Visualizing Terrestrial and Aquatic Systems in 3D

Stills, Fly-throughs and Animations of Complex Topography

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About VISTAS

Grand challenge environmental science problems involve large data sets spanning multiple spatial and temporal scales, with complex, highly distributed, heterogeneous data. Visualizing natural phenomena helps scientists formulate new insights, tune models, and communicate results, but ecologists rarely use sophisticated visualization tools. We ask why not.

The **VISualization of Terrestrial and Aquatic Systems** (VISTAS) project, an NSF-funded collaboration among ecologists, computer scientists, and social scientists aims is to help scientists better understand and communicate grand challenge environmental science through visual analytics, in particular 3D interactive topographic images.

ASK TO SEE ANIMATIONS AND LIVE DEMO'S!

Current Status

VISTAS focuses on 3D topographical visualizations over time and perspective. To date, we superimpose measured or modeled variables on digital elevation models and allow collaborators to view and interact with single frames, animations, or multiple images. This poster presents visualizations of scientific teams whose data (at different scales) might be enhanced with visualizations of each other's data on the same canvas for cross-scale visualizations. Each image elucidates one or more concepts that might be better conveyed using VISTAS than with prior tools: 3D terrain, enhanced topography, interactive perspective browsing and manipulation, animation over time, side-by-side viewing of data at different points in time or different attributes.

VISTAS is implemented in C++ and OpenGL, with modular, scalable design, and is freely available (source and executables) from http://blogs.evergreen.edu/vistas.

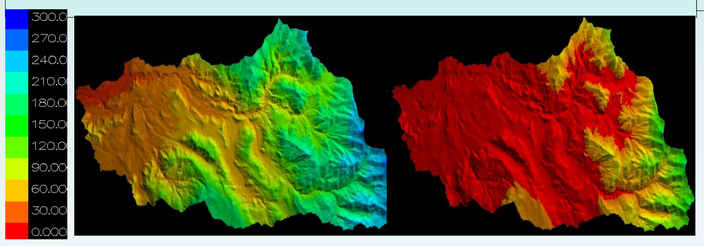
The Future – Visual Analytics

VISTAS collaborators report that *some* data are more effective when superimposed on 3D topography than when seen as 2D maps, and leads to new ways of thinking about how ecosystems respond to stress.

Social scientists are asking which visualizations work, for which purposes, for which audiences. We just received new NSF funding to explore using visualizations to bring communities together with scientists to co-develop climate change adaptation strategies.

Models and remote sensing both produce data streams too large even to view on one screen. We are exploring machine learning techniques to help our collaborators categorize data and zoom in on critical changes in landscapes. Statistical charts, coordinated in time and space with the scientific visualizations, are also next steps for VISTAS.

Hydro-Biogeochemical Processes
VELMA



Mashel Watershed **Snow Depth (SWE)**

Feb 4 & 9, 1996

Begin & After Rain-on-Snow Event

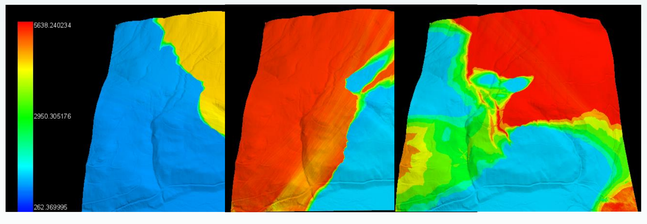
VISTAS 3D stills help Bob McKane (EPA Corvallis) illustrate snow melt (above) and consequent effects on stream hydrology & habitat conditions. These and other visualizations are facilitating science-based decision support for Salmon Recovery Planning by Puget Sound tribes & communities.

Modeling Irradiance
Penumbra

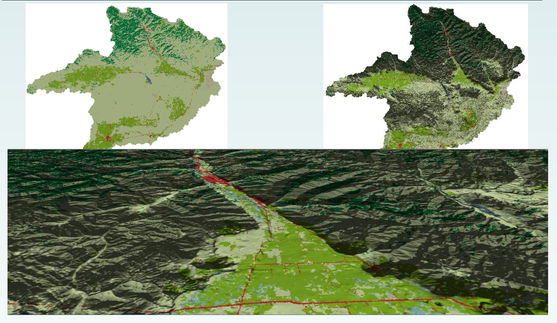
Following the Sun at **Mt. Gardner, WA**

July 6, 2013

3D VISTAS animation helps Jonathan Halama (OSU Ph.D. Candidate) fine-tune & validate his Irradiance model & then create images to illustrate changes in light at ground level as shaded by vegetation at this Snotel Site. Other applications will help visualize effects on snow melt, stream temperature and plant growth.



Alternative Land Use
ENVISION



Vegetative Cover & Land Use

Big Wood Basin, Idaho

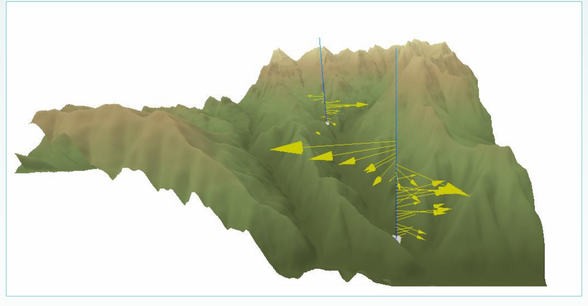
Ecologist Allison Inouye used VISTAS to show land use futures near Sun Valley.
Above (left) 2D image vs. (right) 3D image.
Below: Still from VISTAS fly-through.

Airflows in Mountain Valleys
Micrometeorology

Wind Direction and Speed

HJ Andrews LTER

A WebGL VISTAS prototype helps explain how wind speed and direction vary over complex topographical landscapes, and how flow patterns affect atmospheric transport of nutrients and pollutants.



VISTAS' focus is data from HJ Andrews Long Term Ecological Research (LTER) Site in the Cascade Mountains, Oregon, USA.

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For more information visit http://blogs.evergreen.edu/vistas
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