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Keeping an eye on the carbon balance: linking canopy development and net ecosystem exchange using an international webcam network.

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Phenological events such as the spring leaf-out and the autumn fall exert a strong control on both spatial and temporal patterns of the carbon and water cycle. As these life cycle events are strongly influenced by changes in weather patterns from year to year, phenology is deemed a robust integrator of the effects of climate change on natural systems. It is now recognised that improved monitoring of phenology on local-to-continental scales is needed. At FLUXNET sites around the world overlooking forests, pastures, and wetlands, we have identified an opportunity to establish precision measurements of phenological events by simply mounting networked digital cameras ('webcams') and recording daily (or even hourly) images of the vegetation canopy. A recent FLUXNET survey has identified at least 28 such phenocams already 'keeping an eye' on canopy development whilst simultaneously monitoring carbon and water exchange between the forest and the atmosphere. Although this network is in its infancy, it appears to be growing steadily, and already represents some 58 site-years of combined flux and webcam data (Wingate et al., 2008). Here we present the efforts of this growing, international phenocam network and illustrate with examples taken from the network some of the key uncertainties that can now be tackled using this multi-technique approach. The opportunity presented to us is clear: webcam measurements at FLUXNET sites will reveal the link between phenology and carbon uptake and provide much-needed ground verification of phenology products derived from satellite remote sensing (e.g., MODIS). This multi-scale monitoring of phenology and net ecosystem exchange of CO_2 will enrich our understanding and efforts at modelling not only the impacts of climate on phenology but also the impact of phenology on climate through feedbacks on the carbon and energy cycle of the planet.

References-

Wingate, L., Richardson, A., Weltzin, J.F., Nasahara, K.N. Grace, J. (2008). Keeping an eye on the carbon balance: linking canopy development and net ecosystem exchange using a webcam. Fluxletter, Vol 1, No. 2, 14-17.