

## **A Cross-community Collaborative Visualization Platform for Comprehensive System Understanding in Geosciences**

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Research in Geosciences emphasis more and more the understanding of systems instead of examine closed single problems. Gaining insight and knowledge about correlations of different spatial phenomena and their influence on each other is a major point in scientific investigation.

If we try to understand complex systems the cooperation of several disciplines with their different knowledge is necessary. An effective cooperation which aims at a comprehensive understanding of the investigated system requires cognitive artifacts which support collaborative knowledge building. In the field of processing, exploring and visualizing spatial information many different and specialized tools exist to support a single scientist. However, it lacks tools that emphasis the collaborative aspect for experts from various research fields. Dealing with a complex system application field and not with single datasets, requires extending visual analytical methods to concepts which support a group of scientist in their cross-community collaborative work.

In a recent project we are going to develop such a cross-community collaborative working tool which combines methods of knowledge management and representation with geo-visual analytics methods. The geo-scientific context is TIPTEQ, a project which aims the better understanding of subduction earthquake mechanisms and of the related seismological structure in a particular Andes region. Several views are necessary to understand the system as a whole: geology gives an overview about the rock formations and the historical timeline of the region; chemical samples, for example, help to observe the thermal spring state, which in its turn informs about the seismic activity; seismology provides the floor sweeps and the structure of the experimental field; GPS stations record ground movements which support the tracing of subduction plate movements; geophysical analog experiments provide subduction process understanding.

According to our concept the cross-community collaborative working platform will consist of three conceptual components:

One component organizes and visualizes the knowledge space. It is structured according to concept knowledge, context knowledge and related information sources. Concept maps in form of graphs are used for visualizing this knowledge space. The experts contribute their knowledge and information sources in form of documents, graphics, links, data, etc. to the system. Each of them creates their own reference space (and therefore a new information space) by linking the knowledge items with each other. The items can also be labeled by a keyword or a priority level. By viewing the information spaces of other participants and creating or/and extending the own space, new spheres and correlations can be found; and cooperation and themes of interests can be invented.

The second component visualizes the information resources in a spatio-temporal reference system. Each information item is linked to a 4D visualization model of the Earth or in our case the Ands region model, which operates in 3D spatial and one time dimensions. This is a special knowledge space, where existent knowledge is clearly referenced geographically.

The third component enables the experts to work in a sort of interactive virtual workshop where they can exchange knowledge. A key element of this component is a map- and graphic-mediated dialogue between the experts. By opening new knowledge spheres, dragging knowledge items into them, and by creating graphics and notes on the fly, scientists argue visually, prove hypothesis and discuss particular issues.

The result of the project will be a tool that rounds off the visual exploration of single data sets. It aims at supporting scientists from different fields a) to visually explore the entire cross-community knowledge and information space and b) to visually discuss different scientific views in order to develop a comprehensive system understanding.

Being situated at GeoForschungsZentrum Potsdam give us a well suited context to implement visualization and collaboration concepts paying a high regard to the researchers needs.