscow, Russian Federation
(izvekova@iki.rssi.ru), (2) Moscow Institute of Physics and Technology, Dolgoprudny, Moscow Region, Russian Federation

Dust particle dynamics is modeled in the Dust Devils (DDs). DD is a strong, well-formed, and relatively long-lived whirlwind, ranging from small (half a meter wide and a few meters tall) to large (more than 100 meters wide and more than 1000 meters tall) in Earth's atmosphere. We develop methods for the description of dust particle charging in DDs, discuss the ionization processes in DDs, and model charged dust particle motion. Our conclusions are consistent with the fact that DD can lift a big amount of dust from the surface of a planet into its atmosphere. On the basis of the model we perform calculations and show that DDs are important mechanism for dust uplift in the atmospheres of Earth and Mars. Influence of DD electric field on dynamics of dust particles is investigated. It is shown that influence of the electric field on dust particles trajectories is significant near the ground. At some altitude (more then a quarter of the height of DD) influence of the electric field on dust particles trajectories is negligible. For the calculation of the dynamics of dust electric field can be approximated by effective dipole located at a half of the height of DD. This work was supported by the Russian Federation Presidential Program for State Support of Young Scientists (project no. MK-6935.2015.2).