



Tree invasion effects on peat water storage capacity (La Guette peatland, France)

Stephane BINET (1,2), Emelie VIEL (1), Sebastien GOGO (1), Franck LE MOING (1), and Fatima Laggoun-Defarge (1)

(1) Université d'Orléans, CNRS/INSU, BRGM, ISTO UMR7327 ; 45071 Orléans, France, (2) Université de Toulouse, CNRS/INEE, INPT, UPS, EcoLab UMR5245, ENSAT, 31326 Castanet Tolosan, France.

In peatlands, carbon fluxes are mainly controlled by peat water saturation state, and this saturation state is an equilibrium between recharge/drainage fluxes and the peat storage capacity. The invasion of *Sphagnum* peatlands by vascular plants is a current problem in many peat-accumulating systems, raising the question of the relationships between vegetation changes and water storage capacity of peat horizons.

To investigate this question, the water storage capacity of the "La Guette" peatland (France), invaded by *Betula spp* was monitored at the watershed scale since 2008 using a water balance approach and was estimated during the 20th century using historical photographs showing the drainage network and the land cover change. During this period, the site clearly experienced a vegetation change as the site was treeless in 1944.

Two main results arise from this experimental device:

- (1) In this disturbed peatland, tree consumption amplifies the summer drought and the resulting water table draw-down allows an increase of air entrapment in the peat. Even if runoff flows occurred after this drought, the water storage capacity is affected, with about 30% of air that remains trapped in the peat porosity 6 months after the drought period. The effects of a single drought on peat water storage capacity are observed over more than a single hydrological cycle, suggesting a possible cumulative effect of droughts decreasing the peat water storage capacity.
- (2) Tree invasion is found to drive the drainage network morphology. Hydrological model calibrated for the study site suggested that the development of drainage network had reduced the water storage capacity of the peatland. These observations evidenced a positive feedback between vegetation dynamics and water storage capacity: tree invasion changes the drainage network geometry that decreases the peat water storage capacity, which in return may favor tree development.

These two results highlight that the peat water storage capacity is indirectly reduced by tree invasion.