Fair-Weather Diurnal Wind Field in a Complex Mountainous Region
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Introduction

Thermally driven or diurnal wind systems are known to form regularly in the mountain areas of the arid Intermountain West (Stewart et al., 2002). The U.S. Army's Dugway Proving Ground (DPG) has collected a large archive of wind data from their Surface Automated Measurement System (SAMS) network of 26 10-m towers in the Great Salt Lake Desert of west-central Utah. The goal of this research is to determine the diurnal wind patterns on summer fair weather days over this area of complicated topography in the Intermountain Basin.

Data Processing

Data were available from a network of twenty-six 10-m towers located in and surrounding DPG for the period from January 1998 through August 2008. We wished to investigate diurnal wind systems on summer (June, July and August) fair weather days. There were about 11 × 3 × 30 = 990 possible days in the period of record.

Fair weather days were defined as days with clear or partly cloudy skies and weak background synoptic-scale flows. The radiation and wind speed thresholds were defined using data from the Ditto site.

Approach

An average wind vector was determined for each site for each hour of the 24-hour day. A vector average was obtained from wind observations for that hour from the string of ~331 fair weather days. The results for 00, 06, 12, and 18 MST are shown in Fig. 5 a-d. Maps drawn for each of the 24 hours of the day were animated using QuickTime to reveal the temporal evolution of the wind field. The animation can be seen on the computer near this poster.

Results

Figure 5. Wind fields at 00, 06, 12, and 18 MST. A wind flag indicates a speed of 5 m/s, a full barb is 1 m/s and a half-barb is 0.5 m/s.

Future Work

We plan to continue exploring this data set, refining the wind and radiation threshold criteria, creating hodographs and wind roses for all of the sites, and producing animations for the other seasons.

Acknowledgments & References

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