VIP DATA EXPLORER: 30 Years of Vegetation Index and Phenology Observations

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Introduction

Continuous acquisition of satellite imagery over the years has contributed to the creation of global long term data records from AVHRR, MODIS, TM, SPOT-VGT and other sensors. These records account for 30+ years, as these archives grow they become invaluable tools for environmental, resources management, and climate studies dealing with trends and changes from local, regional to global scale. However, the disparity of these data records makes very challenging taking full advantage of their temporal and spatial coverage.

With Making Earth Science Data Records for Use in Research Environments (MEaSUREs) program NASA is aiming to support the creation of long term, reliable, and well characterized Earth Science Data Records (ESDR) in support of the Earth Science research community.
The Vegetation Index and Phenology Lab. (vip.arizona.edu) at the University of Arizona, in collaboration with the scientists at the University of Hawaii, Boston University, Earth Recourse Technology Inc., and the LP-DAAC is processing 30 years of daily global surface reflectance data into Vegetation Index and Land Surface Phenology Earth Science Data Records. Data from AVHRR (N07, N09, N11 and N14) and MODIS (AQUA and TERRA) for the periods 1981-1999 and 2000+, at CMG resolution were processed into a seamless and sensor independent data record using a suite of algorithms and methodologies for filtering, across-sensor continuity, and spatial and temporal gap filling. The first provisional version (V1.0) of this data record is now available for evaluation and download via our VIP DataExplorer and the LP-DAAC.

Objectives

The objectives of this project are:

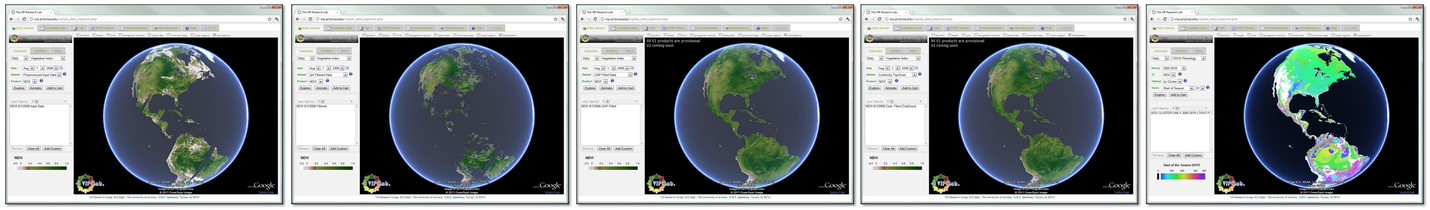
•To create a well characterized sensor independent and seamless VI and Phenoloy ESDRs from 30 years of disparate satellite observations in support of accurate change and climate studies.

•To design an interactive online tool (VIP DataExplorer) for exploring, assessing, and pre-analyzing these ESDRs (this poster).

The VIP Data Explorer

An interactive online tool (VIP Data Explorer) was developed to support the visualization, qualitative and quantitative exploration, distribution, and documentation of these records using a simple web 2.0 interface and the Google Earth (GE) API. The VIP Data explorer (http://vip.arizona.edu/viplab_data_explorer) can display any combination of the multi-temporal and multi-sensor data, enable the quick exploration and cross comparison of their various levels of processing. The VIP Data Explorer enables:

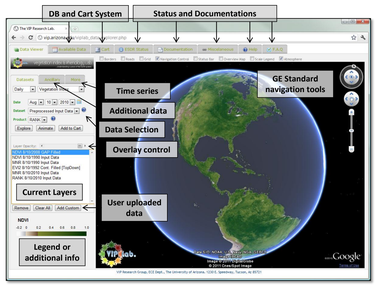
- Visual exploration of this 30-year VI and Phenology data records
- Online time series analysis of any land pixel
- To search, order, reformat, subset, and acquire these data
- Visually compare the VIP data with user uploaded data/images
- Access to all the project documentation



a) Preprocessed Input Data b) QA Filtered Data c) GAP Filled & Continuity Data d) NDVI/EVI2 ESDRs e) Phenology ESDRs

The full 30-year data processing flow could be visually explored, any data ordered and downloaded, from within the DataExplorer.

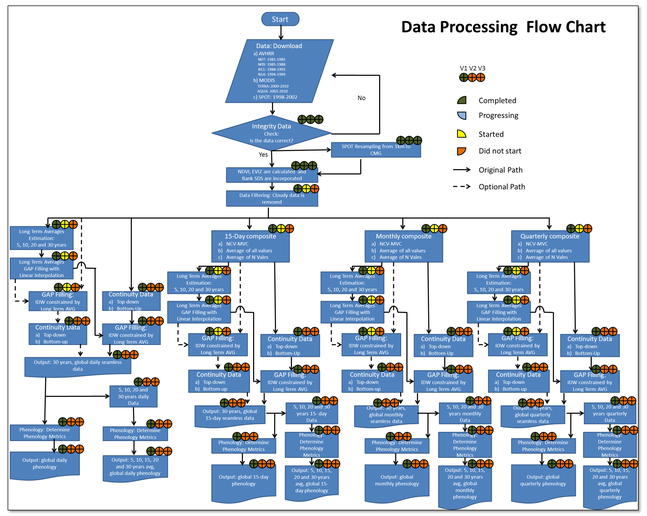
User Interface



A simple and intuitive interface that enables the selection, display, and interaction with all VIP data.

