



Water exchange between plants and atmosphere : relationships between water vapour flux and sap flow

S. Mereu(1), f. Manes(1) and S. Cieslik (2)

1. Università La Sapienza, Rome, Italy
2. Joint research Centre, Ispra, Italy

Exchange of water, liquid or gaseous, between vegetation and the atmosphere is an important indicator for stomatal activity of plants, which in turn governs air pollutants uptake by plants. It can be determined by various methods, such as micrometeorological techniques and sap flow measurement. Water vapour fluxes above a canopy can be recorded by the micrometeorological eddy-covariance method, whereas liquid water transport through the plant can be measured using sap flow measurement techniques. These two parameters are obviously related with each other, as they constitute successive steps of a hydraulic circuit, representing water transfer through a plant, which originates in the soil and ends up in the atmosphere in the form of water vapour.

During summer 2006, a measuring campaign has been conducted over a Holm Oak (*Quercus Ilex*) stand on the Castelporziano site (near Rome, Italy), where both micrometeorological techniques and plant sap flow monitoring was used. Micrometeorological measurements were made to determine vertical fluxes of sensible heat flux and water vapour above the stand. Stomatal conductances were derived from water vapour flux. Plant physiological observations mainly consisted of sap flow and leaf water potential measurements, made at different heights on three trees.

The relationships between water vapour flux and sap flow takes the form of a hysteresis cycle, as evaporation acts as a pumping agent. When stomata open up, evaporation increases, creating a pumping effect inside the plant. Thus, sap flow follows with some delay. So sap flow data should be used carefully in deriving stomatal conductance.