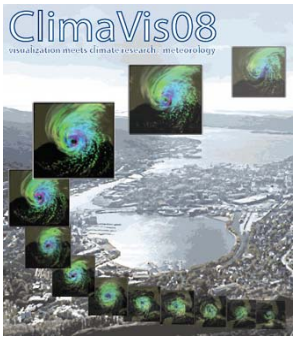
ClimaVis08



visualization meets climate research / meteorology

August 21, 2008; Høyteknologisenteret (HiB), store auditorium
http://www.ii.UiB.no/vis/events/ClimaVis08/

Program

12:45 Arrival / welcome in front of the auditorium

13:00 **Opening** (on behalf of ii.UiB.no)

13:15 **Laurent Bertino** (Mohn-Sverdrup Center, MSC.NERSC.no)

Some Visualization Issues in Operational Ocean Modelling

Operational ocean model interpretation and debugging[1] are based on -- often subjective -- visualization of the model output. However the temporal and spatial resolution of modern ocean models is now so high that the amount of data to be evaluated is overwhelming. Instead, 2D samples of the data and time series of spatially integrated variables are monitored. As a consequence, the probability of sending erroneous data to the users is superior to zero. Illustrations and anecdotes will be taken from the TOPAZ system monitoring and forecasting the North Atlantic and Arctic Oceans.
// note [1]: The two activities are in practice identical.

13:45 **Thomas Nocke** (Potsdam Institute for Climate Impact Research, PIK-Potsdam.de)

An Overview on Visualization of Climate and Climate Change Data

For climate change researchers, visualization is a key technology for analyzing and presenting climate simulations, measurements as well as climate-driven socio-economic and ecological data. Furthermore, communicating research results to decision makers and to the general public in an easily-understandable way is of growing importance. Designing intuitive and meaningful visual representations in this context faces a variety of challenges: the heterogeneity of data and of user groups, and manifold tasks. Thus, applying visualization to scientific data is - due to a variety of available tools, techniques and parameters - not straightforward. Sophisticated technologies (GUI, visualization design) are essential for bridging the gap [...]

14:15 **Coffee Break**

14:30 **Helmut Doleisch** (SimVis GmbH, SimVis.at)

Interactive Visual Analysis in Meteorology with SimVis

SimVis is an interactive visual analysis technology which has been researched and developed since 2001 at the VRVis Research Center in Vienna. The original goal was to develop an supportive technology for the exploration and analysis of very large and complex data sets resulting from computational fluid dynamics simulation (CFD). After having presented the basic concepts of the SimVis framework, the presentation will concentrate on case studies and applications from meteorological data analysis. This will also demonstrate the general applicability of the SimVis approach for data from many different sources. In the third part of the presentation the new developments of SimVis with regard to the ongoing commercialization will be discussed, [...]

15:00 **Johannes Kehrer** (VisGroup at the Dep. of Informatics, UiB, ii.UiB.no/vis)

Interactive Visual Exploration of Climate Data

The SimVis framework has been recently extended to work with large climate simulation results, where the time-dependent behavior of different attributes is of interest. In the newly developed function graphs view, a scalar function over time is depicted for each voxel/cell of a volumetric and time-dependent dataset. This can lead to a dense visualization consisting of hundreds of thousands or even millions of function graphs. Special techniques were applied to cope with overdrawing and visual cluttering, and to retain the responsiveness of the system even when interacting with such large datasets. Enhanced brushing (selection) techniques were developed, which allow to classify time series according to their similarity to a user-defined, temporal pattern. [...]

15:30 **Break** with **SimVis demo** (by Johannes Kehrer)

16:00 **Michael Böttinger** (Deutsches Klimarechenzentrum GmbH, DKRZ.de)

Visualizing the future? Applied Data Visualization in Earth System Research

Numerous findings with respect to the climate of the past, today and the future could only be achieved by means of simulations with numerical climate models. Such simulations need months or years to process on even the most powerful high performance computer systems. As a result of these numerical experiments, very large data sets are produced and hence complex storage and archiving technologies are needed. Dealing with statistical and visual analysis is increasingly becoming a real challenge due to the rapid growth of resulting data. Data visualisation is one of the key technologies needed for the understanding of the simulation results and their dissemination. Where do we stand today with respect to the visualisation of earth system model data? [...]