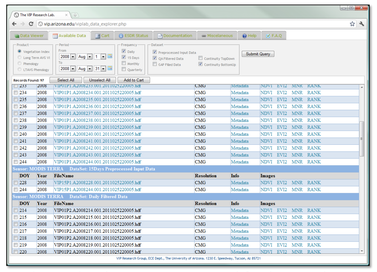
Data selection options and controls

Processing Flowchart

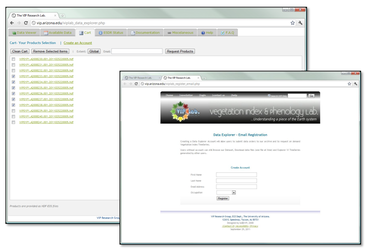


Data processing flowchart showing all possible processing combinations. In V2.0 (in progress) some of these processing options will be eliminated

Database Search

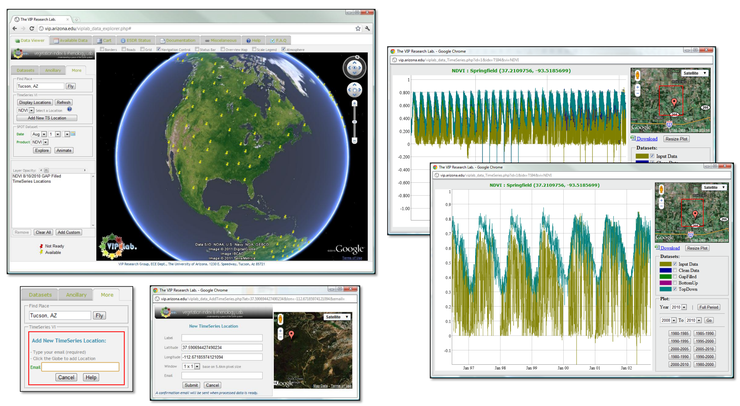


A direct database querying tool facilitates the search and order of data, metadata, along with images. Selected data are added to the cart for ordering/download.



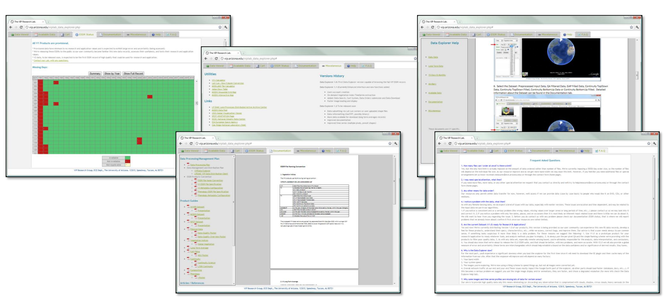
The cart order system helps manage data orders and communicates with registered users. Certain parts of the system are only open to registered users.

Vegetation Index Time Series



Vegetation Index Time Series created by other users and the VIP Lab. are available for browsing. A user can request his/her location specific time series and the system will notify him/her when the time series is ready. Time series results are displayed in an interactive window, where users can explore the detail of the 30-year time series and download the corresponding data. Only registered users with a validated email can use this tool.

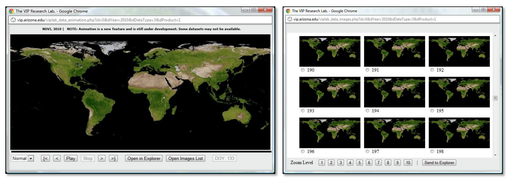
Project and ESDR Documentations



Within the VIP Data Explorer user can consult the various project documents that describe the algorithms, data sets, tools, and project status. These are live documents that are expected to change often.

Faster Data Browsing and Animation

Displaying datasets in the Google Earth Globe has several and appealing advantages (ex: data stacking, interactive zooming, comparative visual inspection, etc…), however, images need to be added one at a time, making multi-temporal visualization time consuming. To overcome this drawback we're providing direct access to all the images (b) in our database with annual animation (a) in a non GE environment.



a) Animation b) Image Quick view

Additional Functionality

We're still adding functionality to the Data Explorer and the new version (end of 2011) will provide:

- Time series of predefined multiple pixels and shape areas (via user uploaded KML, KMZ, or ESRI shapefiles)
- Interactive comparison of the VIP data record with user uploaded data/images
- Data reformatting
- Integration with our iPhen app and database (Crowdsourcing iPhone app for phenology and land surface vegetation documentation).

Conclusions

With the Data Explorer tool the Vegetation Index and Phenology ESDRs can be quickly animated and visually explored for trends and anomalies. The 30+ years temporal profile of any land pixel can be extracted and explored in an interactive window. Any desired data can be ordered via the dynamic 'cart' and downloaded later. More functionalities are planned and will be added to this data explorer tool as the project progresses.

vip.arizona.edu/viplab_data_explorer.php

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