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# Experimental evaluation of the significance of the pressure transport term for the Turbulence Kinetic Energy Budget across contrasting forest architectures

Laura Ehrnsperger, Tobias Wunder, and Christoph Thomas
University of Bayreuth, Mikrometeorologie, Bayreuth, Germany (laura.c.ehrnsperger@uni-bayreuth.de)

Forests are one of the dominant vegetation types on Earth and are an important sink for carbon on our planet. Forests are special ecosystems due to their great canopy height und complex architecture consisting of a subcanopy and a canopy layer, which changes the mechanisms of turbulent exchange within the plant canopy. To date, the sinks and sources of turbulence in forest canopies are not completely understood, especially the role of the pressure transport remains unclear. The INTRAMIX experiment was conducted in a mountainous Norway spruce (*Picea abies*) forest at the Fluxnet Waldstein site (DE-Bay) in Bavaria, Germany, for a period of 10 weeks in order to experimentally evaluate the significance of the pressure transport to the TKE budget for the first time. The INTRAMIX data of the dense mountain forest was compared to observations from a sparse Ponderosa pine (*Pinus ponderosa*) stand in Oregon, USA, to study the influence of forest architecture. We hypothesized that the pressure transport is more important in dense forest canopies as the crown decouples the subcanopy from the buoyancy- and shear-driven flow above the canopy. It is also investigated how atmospheric stability influences the TKE budget. Based upon model results from literature we expect the pressure transport to act as a source for TKE especially under free convective and unstable dynamic stability.

Results to date indicate that pressure transport is most important in the subcanopy with decreasing magnitude with increasing height. Nevertheless, pressure transport is a continuous source of TKE above the canopy, while in the canopy and subcanopy layer pressure transport acts both as a sink and source term for TKE. In the tree crown layer pressure transport is a source in the morning and afternoon hours and acts as a sink during the evening, while in the subcanopy pressure transport is a source around noon and during the night and acts as a sink in the early morning and afternoon hours. This complementary pattern suggests that the pressure transport is an important means for exchanging TKE across canopy layers.