VISUALISATION

VISUAL EXPLORATION AND EVALUATION OF CLIMATE IMPACT DATA

In climate impact research, heterogeneous, increasingly large data sets require flexible data analysis techniques. The Scientific Data Management Group provides a variety of interactive visualisation techniques and paradigms rarely used before now in climate impact research.

CHALLENGES

- **Large** measured and model output **data sets**
- **Heterogenity of data sets with different characteristics** (coupled multi-dimensional and multi-variate scalar and vector data on different grids)
- **Detection of** possibly interesting, partly unknown **features** in the (multi-variate) data
- **Evaluation and comparison of model simulations**
- Combination of **visualisation** and **statistical methods**
- User support to **identify appropriate visualisation techniques** and parameters

APPROACH

Visualisation can go beyond

- data and result presentation and
- standard, uni-variate visualisation techniques

and allows

- new insights by a high level of **interactivity**.

Consequently,

- we develop a **library of tailored, interactive visualisation techniques** from different environments (e.g. OpenDX, OpenGL), including
  - spatial and temporal scalar and vector data visualisation,
  - multi-variate visualisation,
  - visualisation of simulation experiment output, of clustered and PCA transformed data,
- integrate it into the **easy-to-use framework SimEnvVis** that
  - gathers and uses metadata,
  - utilizes user goals and user preferences,
  - supports users to generate appropriate visualisations for their current problem context,
  - and manages the analysis history, and
- **reuse theses functionalities** in derived applications (e.g. an OpenDX based visualisation online portal).

VISUALISATION TECHNIQUES

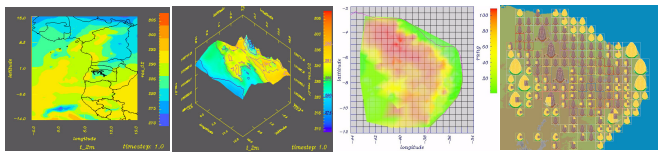

Fig.1: Visualisation of scalar data in 2D (left to right): coloured map, coloured height map with isolines, data comparison combining colour and transparency map, multi-variate maize icon metaphors on a map

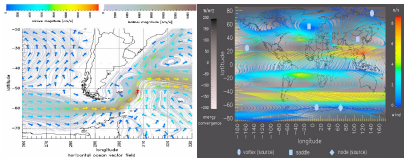

Fig.2: Flow visualisation:coloured streamlines with arrows (left) or critical point glyphs (right)

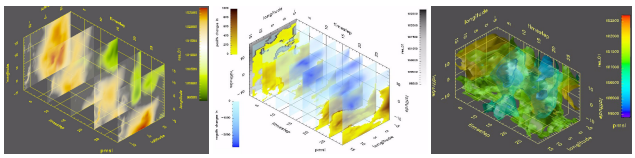

Fig.3: Visualisation of scalar 2D temporal data in 3D: parallel slices highlighting extreme values (left), extreme differences (centre), and transparent isosurfaces (right)

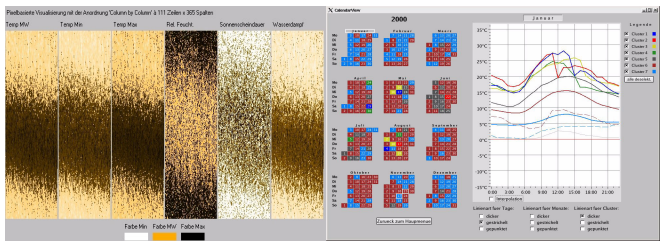

Fig.4: Visualisation of long time series: pixel-based visualisation of six daily weather variables (left), clustered temperature day profiles (right)

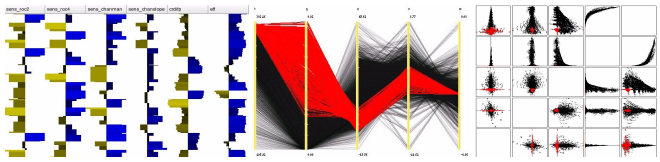

Fig.5: Multi-variate visualisation (left to right): graphical table, brushed parallel coordinates and scatterplot matrix

APPLICATIONS & PROSPECTS

Development of visualisation methods & tools for simulation experiments (SimEnv) & for large spatial/temporal multi-variate data (LPJ, Potsdam series, Climber-3).

Leibniz Gemeinschaft

DATA & COMPUTATION / SCIENTIFIC DATA MANAGEMENT
VISUALISATION
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