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Modelling rainfall interception by forests: a new method for estimating the canopy storage capacity

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Evaporation of rainfall intercepted by forests is usually an important part of a catchment water balance. Recognizing the importance of interception loss, several models of the process have been developed. A key parameter of these models is the canopy storage capacity (S), commonly estimated by the so-called Leyton method. However, this method is somewhat subjective in the selection of the storms used to derive S, which is particularly critical when throughfall is highly variable in space. To overcome these problems, a new method for estimating S was proposed in 2009 by Pereira *et al.* (Agricultural and Forest Meteorology, 149: 680-688), which uses information from a larger number of storms, is less sensitive to throughfall spatial variability and is consistent with the formulation of the two most widely used rainfall interception models, Gash analytical model and Rutter model. However, this method has a drawback: it does not account for stemflow (S_f). To allow a wider use of this methodology, we propose now a revised version which makes the estimation of S independent of the importance of stemflow. For the application of this new version we only need to establish a linear regression of throughfall *vs.* gross rainfall using data from all storms large enough to saturate the canopy. Two of the parameters used by the Gash and the Rutter models, p_d (the drainage partitioning coefficient) and S, are then derived from the regression coefficients: p_d is firstly estimated allowing then the derivation of S but, if S_f is not considered, S can be estimated making p_d= 0. This new method was tested using data from a eucalyptus plantation, a maritime pine forest and a traditional olive grove, all located in Central Portugal. For both the eucalyptus and the pine forests p_d and S estimated by this new approach were comparable to the values derived in previous studies using the standard procedures. In the case of the traditional olive grove, the estimates obtained by this methodology for p_d and S allowed interception loss to be modelled with a normalized averaged error less than 4%. Globally, these results confirm that the method is more robust and certainly less subjective, providing adequate estimates for p_d and S which, in turn, are crucial for a good performance of the interception models.