

Title: Dataset associated with "Temporal Variations of NDVI and LAI and Interactions with Hydroclimatic Variables in a Large and Agro-Ecologically Diverse Region"

Abstract: Satellite based vegetation indices are increasingly used to characterize seasonal and interannual variations in vegetation as well as vegetation's response to hydroclimatic variability. However, differences in the behavior of vegetation indices are not well understood over large spatial extents (e.g., 0.5° or larger). We hypothesize that normalized difference vegetation index (NDVI) and leaf area index (LAI) can exhibit different behaviors due to different relationships with hydroclimatic variables. To test this hypothesis, observations of monthly precipitation, discharge, temperature, vapor pressure deficit, evapotranspiration, and total water storage anomalies (TWSA) are processed for the combined Sacramento and San Joaquin river basins in California for 13 water years (October 2002-September 2015). Estimates of NDVI and LAI are obtained for the same period from MODerate resolution Imaging Spectroradiometer (MODIS). The seasonal cycle of NDVI peaks 2-3 months earlier than LAI. The seasonal variation in NDVI follows the seasonality of TWSA (i.e. water availability) whereas the seasonal cycle of LAI follows the seasonality in mean temperature and vapor pressure deficit (i.e. atmospheric water demand). Cross-correlation analyses of NDVI and LAI with the hydroclimatic variables show that LAI is more strongly correlated with most of the hydroclimatic variables considered.

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Format of data files – .csv

Location where data were collected – Sacramento and San Joaquin river basins, California

Time period during which data were collected - 2002-10-2015-09

File Information

Dataset-1.csv: Regional averages of monthly hydroclimatic and vegetation anomalies

Dataset-2.csv: Mean and standard deviations of monthly hydroclimatic and vegetation anomalies

Dataset-3.csv: Prewhitened time series of monthly hydroclimatic and vegetation anomalies

Dataset-4.csv: Prewhitened-detrended time series monthly hydroclimatic and vegetation anomalies

Dataset-5.csv: Annual time series of regional hydroclimatic and vegetation anomalies

Variable information

Dataset-1.csv, Dataset-2.csv, Dataset-3.csv, and Dataset-4.csv:

- Month (YYYYMM where YYYY is year and MM is month)
- Monthly Precipitation (mm/month)
- Mean Monthly Temperature (°C)
- Mean Vapor Pressure Deficit (hPa)
- Monthly Evapotranspiration (mm/month)
- TWSA (mm) (total water storage anomalies obtained from University of Colorado, Boulder GRACE data portal)

- $d(TWSA)/dt$ (mm/month)
- Monthly NDVI (monthly normalized difference vegetation index from MODIS)
- $d(LAI)/dt$
- Monthly LAI (m^2/m^2) (monthly leaf area index from MODIS)

Dataset-1.csv and Dataset-2.csv:

- Discharge (mm/month)

Dataset-5.csv:

- Water Year (Water year starts in preceding October and ends in September e.g. Water year 2003 starts in October 2002 and ends in September 2003).
- Annual Precipitation (mm/year)
- Annual Discharge (mm/year)
- Annual Mean Temperature ($^{\circ}C$)
- Annual Mean Vapor Pressure Deficit (hPa)
- Annual Evapotranspiration (mm/year)
- Annual TWSA (mm)
- $d(TWSA)/dt$ (mm/year)
- Annual NDVI
- Annual $d(LAI)/dt$
- Annual LAI (m^2/m^2)

Data sources

Precipitation and mean temperature data obtained from the Oregon State University PRISM Website: PRISM Climate Group, Oregon State University, <http://prism.oregonstate.edu>, created September 2018.

Vapor pressure deficit data obtained from the Oregon State University PRISM Website: PRISM Climate Group, Oregon State University, <http://prism.oregonstate.edu>, created June 2021.

Discharge data obtained from United States Geological Survey Website:

U.S. Geological Survey, 2016, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [June 06, 2021], at URL <http://waterdata.usgs.gov/nwis/>. DOI: <http://dx.doi.org/10.5066/F7P55KJN>

Evapotranspiration data obtained from:

Ma, N., & Szilagyi, J. (2019). The CR of evaporation: A calibration-free diagnostic and benchmarking tool for large-scale terrestrial evapotranspiration modeling. *Water Resources Research*, 55(8), 7246-7274. <https://doi.org/10.1029/2019WR024867>

TWSA data obtained from the University of Colorado GRACE Data Analysis Website - <http://geoid.colorado.edu/grace/>

The NDVI and LAI data were obtained from the online Data Pool Terra MODIS product, courtesy of the NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota, <https://lpdaac.usgs.gov/tools/data-pool/>