



Characterization of night-time flow oscillations over forest canopy near a mountain crest

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We will present an improved wavelet-based method for detection and characterization of the low-frequency oscillations in the time series of temperature and vertical velocity. Data for the study were obtained from the sonic anemometer measurements over an even-aged Norway spruce forest at the Experimental Ecological Study Site Bily Kriz (800-900 m a.s.l.). Bily Kriz is a CarboEurope site located in the Moravian-Silesian Beskydy Mts., the Czech Republic. It is situated on a steep (13°) SSW-faced slope. To the north of the site, there is a W-E oriented mountain crest with a shallow saddle. The along-slope wind direction cases dominate at the site, the majority of them being upslope.

Except for the fog episodes when the site is covered with clouds, the nights at Bily Kriz are characterized by almost exclusive occurrence of negative buoyancy, which tends to drive a downslope flow. Nevertheless, near the crest a larger-scale flow is critical for the wind direction above the canopy, and therefore the upslope flow is more frequent even at night. Then the direction of sub-canopy flow is a result of the downslope-directed buoyancy force and the opposing perturbation pressure force that is caused by the flow over a ridge. Accordingly, the flow is either downslope (katabatic) or upslope. For the less frequent cases of a downslope flow above the canopy, the resulting sub-canopy flow is usually downslope and dependent on the vertical temperature gradient.

Recent study of turbulent fluxes at Bily Kriz by using the wavelet technique revealed an existence of the low-frequency oscillations above the canopy. The periods of detected oscillations seem to vary with the temperature gradient in the canopy. Here we propose a more effective method for identification of the periods and number of oscillations in the time series. It allows us to analyze the occurrence and character of oscillations in the data covering the different flow regimes described above.