Visualizing Terrestrial and Aquatic Systems in 3D

http://blogs.evergreen.edu/vistas

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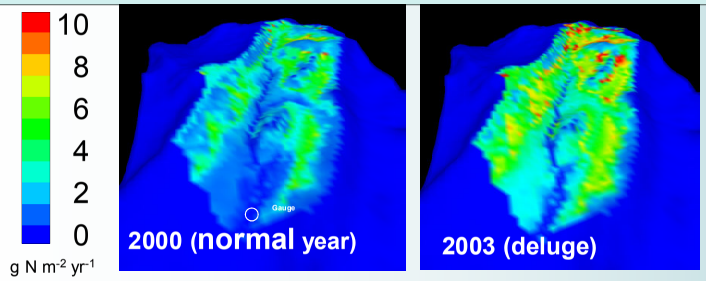
Hydrological-Biogeochemical Processes



Simulated Denitrification in a Chesapeake Bay Catchment

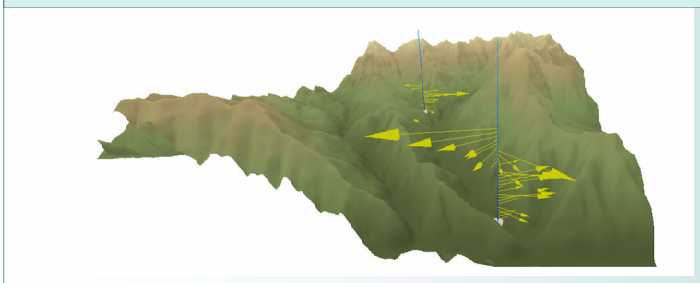
VISTAS animation of VELMA model output helps illustrate how green infrastructure protects water quality from non-point sources of agricultural nitrate pollution. Note how extreme climatic events, such as record high precipitation, affect denitritrication (conversion of nitrate to nitrogen gas).

Current Status - Animations

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 three 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.

Airflows in Mountain Valleys
Micrometeorology



Heat, Humidity, & CO2 Distribution, HJ Andrews LTER

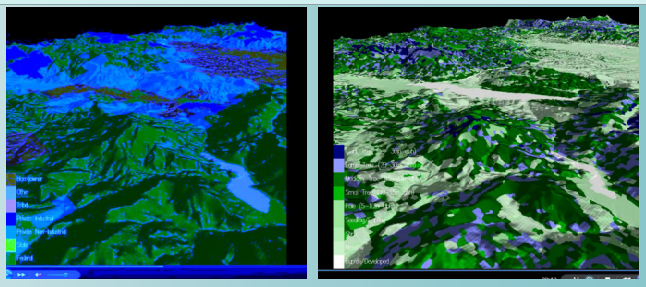
A WebGL VISTAS prototype helps explain how wind speed and direction vary over complex topographical landscapes, and how flow patterns affect atmospheric transport of nutrients and pollutants.

VISTAS …

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 interfactive topographic images.

Alternative Land Use Scenarios



ENVISIONVegetative Cover and Land Use, Central Oregon

VISTAS fly-through animations help scientists and decision makers determine how biophysical systems, management actions, and socio-economic influences interact to affect sustainabillty in fire-prone landscapes under climate change.

The Future – Visual Analytics

VISTAS collaborators report that *some* data previously visualized with fixed-format 2D images are more effective when superimposed on 3D topography. They believe this is leading to new ways of thinking about how ecosystems respond to stress. Social scientists are currently evaluating both the VISTAS visualizations (asking which visualizations work, for which purposes, for which audiences), as well as observing the development process. We aim to produce frameworks specialized for these visualizations for evaluation and development of visualizations and visualization software.

Statistical charts and other visual analytics, and metadata, both coordinated in time and space with the scientific visualizations, are the next steps for VISTAS. We also intend to test VISTAS with other collaborators, and to scale images across spatial and temporal scales.

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For more information visit
http://blogs.evergreen.edu/vistas
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(left) VISTAS' focus is data from HJ Andrews Long Term Ecological Research (LTER) Site in the Cascade Mountains, Oregon, USA.

NSF HJA