Remote sensing of reflectance properties related to ecological shifts post-fire in southern Siberia

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Rapid ecological shifts such as the replacement of forest ecosystems by grasslands can be detected using remotely sensed reflectance data. In addition to detecting forest losses, a longer time series of reflectance data can provide information about the persistence of these shifts, or alternatively about ecosystem recovery. In addition to changes in the amount of reflected energy, ecological shifts can be detected from the timing of phenological events that may change as the result of the replacement of one plant functional type with another. Our ability to detect forest recovery from disturbance depends on the length of the remotely sensed data record in relation to the recovery signal. Monitoring ecosystem recovery often relies on some proxy for a fully recovered ecosystem, usually the signal from the period prior to disturbance or from an adjacent, undisturbed area. The requirement of a pre-disturbance signal means an even longer time series of data are needed, and finding nearby undisturbed areas for comparison can be unreliable and time-consuming. The pattern of reflectance time series data is also likely vary depending on the spatial and temporal resolution of the data used to analyse them. In the southern boreal forests of Siberia, recovery of reflectance properties post-disturbance may take several decades or more, or it may appear suddenly after a prolonged period without a discernible trend. We analyse several areas of known forest loss post-fire as well as some normally recovering sites to determine typical trajectories of recovery in reflectance properties from several remotely sensed datasets.

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