"NDVI; The Movie"

Dynamically Characterizing a Variety of Phenological Responses of Semi-Arid Areas to Hydrological Inputs using Multi-Year AVHRR NDVI Time Series

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Location of the Study Area
Note the trend for elevation to increase to SE.
Topography of the Study Area.
Compare elevation (250 m DEM) and vegetation (AVHRR NDVI).

Elevation (200 m contour interval)  

The NDVI parameter is the upper quartile of all 7 yrs data at each site.  
(Large red squares are subareas; small red polygons are farms.)
Compare vegetation (AVHRR NDVI) w/ Homer's ('97) landcover classes.

NDVI (Q75 for 1995 - 2002)  
Homer's (1997) Landcover Classes
Bradley et al.s. (2006) landcover classes using this algorithm

NDVI (Q75 for 1995 - 2002)
An objective of this study is to more closely identify particular fluctuations in the spatial and temporal patterns of NDVI with other environmental variables. Here, we explore hydrologic inputs.

Short-term, multi-year hydrologic indicators for the region: the mean monthly precipitation at 6 stations, and stream runoff in the Humboldt River.
Landsat scene.
Landsat scene.

Thematic Mapper;
Path 42 Row 32

(Post "Dry"
Season)
The Algorithm.
(Reported previously at this meeting.)

Location map for our study area in west central Nevada, along with the names of adjacent states. Also indicated is the boundary of the Great Basin.

The interannual spline algorithm uses:

*Model roughness damping;*
*Upper data envelope tracking.*
Examples of data classes.

Original NDVI time series from 3 classes of vegetation types. Panel A: Stable agriculture. Panel B: Montane shrubland. Panel C: Invasive grasses (cheatgrass). The vertical gray band at approx. 1999.4 yr (actually from the 1 week data composite centered at 1999.414) denotes an inferred data gap associated with what is observed as a ubiquitous anomalously high NDVI data value for this interval throughout our Basin and Range data base.
Each step in the procedure applied to the Cheatgrass time series. Panel A; Step 1: The simple annual harmonic starting model. Panel B; Step 2: The roughness damped, average annual harmonic model weighted to track the upper data envelope. Panel C; Step 3: A preliminary 8-th order inter-annual spline model with weak upper-envelope weighting. Panel D; Step 4: A 14-th order inter-annual spine model with stronger upper-data envelope weighting.
Average annual variation models for the three classes of vegetation types. All models were computed using the same control parameters (weighting coefficients, roughness damping, etc.).
Inter-annual fit to 3 data classes.

Inter-annual (spline) variation models for the three classes of vegetation types. All models were computed using the same control parameters (weighting coefficients, roughness damping, etc.).
Comparing the inter-annual spline model in this report (Panel A) with the average annual model (Panel B) of Hermance (2006) for the same time series from a single 1 x 1 km montane shrubland site. The substantial data gap (from 1994.72 to 1995.05) is due to sensor failure on board NOAA-11. Panel A: The inter-annual model uses 14th order annual splines. Panel B: The average annual model uses a 10th order non-classical harmonic series superposed on a 0th order polynomial (mean value). (Note the flags (a), (b) and (c) denote noteworthy tracking attributes.)
The NDVI animations will begin with the entire study area.
NDVI: Entire Study Area
(1995-2002 Interannual variations.)

Note: Agricultural areas.
Montane snow cover.
Anomalous greenup in valleys.

Run animation.
NDVI from the Dixie Valley / Edwards Creek Valley Subarea.
NDVI: Dixie and Edwards Creek Valleys
(1995-2002 Interannual variations.)

Note: Impulsive greenup of Cheatgrass in NE Edwards Crk Valley in 1998.
Behavior of montane snow cover.
Concatenation of NDVI w agricultural areas.

Run animation.
NDVI from the Buena Vista Valley Subarea.
Run animation.

NDVI: Buena Vista Valley
(1995-2002 Interannual variations.)

Note: Impulsive greenup of Cheatgrass in SW sector of valley in 1998.
Behavior of montane snow cover.
Concatenation of NDVI w agricultural areas.
NDVI from Desatoya Mountains Subarea.
NDVI: Desatoya Mountains
(1995-2002 Interannual variations.)

Note: Asymmetric spatial and temporal development of montane snow cover and greenup.

Run animation.
Background

This poster is one of several, related presentations made at this meeting. For more details on the application of this and other methods to classification and monitoring land cover change in the western U.S. (and relations to climate change) see


The Landsat-based landcover classification is from Homer (1997). Citation Information:
Collin G. Homer, Dept. of Geography and Earth Resources, Utah State University Logan, Utah 84322
Publication_Date: 1997
Title: Nevada Landcover Classification
Online_Linkage: <http://earth.gis.usu.edu/>

For reports on our latest work:

For copies of reports on the algorithm:
http://www.geo.brown.edu/research/Hydrology/NDVI_reports/