HIGH-RESOLUTION DUST DEVIL SAMPLING FOR SEDIMENT LOADS, WIND SPEEDS, TEMPERATURE AND PRESSURE EXCURSIONS. S. Metzger[1], M. Balme[1], A. Pathare[1], N. Renno[2], M. Towner[3], A. Spiga[4], H. Elliott[2], [1]Planetary Science Institute, Tucson AZ (metzger@psi.edu), [2]Dept. of Atmospheric, Oceanic & Space Sciences, University of Michigan, Ann Arbor, MI, [3]The Open University, PSSRI, Milton Keynes UK, [4]Dept. of Physics and Astronomy, The Open University, Milton Keynes, UK.

Introduction: This interim report on field activities in the Eldorado Valley of Southern Nevada is part of a larger effort to understand dust devil formation under natural meteorological conditions and the resultant dust-lifting efficacy they achieve. To this end we upgraded our sensors and *in situ* placement techniques (i.e. chase truck with extended boom). These include an Applied Technologies, Inc. 3-dimensional sonic anemometer with Vx probe that sampled U, V & W wind components, plus sonic temperature, at 10 Hz., A TSI DustTrak aerosol monitor was used to sample PM10 dust (0.1 to 10 um diameter) at 1 Hz. A Kestrel 4500 weather station was used to measure maximum pressure excursions (negative). Dust devil diameter was visually estimated by Metzger via direct observation near the columns' base during encounters (Photogrammetric size determination via GIS techniques will be used to augment these estimates). All sensors were placed 2-m above the desert surface, 5-m in front of the chase vehicle on a rigid boom.

This report covers 50 encounters that directly bisected the dust devil columns, using a mobile chase vehicle. These data were collected in late June 2010. We are not aware of any other study that has measured, *in situ*, this range of thermal vortex parameters at such high-resolution, spatially and temporally.

The following results from direct dust devil sampling will be integrated into the next phase of this project; the determination of the consequences of various weather conditions on vortex formation, size, longevity, and dust flux.

Results The typical boundary layer thermal vortex laden with dust (dust devil) was sampled at 13:51 LST, rotated at 9.8m/s (with a peak max 13.5), experienced buffeting upward vertical flow of 3.6 m/s and downward vertical flow of -1.8 m/s, a sonic temperature of 3.2 °C above ambient (at 2-m ht), a pressure drop below ambient of 0.8 mbar, and a resultant dust load of 11.3 mg/m^3. The highest observed values were a maximum rotation of 25.5 m/s, minimum rotation of 3.3 m/s, maximum upward lift of 7.1 m/s and maximum downward "lift" of –4.3 m/s, maximum pressure depression of 1.9 mbar from ambient and a minimum of 0.3 mbar, sonic temperature excursions over ambient ranging from 0 to 8.2°C, and dust loading as high as 139 mg/m^3 yet as low as 0.4 mg/m^3 while ambient dust remained below 0.02 mg/m^3.

Correlations:

R^2	Linear Eqn. (usually through origin)
0.984	Hmax = 1.34Hmean Thru Origin
0.950	Dstmax = 2.22 Dstmean Thru Origin
0.916	Dstmax = 2.17 Dstmean + 1.62
0.913	Hmax = 1.13Hmean + 2.55
0.856	Hmax = 13.34 Pres Thru Origin
0.847	Hmean = 9.73 Pres Thru Origin
0.715	W+max = 3.98 Wmean
0.700	Hmax = 1.41 Diam Thru Origin
0.700	Hmean = 1.02 Diam Thru Origin
0.698	W+max = 0.91 Temp Thru Origin
0.687	Hmax = 3.08W+max Thru Origin
0.664	W+max = -1.53 W-max Thru Origin
0.631	W+max = 0.29 Hmean Thru Origin
0.616	Hmax = -5.51W-max Thru Origin
0.604	Pres = 0.07 Diam Thru Origin
0.601	W+max = 3.14 Pres Thru Origin
0.584	W-max = -0.15 Hmean Thru Origin
0.576	Hmax = 3.1 Temp Thru Origin
0.564	Hmax = 0.85 Dstmean Thru Origin
0.563	Dstmax = 4.14 Diam Thru Origin
0.550	W-max = -1.61 Pres Thru Origin
0.546	Hmean = 2.23 Temp Thru Origin
0.535	Dstmax = 34.7 Pres Thru Origin
0.532	W+max = 0.23 Dstmean
0.529	Hmean = 0.60 Dstmean Thru Origin
0.527	Wmean = 0.17 Temp Thru Origin
0.523	W+max = 1.94 Wmean + 2.47
0.516	Hmax = 0.31Dmax Thru Origin
0.516	Dstmean = 14.0 Pres Thru Origin

Hmax = horizontal max (fastest U&V rotation, m/s)
Hmean = mean rotation (m/s)
W+max = positive lift; upward (m/s)
W-max = negative "lift"; downward (m/s)
Wmean = mean vertical flow (m/s)
Dstmax = max Dust load/peak (mg/m^3)
Dstmean = mean Dust load (mg/m^3)
Pres = Delta Pressure below ambient (mbar)
Temp = Delta Sonic Temperature above ambient ('C)
Diam = Diameter (m)