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Spanning Scale and Platform to Track Spring and Autumn Phenology

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Important opportunities to further understanding of ecosystem processes can be realized through improved integration and utilization of multiple phenological measures. Combining satellite-derived remote sensing data, which facilitate needed spatial integration and large area coverage with detailed conventional (visual) ground observations, which provide necessary information on species timing differences, is an important path for advancement in this area. A relatively new resource to address this scaling issue is near-surface remote sensing data collected from fixed position cameras. This paper presents on-going findings from a multi-year comparison of the spring and autumn seasonal transitions in Downer Woods, a small urban woodlot on the University of Wisconsin-Milwaukee campus (43.08°N, 87.88°W) dominated by white ash (Fraxinus americana) and basswood (Tilia americana) trees. The study area is under observation from a visible/near-infrared camera installed in March 2013 that is part of the Phenocam network (http://phenocam.sr.unh.edu), and also has detailed ground-based species-specific visual phenological observations collected in both spring and autumn, as well as air/soil temperatures and light sensor data measured under the canopy. The results show that at this location, the Phenocam visible/near-infrared band data series can be successfully compared to aggregated species visual phenological observations. Further, both of these changes can be in turn simulated by process models based on seasonal temperature changes. Thus, the concurrent collection of these data suggest a coherent process whereby more robust ground-based species-aggregated "pixel" data can be produced which will be scalable to large areas, and potentially be applicable to more complex environments and ecosystems. Such an approach could potentially improve phenology-based spatial estimates of carbon and energy flux.