

Observations of Niveo-Aeolian Activity at Great Sand Dunes National Park and Preserve (GSDNPP).

Ralph D. Lorenz¹ and Andrew Valdez², ¹Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel, MD 20723 (Ralph.lorenz@jhuapl.edu) ²Great Sand Dunes National Park and Preserve, 11500 Highway 150, Mosca, CO 81146-9798, USA

Introduction: Here we report on Aeolian movement of snow and sand at GSDNPP. The site is a large parabolic dune at 37°41'35.30"N 105°35'11.25"W. This area is within GSDNPP but is far from the main dunefield and is not in an area frequented by visitors, nor is it an NPS wilderness area. The site is where the dirt road west from the Lodge on the Desert is blocked by the dune. The interior of the dune has prominent granule ripples that have been the subject of a recent timelapse imaging ripple migration rate study [1].

Buried Snow: During the retrieval of timelapse equipment in January 2011, it was noted that the dune sand was substantially frozen. An interbedded deposit of snow and sand was literally stumbled upon (figure 1) and is investigated here.



Figure 1. Looking down front of parabolic dune, buried snow was encountered beneath a damp rippled patch of sand.

Close examination of the layer (figure 2) shows many fine layers of sand and snow, suggesting alternating snowfall/snow transport and sand transport. The weather records (figure 3) support two main episodes of snowfall. The deposit appears to be ~3 weeks old.



Figure 2. Close inspection shows two principal snow layers, each with sand-rich substrata

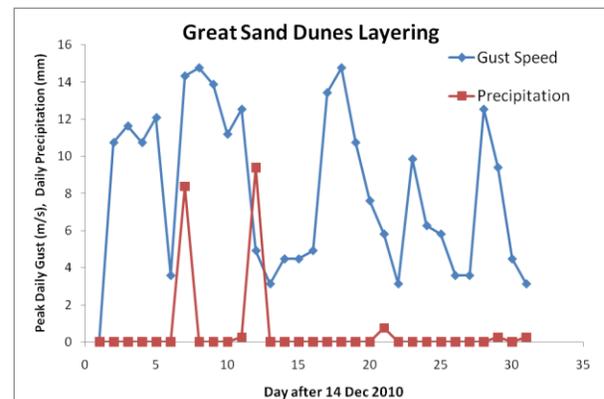


Figure 3. Inspection of weather records at a near-by RAWS station indicates two days of precipitation. Winds exceeded the saltation threshold much of the time.

Mixed blowing sand and snow: During subsequent timelapse imaging, mixed snow/sand movement was observed in action. Images are recorded at 10 minute intervals during daylight by a timelapse digital camera. The camera is mounted about 2.5m above the ground on a fencepost and looks in a downwards-northward direction. A selection of images of combined snow and Aeolian activity follows.

Reference [1] Lorenz, R. D. and A. Valdez Variable Wind Ripple Migration at Great Sand Dunes National Park, Observed by Timelapse Imagery, *Geomorphology*, 133, 1-10, 2011



Figure 4. Initially (Jan 31, 2011) pre-existing sand ripples are highlighted by snow deposition.



Figure 7. One day later, as snow melts, regular snow patches are left due to snow thickness/texture in the original structures.

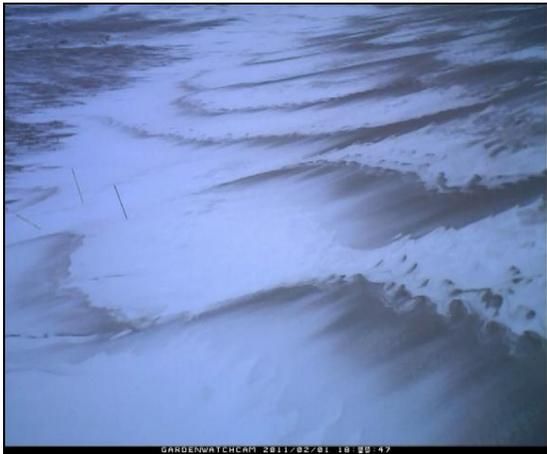


Figure 5. Sand and snow blowing ~08.20am on Feb 1, 2011. The snow forms regular drifts with interbedded layers of snow and sand.



Figure 8. Sand deposited with snow, presumably colder and moister, leaves residual regular structures with distinct texture.



Figure 6. Next day after saltation and overnight snowfall structures are visible as rippled patches at right, despite the uniform albedo. Note coyote tracks.



Figure 9. A second episode of mixed snow-sand blowing was observed on 8th February