The potential of throughfall measurements for the derivation of canopy leaf area

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Precipitation above canopy (high resolution and bi-weekly)

Throughfall below canopy (15 samplers, bi-weekly)

Site factor of throughfall

2.0

Summary

Leaf Area Index (LAI) is a decisive parameter in canopy models, but not all Level II plots provide measurements of LAI. Optical LAI measurements are based on differential light measurements above and below the canopy.

Can throughfall measurements be used to estimate LAI?

Similar to differential light measurements, precipitation is measured on nearly all Level II plots above and below canopy. May the penetration of water through the canopy be treated similarly to light penetration? Canopy view from a throughfall collector Throughfall high resolution

Spatial variability of throughfall is conservative: The relative amount of throughfall reaching a collector in a collector field was expressed as site factor. While the background variability is high, the mean site factor of a collector did only slowly change over 10 to 30 years of measurement on 23 Level II plots.

Site factors correlate to Leaf Area Index

Optical Leaf Area Index measurements above each collector were compared to the Site factors of these collectors. The best correlations were found, when the LAI measurement was restricted to a 32° field of view (2 rings of the LAI-2200 sensor). The correlations were better in spruce plots than in pine or broadleaved stands.

Plot-representative throughfall time series

As a by-product, the site factor calculated for each highresolution throughfall collector (with measurement every 15 minutes) could be determined and provides a plotrepresentative time series of throughfall, as well as the possibility to detect measurement errors in the past.



collector



Conclusion

Throughfall measurements reflect the canopy structure vertically above the collector – different from light, the direction of water arriving is not as evenly distributed over the hemisphere above the sensor. The direct derivation of whole canopy LAI would require more exact information on the direction of water arriving, e.g. including the wind direction and wind speed as additional parameters

