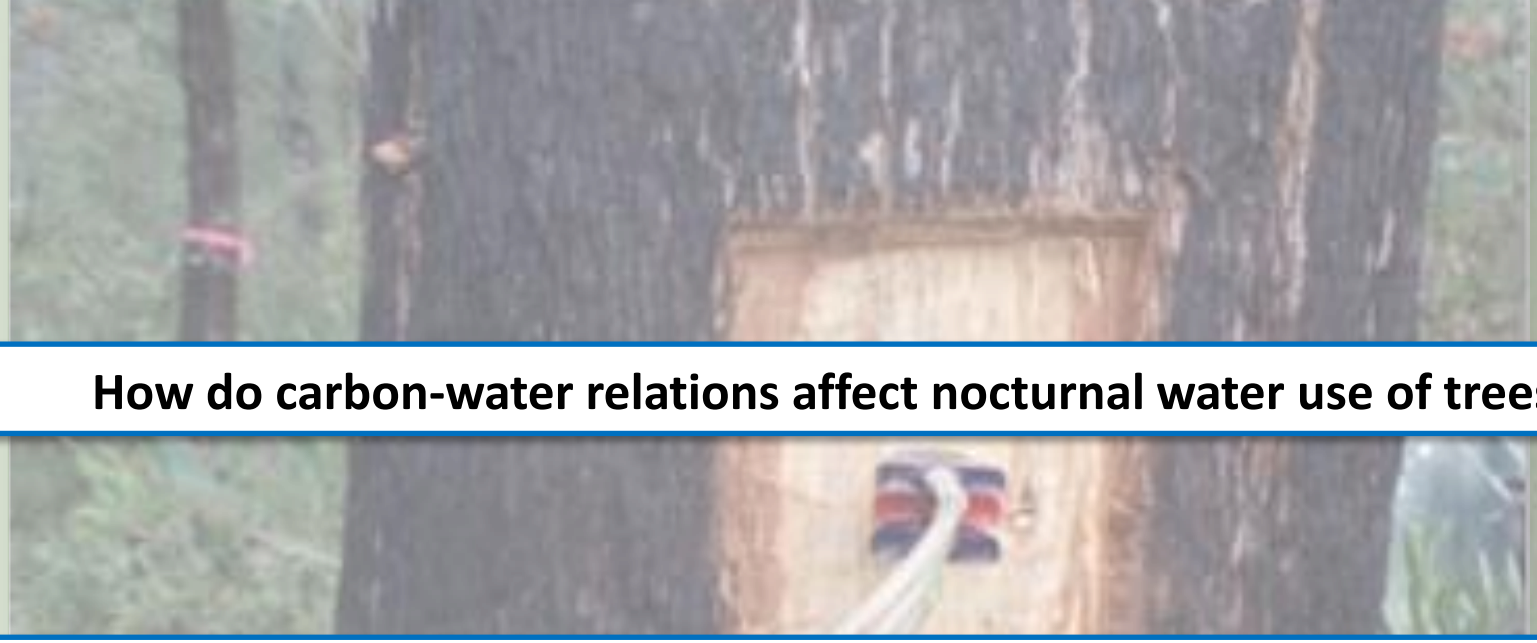
How does air pollution affect forest response to drought?

A large body of evidence suggests that increased air pollution can weaken forest resilience to a range of biotic and abiotic stresses. For example, long ozone exposure can disrupt stomatal closure which directly affects the capacity of trees to respond to increased air dryness and to avoid negative drought impacts. In this project we will use long-term air pollution and ecosystem water vapour and energy exchange measurements (collected with the eddy covariance method) to quantify ecosystem responses and identify mechanism that explain the interaction of air pollution with forest response to drought.

