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The interaction of dust devils and near-surface wind stress lifting with large scale circulation on Mars

P. Rogberg (1), S.R. Lewis (2) , C. Newman (3) and P.L. Read (1)

(1) Dept of Physics, University of Oxford, UK, (2) Dept of Physics and Astronomy, CEPSAR, The Open University, UK, (3) Geological and Planetary Science, Caltech, USA

An important feature of the Martian atmospheric environment is the mixture of atmospheric processes, in particular dust devils and near-surface wind stress, which lift and also sustain dust suspended in the atmosphere. Their mutual interaction with the circulation on synoptic and global scales is important, but still not completely understood. When dust enters the atmosphere it significantly affects its radiative properties and provides a potential source of feedback through altering the atmospheric temperature structure and winds. Numerous observations indicate that these interactions can produce and amplify large scale dusty atmospheric regions which are often sustained for significant periods (10-100 days). The lifting processes, however, operate on shorter time and spatial scales. For example the life time of an individual dust devil, which is essentially a convective vortex, is limited by the diurnal cycle. Dust lifting due to wind stress might depend strongly on local variations in topography or thermal inertia, which might generate persistent temperature gradients. We present results from a Martian global circulation model, here focusing on understanding the relative importance of dust devil lifting and near-surface wind stress lifting at different scales and their connection with the large scale circulation.