Simulation of Dust Storms on Mars with a General Circulation Model

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We use our Martian general circulation model (MGCM) to simulate the dust cycle on Mars. This cycle consists of a dust lifting from the surface, transport, and sedimentation. The dust lifting scheme represents the vertical flux of aerosols into the atmosphere in terms of a near the surface wind. We studied seasonal variations in dust lifting, and development of regional and global dust storms.

Around Ls=200, a strong dust lifting occurred on the edge of CO2 ice polar cap in our simulations. During it, the dust optical depth increased up to 1.5 within one Martian day. This event developed into a regional-scale dust storm, which decayed after a couple of week. At Ls=233, another dust storm started at Hellas Basin and expanded westerly. Within a week, this dust storm spread to cover globally the southern hemisphere. In this case, a secondary lifting event occurred around Mariner Valleys after the initial dust lifting at Hellas Basin. We discuss the conditions that allow certain regional dust storms to develop into global ones.