



Fibre Optics Distributed Temperature Sensing for EcoHydrological Characterization of a Complex Terrain

Francesco Ciocca (1), Stefan Krause (2), Athena Chalari (1), and Michael Mondanos (1)

(1) Silixa Ltd., London, United Kingdom, (francesco.ciocca@silixa.com), (2) School of Geography, Earth and Environmental Sciences, University of Birmingham, Birmingham, United Kingdom, (s.krause@bham.ac.uk)

Being able to properly monitor the heat and water dynamics in the soil vadose zone is crucial to the ecohydrological characterization of any field site. Point sensors may provide accurate measurements of temperature and soil moisture but offering a spatial footprint limited to few centimeters, dramatically reducing the amount of information that can be obtained, in particular about the spatial variability and directions of the soil heat and water fluxes. Fibre Optics Distributed Temperature Sensing (FO-DTS) demonstrated to be a very promising, cost effective and non invasive technique for heat and moisture distributed monitoring from small (centimeters) to large (kilometers) spatial scales.

A permanent installation aiming at monitoring the long time and large space-scale soil moisture and temperature variations in the shallow soil is going to be realized in two areas presenting different vegetation (trees and low grass, respectively) and inclined transects in a forest close to the Birmingham area.

FO cable is going to be buried at different depths by mean of a plow and both active (monitor cooling rates of a heated cable) and passive (e.g. Fourier or Dynamic Harmonic Regression analysis to diurnal and seasonal temperature trends) FO-DTS techniques will be used to constantly monitor and quantify the soil water and heat traces.

The ability of FO-DTS to provide reliable information about moisture and heat dynamics in this complex environment affected by the variability of many natural factors (e.g. precipitation, presence or absence of deep vegetation, diurnal/seasonal atmospheric forcing, orography) will be exploited.

A detailed description of this complex and unique installation will be provided, along with a presentation of the preliminary results of the FO-DTS measurements. Particular emphasis to the comparison between both the initial state and the differences in diurnal moisture and temperature regimes between the two areas (due to the difference in vegetation) will be given.