Toward a comprehensive landscape vegetation monitoring framework

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Blossoming Earth observation resources provide great opportunity to better understand land vegetation dynamics, but also require new techniques and frameworks to exploit their potential. Here, I describe several parallel projects that leverage time-series Landsat imagery to describe vegetation dynamics at regional and continental scales. At the core of these projects are the LandTrendr algorithms, which distill time-series earth observation data into periods of consistent long or short-duration dynamics. In one approach, we built an integrated, empirical framework to blend these algorithmically-processed time-series data with field data and lidar data to ascribe yearly change in forest biomass across the US states of Washington, Oregon, and California. In a separate project, we expanded from forest-only monitoring to full landscape land cover monitoring over the same regional scale, including both categorical class labels and continuous-field estimates. In these and other projects, we apply machine-learning approaches to ascribe all changes in vegetation to driving processes such as harvest, fire, urbanization, etc., allowing full description of both disturbance and recovery processes and drivers. Finally, we are moving toward extension of these same techniques to continental and eventually global scales using Google Earth Engine. Taken together, these approaches provide one framework for describing and understanding processes of change in vegetation communities at broad scales.