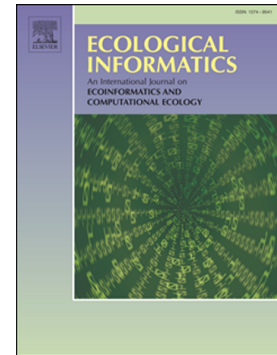


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CropPhenology: An R package for extracting crop phenology from time series remotely sensed vegetation index imagery

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Abstract: Remotely sensed vegetation indices to measure crop growth through phenological metrics have a high potential for use in agricultural management. However, implementing the analytical routines from remote sensing data acquisition to relating vegetation index information to *in-situ* plant development and management is complex to even the most experienced user. We present the CropPhenology package, a free, easy to use package designed in the R environment that enables flexibility and interoperability that allows users to progress from downloading remote sensing images to crop phenology analysis and visualisation with only minor processing steps. Furthermore, this environment allowing users to easily incorporate other R packages to form a seamless chain of functions to undertake more complex pre or post image processing and analysis. The package computes 15 phenological metrics based on satellite-based NDVI measurements over the season which can be easily visualised and used for successive spatio-temporal analysis. The metrics are theoretically related to Zadoks growth stages which explicitly characterise cereal crop growth conditions, including new leaf emergence, flowering, ripening, and yield. These metrics provide a systematic understanding of characterisation of the plant-soil-climate interactions. We present examples that illustrate the utility of our package in a Southern Australian broad-acre, rain-fed cereal cropping region.

Keywords: Phenological metrics; R package; MODIS; cereals; Remote sensing; Zadoks growth stage; spatio-temporal analysis; agriculture

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