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Tracking the footprints of downslope windstorms with an automobile measurement system

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A car instrumented to measure temperature, dew point, pressure, 2D wind and horizontal position while driving, observed downslope windstorms east of the North American Sierra Nevada during the Sierra Rotors Project in spring of 2004. Three cases are presented: a no-show case, where a thermal valley and slope wind system was observed, and a downslope windstorm by itself and in combination with a cold front, respectively. The car measurements together with upstream and downstream radiosoundings showed the hydraulic nature of the downslope windstorms, supercritical and subcritical regions, hydraulic jumps, flow separations, the importance of downslope nocturnal cold pools for the penetration of the downslope flow to the ground, and the superposition of flow across the crest on gap flow.