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Low-frequent coherent motions within the spruce forest at mountainous site Bý Kříž: effect of thermal stabilty

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We present here a wavelet-based characterisation of organized structures in the time series of temperature and vertical velocity. Data consists of measurements within and at the top of an even-aged Norway spruce forest, collected during the growing season 2006 at the Experimental Ecological Study Site Bílý Kříž (800-900 m a.s.l.). Bílý Kříž is a CarboEurope site located in the Moravian-Silesian Beskydy Mountains (Czech Republic). Measurements are situated on a steep (13˚) SSW-faced slope. North of the site, there is a W-E oriented mountain crest with a shallow saddle. High-frequency wind velocity components and sonic temperature were collected using three-dimensional sonic anemometers at three levels (z/h = 0.3, 0.5 and 1, where h is the canopy height) jointly with measurements of standard meteorological data and tower-based records including radiation.

Our recent study of turbulent fluxes at one level above the canopy by means of the wavelet technique revealed an existence of the low-frequency oscillations. The periods of detected oscillations are shorter for north (downslope) than for south (upslope) flow. In case of the south flow, they decrease with increasing wind speed above the canopy.

Here, we are concentrated on the vertical coherency of the turbulent flow within the forest under various atmospheric conditions (wind speed and direction, thermal stability). The co-variance of spectra of low-frequency oscillations in time series of variables measured during several hours at two different levels are computed using the adapted Matlab wavelet coherence package (Grinsted, Moore and Jevrejeva, 2004). The possible sources of individual low-frequency oscillations are discussed.