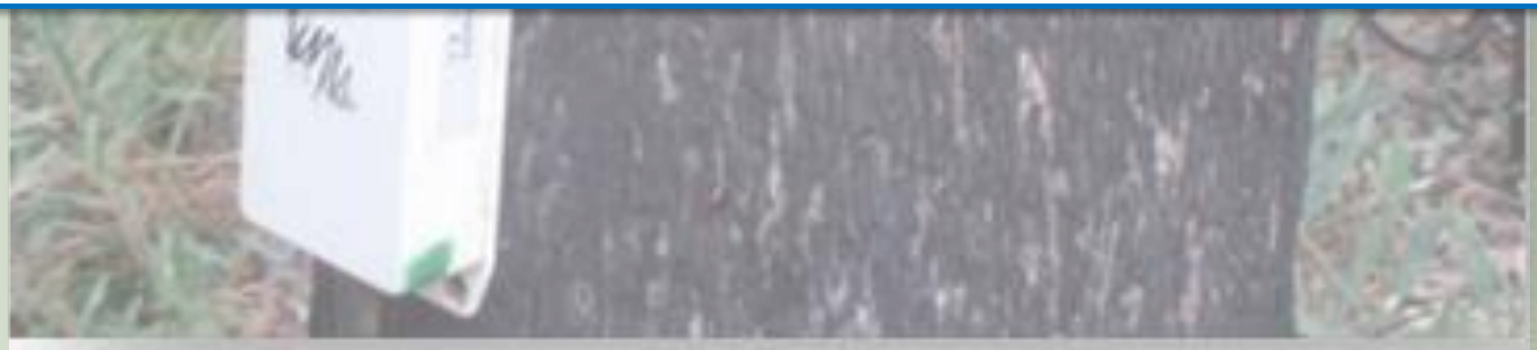
Keywords: O_3 uptake, evapotranspiration, forest micro-meteorology

