

## **It's Complicated: Representing the relationships between field collected carbon exchanges and surface reflectance using geospatial and satellite-based techniques**

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Carbon exchanges between the atmosphere and the land surface vary in space and time, and are highly dependent on land cover type. It is important to quantify these exchanges to understand how landscapes affect the carbon budget, which will have a significant impact on future climate change and will inform climate change projections. However, how do you represent regional carbon exchanges from a single meteorological station? A single observing station will represent a limited area around the station, but each individual observation will sample a different physical land area in time due to varying wind speeds, wind direction, and atmospheric stability. The methods and techniques presented address the challenges, limitations, and future work that is needed to properly scale and model carbon exchanges in four dimensions for varying agricultural and transitioning ecotones. Seasonal variability of carbon exchanges can be modeled in agricultural land covers using satellite-based techniques, but due to physiological differences in crop types the values must be modeled by crop species. The spatially varying atmospheric conditions must also be considered when modeling carbon exchanges from a single point in the spatial realm because of the dependency of carbon exchange on temperature and humidity conditions. In summary, field-based carbon exchange observations are used to quantify whether a specific land cover in a region is a carbon source to carbon sink to the atmosphere, however, it is important to consider the spatially varying variables that limit the ability of a single point measurement to represent carbon exchanges of an entire region.