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Thermal circulation patterns and turbulent fluxes along steep mountain slopes

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In hydrology, it is crucial to understand the atmospheric flow dynamics in mountainous terrain to predict turbulent exchanges of heat and moisture accurately at the regional scale. Under clear skies and weak synoptic conditions, these land–atmosphere interactions are principally driven by thermal circulations that take place over a strong diurnal cycle. During the day, winds travel up the mountain slopes and at night, they travel down toward to the bottom of the valley. Little is known about how the transition between these two wind regimes takes place over steep slopes. The Slope Experiment at La Fouly (SELF) in the Swiss Alps was designed to investigate these transition periods throughout summer 2010. In this paper, we will present the first results obtained from this field campaign. Detailed measurements of the turbulent processes on a steep idealized slope (20 to 45 degrees) were made with four towers (including a surface energy budget station and 10 m tower with sonic anemometers), 15 surface temperature measurement stations and a tethered balloon system to capture the complex interplay between surface and atmosphere. Initial data presented will include basic circulation pattern development and measurements of the turbulent fluxes of water vapor, heat and momentum on the slope.