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Energy Balance Closure at a Variety of Ecosystems in the Czech Republic

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A long-standing problem in micrometeorology is that at most eddy covariance sites around the world, the sum of the sensible and latent heat measurements is less than the available energy, resulting in the so-called energy balance closure problem. This study utilised the national network of eddy covariance towers in the Czech Republic to examine the degree of energy balance closure at sites covering a wide variety of vegetation types and terrain complexities. In addition, variation in closure under a range of meteorological conditions was also analysed. The energy balance closure fractions for the different ecosystems ranged from 0.68 (beech forest) to 0.81 (spruce forest). Best energy balance closure at each of the sites occurred in strongly unstable to moderately unstable atmospheric conditions. As in previous studies, energy balance closure improved with increasing friction velocity, although in this study the ratio of friction velocity and wind speed seemed to have a greater impact on energy balance closure, particularly at the sites with tall canopies. At the Štítná site, in the Carpathian Mountains, evidence suggested that the complex topography to the south of the eddy covariance tower was influencing the airflow and resulting in low friction velocity measurements and poor energy balance closure results. Finally, applying the sector-wise planar fit method and increasing the flux averaging period from 30 minutes to 1 hour resulted in minor increases in energy balance closure at the majority of sites.