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An improved description of light interception in the JULES SVAT model: calibration and testing against carbon fluxes at a coniferous forest

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Recent comparisons of the Hadley Centre SVAT scheme, "MOSES" against land-atmosphere CO_2 flux measurements from eddy-covariance towers show a tendency for the model to underestimate the higher uptake rates in the middle of the day. Here we trace the reason for this bias to an underlying assumption that the plant canopy functions like a scaled "big-leaf". An alternative treatment of canopy radiation interception is proposed based on an analytical two-stream model, and an explicit scaling-up from leaf-to-canopy. The new model (which will form part of the next generation community land-surface, "JULES") produces a better fit to the flux measurements from the pine tree site in Loobos, Netherlands, and also has the additional benefit of distinguishing between diffuse and direct radiation effects on photosynthesis. It is noted that changing the light interception component influences parameters associated with other environmental stress during the Loobos data-model calibration.