

Development of land surface phenology monitoring using time series of remote sensing data

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Phenology is the chronology of periodic phases of development of living species. Changes in plant phenology are considered to be a sensitive indicator of plant responses to climate change. Traditional ground phenology observation across large area is expensive and time-consuming. Remote sensing data has the advantage of large spatial coverage and good temporal repeatability. Since the 1980s, time series of remote sensing data have been applied to monitor land surface phenology. In the last two decades, with the increase of consistent remote sensing dataset, more and more remote sensing data are used in land surface phenology metrics extraction and trend analysis at continental and global scale.

This paper gives a review about the recent development in a) theoretical basis, b) data, c) methodologies, and d) applications of land surface phenology monitoring using remote sensing data. Optical and microwave remote sensing data, especially retrieved biophysical and biochemical parameters, can reflect vegetation conditions. Time series of these data can capture the temporal variation of land surface. To monitor the land surface dynamics from these data, various techniques for time-series analysis such as threshold definition, curve fitting, and harmonic analysis, are developed. Phenology information extracted can be used in several aspects including climate change research, land cover and use classification, crop management and ecological environment assessment. Finally, prospective development in this field is introduced.