16:30 **Nils Gunnar Kvamstø** (Dep. of Geophysics, UiB, GFI.UiB.no, and Bjerknes Centre)

Potential use for new analysis/visualisation tools in research at GFI/BCCR

The climate research at BCCR and GFI spans a range of diciplines; obsevational activities, palaeo climatology, numerical modelling, data analysis and theoretical studies. Some typical present data analysis activities will be presented with focus on the needs for flexible analysis tools.

19:30 **ClimaVis08 Dinner**

ClimaVis08 Sheet of Abstracts (complete texts)

13:15 **Laurent Bertino** (Mohn-Sverdrup Center, MSC.NERSC.no)

Some Visualization Issues in Operational Ocean Modelling

Operational ocean model interpretation and debugging* are based on - often subjective - visualization of the model output.

However the temporal and spatial resolution of modern ocean models is now so high that the amount of data to be evaluated is overwhelming. Instead, 2D samples of the data and time series of spatially integrated variables are monitored.

As a consequence, the probability of sending erroneous data to the users is superior to zero.

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An Overview on Visualization of Climate and Climate Change Data

For climate change researchers, visualization is a key technology for analyzing and presenting climate simulations, measurements as well as climate-driven socio-economic and ecological data. Furthermore, communicating research results to decision makers and to the general public in an easily-understandable way is of growing importance. Designing intuitive and meaningful visual representations in this context faces a variety of challenges: the heterogeneity of data and of user groups, and manifold tasks. Thus, applying visualization to scientific data is - due to a variety of available tools, techniques and parameters - not straightforward. Sophisticated technologies (GUI, visualization design) are essential for bridging the gap between such systems and users. At best, they reduce the obstacles for applying the full functionality of advanced, interactive data visualization systems. With regard to these challenges, the talk provides an overview of visualization techniques and systems used to represent climate and climate change data, presents results of a questionaire with climate change researchers and proposes own solutions. The talk discusses both standard and alternative techniques (known from visualization research) for presenting spatial, (spatio-)temporal and multi-variate climate change data.

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After having presented the basic concepts of the SimVis framework, the presentation will concentrate on case studies and applications from meteorological data analysis. This will also demonstrate the general applicability of the SimVis approach for data from many different sources.

In the third part of the presentation the new developments of SimVis with regard to the ongoing commercialization will be discussed, especially focusing on future plans and possibilities of cooperative research work.

15:00 **Johannes Kehrer** (VisGroup at the Dep. of Informatics, UiB, ii.UiB.no/vis)

Interactive Visual Exploration of Climate Data

The SimVis framework has been recently extended to also work with large climate simulation results, where especially the time-dependent behavior of different attributes is of interest. In the newly developed function graphs view, a scalar function over time is depicted for each voxel/cell of a volumetric and time-dependent dataset. This can lead to a dense visualization consisting of hundreds of thousands or even millions of function graphs. Special techniques were applied to cope with overdrawing and visual cluttering, and to retain the responsiveness of the system even when interacting with such large datasets. Enhanced brushing (selection) techniques were developed, which allow to classify time series according to their similarity to a user-defined, temporal pattern.

In a recent cooperation with the Wegener Center in Graz, Austria, we used this extended SimVis framework to rapidly identify regions in the atmosphere which can act as sensitive and robust indicators for climate change. We demonstrate how interactive visual data exploratio multi-variate and time-dependent climate data enables the steered generation of promising hypotheses for subsequent statistical evaluation. Higher-order information (e.g., linear trends, signal-to-noise ratio) is derived and interactively explored in order to detect and explore those regions (e.g., certain pressure levels given at certain latitudes) which react most sensitively to climate change.

16:00 **Michael Böttinger** (Deutsches Klimarechen-zentrum GmbH, DKRZ.de)

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Numerous findings with respect to the climate of the past, today and the future could only be achieved by means of simulations with numerical climate models. Such simulations need months or years to process on even the most powerful high performance computer systems. As a result of these numerical experiments, very large data sets are produced and hence complex storage and archiving technologies are needed. Dealing with statistical and visual analysis is increasingly becoming a real challenge due to the rapid growth of resulting data.

Data visualisation is one of the key technologies needed for the understanding of the simulation results and their dissemination. Where do we stand today with respect to the visualisation of earth system model data? Scientifically, many major questions concerning the visualisation of time dependent multivariate 3D data have been answered, but how is the practical availability of satisfactory visualisation solutions which fit the needs of the domain scientists?

16:30 **Nils Gunnar Kvamstø** (Dep. of Geophysics, UiB, GFI.UiB.no, and Bjerknes Centre)

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