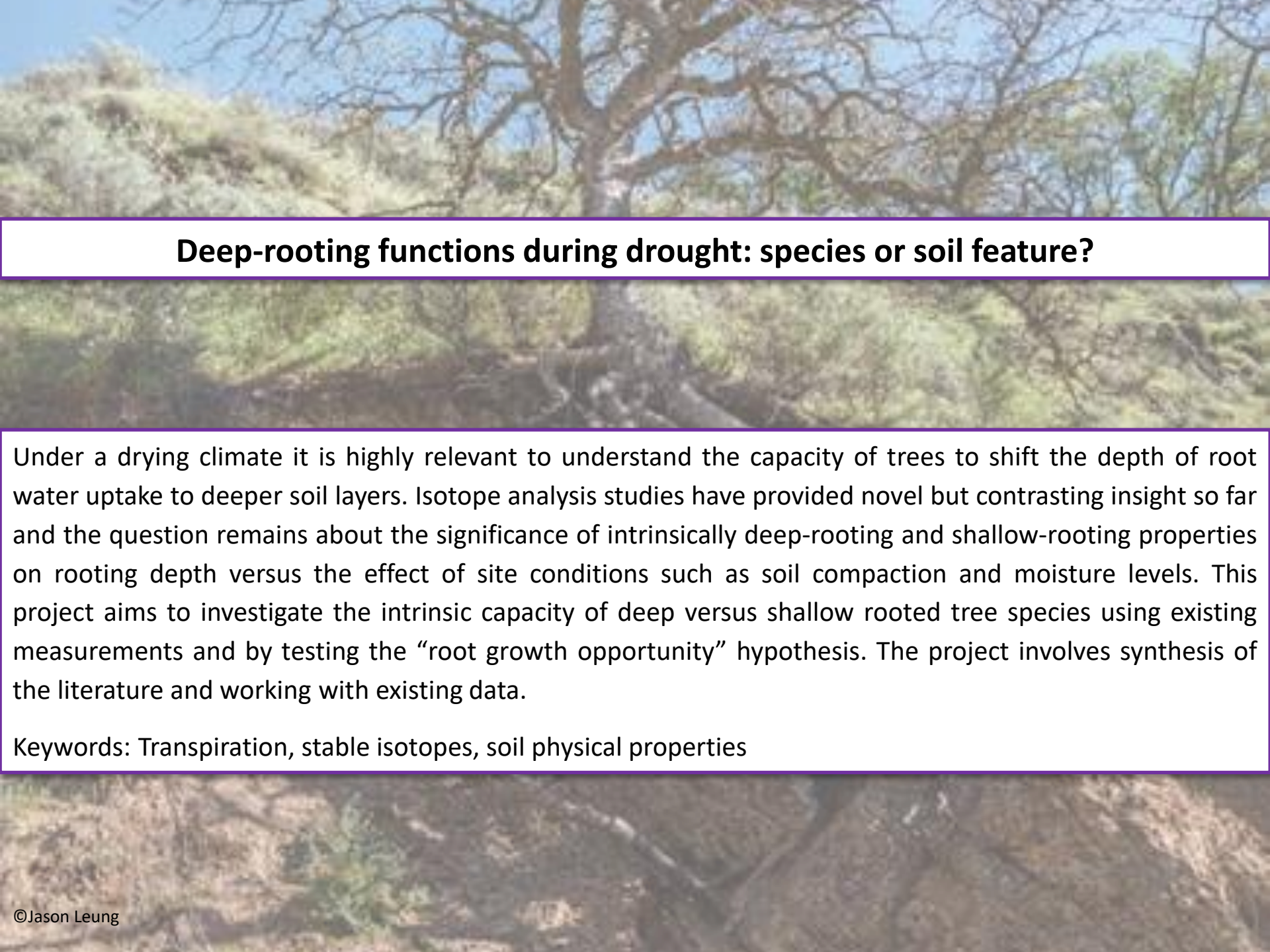


How do carbon-water relations affect nocturnal water use of trees?

About 30% of water used by trees during the day is lost to the atmosphere at night. This nocturnal water use (i.e., transpiration) depends on a variety of anatomical and physiological properties. Under a drying climate, it is important to have an understanding of the relevance and contribution of the underlying factors to potentially large quantities of water loss. This project investigates the link between carbon and water fluxes based on measurements collected by the scientific community at a number of sites within the SAPFLUXNET and FLUXNET networks.

Keywords: sapflow, forest micro-climate, photosynthesis, respiration





Deep-rooting functions during drought: species or soil feature?

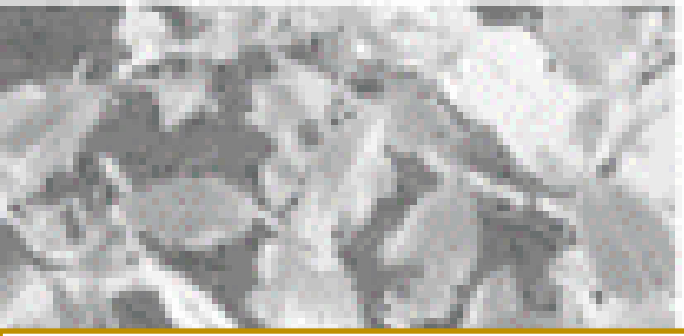
Under a drying climate it is highly relevant to understand the capacity of trees to shift the depth of root water uptake to deeper soil layers. Isotope analysis studies have provided novel but contrasting insight so far and the question remains about the significance of intrinsically deep-rooting and shallow-rooting properties on rooting depth versus the effect of site conditions such as soil compaction and moisture levels. This project aims to investigate the intrinsic capacity of deep versus shallow rooted tree species using existing measurements and by testing the “root growth opportunity” hypothesis. The project involves synthesis of the literature and working with existing data.

Keywords: Transpiration, stable isotopes, soil physical properties

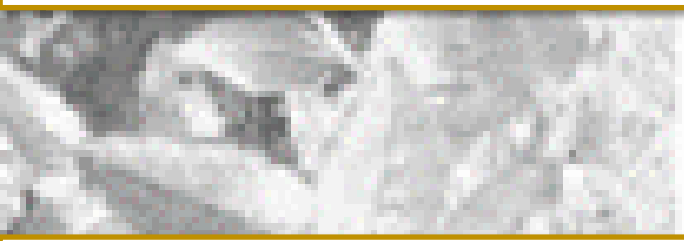
How will peatland fine-root growth change with climate?

Peatlands store about two third of global soil carbon. Below-ground response of peatlands to changes in temperature and moisture is largely unknown despite having an important effect on the greenhouse gas exchange with the atmosphere. The general assumption is that peatland warming increases fine root growth which will directly affect the carbon and nutrient cycling of the ecosystem. This project will investigate peatland root ingrowth measurements using meshed cores installed along a temperature and moisture gradient. Local edaphic and climate conditions combined with the ecological measurements will be used to explain below-ground physiological processes relevant to gas exchange. The project involves data analysis as well as field and lab work.

Keywords: below-ground carbon balance, soil nutrient, soil microclimate, plant growth




Can we measure vegetation biomass from digital images?




Estimation of ground vegetation biomass is relevant for understanding and measurement of ecosystem carbon balance. Harvesting for biomass measurements is time-consuming and destructive. Alternatively visual assessments of ground cover have been used to estimate biomass from cover. These methods however are subjective and prone to large errors. The objective of this project is to develop a model to estimate ground biomass from cover, rapidly and non-destructively, in different ecosystems using digital nadir photography. The project involves data analysis as well as field and lab work.

Keywords: Forest inventory, ground cover, carbon balance