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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Brief Communication: Differences between Sundowner and Santa Ana wind regimes in the Santa Ynez Mountains, California" *by* Benjamin J. Hatchett et al.

Anonymous Referee #2

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The authors propose a simple method for the detection of Sundowner events from surface temperature observations. From the chosen events, the authors build a climatology for the Sundowner winds. This climatology is compared against a pre-existing Santa Ana index. The paper is well written but presents a very basic analysis. The three dimensional dynamics of the phenomena is missing and can be performed using reanalysis data without the need for further downscaling. The authors fail to provide a clear physical and dynamical description of the differences between the two phenomena. This leads me to not recommend the publication.

Major Comments:

The Sundowner winds are downslope wind storms and the dynamics of such winds has been described in the literature since early 1950's (e.g. Scorrer 1955; Clark et al. 1977; Klemp and Lilly 1975; Smith1979, 1985; Smith et al. 1993; Durran 1986, 1990; Vosper 2004; Grubisic and Billings 2007, 2008; Jiang and Doyle 2008; Doyle et al. 2011). There are several examples, in the literature, of flow characteristics and approximations which allow the description of the dynamics of such phenomena even with low resolutions such as reanalysis. The differences in the dynamics, upwind characteristic of the flow and boundary layer differences between the Sundowner and Santa Ana are missing from the manuscript and should be provided The manuscript also, does not provide any analysis of the atmosphere's vertical profile. Although this analysis may be difficult with the NECP reanalysis if model levels are not available, this would not be the case with the Japanese 55-year Reanalysis (JRA-55) or the Modern Era Retrospective-analysis for Research and Applications (MERRA2) which have similar horizontal resolutions to NCEP with 60 and 72 model levels respectively. Both are freely available for research. The analysis of the atmosphere's vertical structure would allow a better understanding of the phenomena and provide clues to the differences between Sundowner and Santa Ana winds. This should be added.

Minor Comments:

A description of the SAW index should be more elaborate, so that the reader does not have to interrupt the reading of this paper and review Guzman-Morales et al. (2016) in order to understand the applied methodology. There are several time periods referred in the text: 1979-2014, 1981-2010, 1997-2014. Figures 1, 2a, 2b and 3 should be for the same time period, either 1979-2014 or 1981-2010. Figures 2c and d should be compared to 2a and b for the same time period, i.e. 1997-2014. I suggest adding the latter figures in supplementary material. In figure 3 I suggest adding a composite of the 500hPa and mean sea level pressure for both seasons in order to facilitate the interpretation of the different differences.

Doyle, J.D., et al., 2011. An intercomparison of T-REX mountain-wave simulations

and implications for mesoscale predictability. Mon. Weather Rev. 139, 2811–2831. Durran, D. R., 1986: Another look at downslope windstorms. Part I: The development of analogs to supercritical flow in an infinitely deep, continuously stratified fluid. J. Atmos. Sci., 43, 2527–2543. Durran, D.R., 1990. Mountain waves and downslope winds.Meteorol. Monogr. 23, 60–83. Grubisic, V., Billings, B., 2007. The intense lee-wave rotor event of sierra rotors IOP8. J. Atmos. Sci. 64, 4178–4201. Grubisic, V., Billings, B., 2008. Summary of the sierra rotors project wave and rotor events. Atmos. Sci. Lett. 9, 176–181. Jiang, Q., Doyle, J.D., 2008. Diurnal variation of downslope winds in Owens Valley during the sierra rotor experiment. Mon. Weather Rev. 136, 3760–3780. Klemp, J.B., Lilly, D.K., 1975. The dynamics of wave induced downslope winds. J. Atmos. Sci. 32, 320–339. Mobbs, S. D., Vosper, S. B., Sheridan, P. F., Cardoso, R., Burton, R. R., Arnold, S. J., Hill, M. K., Horlacher, V. and Gadian, A. M., 2005: Observations of downslope winds and rotors in the Falkland Islands. Quart. J. Roy. Meteor. Soc., 131, 329-351 Scorer, R. S., 1955: The theory of airflow over mountainsâĂŤIV. Separation of flow from the surface. Quart. J. Roy. Meteor. Soc., 81, 340–350. Smith, R. B., 1979: The influence of mountains on the atmosphere. Advances in Geophysics, Vol. 21, Academic Press, 87–230. Smith, R.B., 1985. On severe downslope winds. J. Atmos. Sci. 42, 269–297. Smith, R. B. and S. Grøna°s, 1993: Stagnation points and bifurcation in 3D mountain airflow. Tellus, 45A, 28–43. Vosper, 2004: Inversion effects on mountain lee waves. Quart. J. Roy. Meteor. Soc., 130, 1723–1748

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