Universidad de Concepción
Facultad de Ciencias Físicas y Matemáticas
Departamento de Geofísica

Seminario de Geofísica

13 Years of Dust Devil Monitoring and In-situ Sampling

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Resume:

Dust devil thermal vortex columns are a ubiquitous feature in the atmospheric boundary layer over arid surfaces of Earth and Mars. Utilizing several desert field sites in the United States southwest and South America, we seek to (1) characterize the desert surfaces over which dust devils do or do not develop, (2) characterize dust devil dimensions, especially the height to which material is lofted, as well as the frequency of their activity, and (3) determine the flux of particulate material raised by dust devils. The erosive effectiveness of dust devil vortices is due, in part, to wind speeds gusting 10 ms-1 within 0.15 m of the ground (even among frictional grass-covered surfaces), and only a mature desert pavement surface appears sufficiently armored to deny them a dust source. Furthermore, patches of highly aerodynamically rough ground (such as fields of 3 m diameter boulders) can readily serve as thermal plume "breeding grounds", sheltered from conventional shear wind surface, where hot air can develop without mixing with the cooler air immediately above. A portable field wind tunnel examined the aeolian susceptibility and sediment-shedding behavior of 35 undisturbed desert sites. Actively mobile in-situ sampling of several hundred natural dust devil vortices using a vertical profiling instrumentation mast indicates very high total suspended particle (TSP) and fine dust loadings (PM10), low-pressure cores, and triboelectric charge and RF electromagnetic noise generation. Mean TSP values were 296 mgm-3 and PM10 values ranged from 15.1 to 43.8 mgm-3. Concurrent 3- dimensional wind profiles showed mean tangential rotation of 12.3 ms-1 and vertical uplift of 2.7 ms-1 driving mean vertical TSP flux of 1689 mgm-3 and fine particle flux of ~ 1.0 to ~50.0 mgm-3. Peak PM10 dust loading and flux within the dust column are 3 times greater than mean values. UV occultation, saltation activity, and airborne dust opacity were used to determine dust column geometry and therefore the first flux calculations for column mean as well as peak measurements. Such results are consistent with other observational, theoretical and laboratory studies.

La charla será en inglés.
Martes 6 de enero, 2009, 15:15 horas, Sala Seminario 6ºPiso Departamento de Astronomía, Facultad de Ciencias Físicas y Matemáticas.
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Se invita a docentes, estudiantes y público interesado