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Global estimate of lichen and bryophyte contributions to forest precipitation interception

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Interception of precipitation by forest canopies plays an important role in its partitioning to evaporation, transpiration and runoff. Field observations show arboreal lichens and bryophytes can substantially enhance forests' precipitation storage and evaporation. However, representations of canopy interception in global land surface models currently ignore arboreal lichen and bryophyte contributions. This study uses the lichen and bryophyte model (LiBry) to provide the first process-based modelling approach estimating these organisms' contributions to canopy water storage and evaporation. The global mean value of forest water storage capacity increased significantly from 0.87 mm to 1.33 mm by the inclusion of arboreal poikilohydric organisms. Global forest canopy evaporation of intercepted precipitation was also greatly enhanced by 44%. Ratio of total versus bare canopy global evaporation exceeded 2 in many forested regions. This altered global patterns in canopy water storage, evaporation, and ultimately the proportion of rainfall evaporated. A sensitivity analysis was also performed. Results indicate rainfall interception is of larger magnitude than previously reported by global land surface modelling work because of the important role of lichen and bryophytes in rainfall interception.