Characterization of the valley wind system in a deep Alpine valley

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The local winds in mountain valleys often differ significantly from the prevailing large-scale winds. Terrain-induced thermal and dynamical forcing result in a unique wind climatology for any specific valley. In fair weather conditions, thermally driven local winds often dominate the wind climatology in deep Alpine valleys. In disturbed weather conditions, terrain-related dynamical forcing may result in stormy winds, such as foehn. The accurate forecasting of these local wind systems is challenging, as they are the result of complex and multi-scale interactions. Even more so, if the aim is an accurate forecast of the winds from the near-surface to the free atmosphere, which can be considered a prerequisite for the accurate prediction of mountain weather. The aim of the present study is to characterize the valley wind system in a deep Alpine valley, the Rhone valley at Sion, based on almost one year of continuous wind profiler data. The climatology of the local winds will be documented for the different seasons and different weather conditions from the near-surface to the free atmosphere. The analysis may serve as a basis for future model evaluation.