Visual Climate Knowledge Discovery within a Grid Environment

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The C3Grid-INAD project aims to provide a common grid infrastructure for the climate science community to improve access to climate related data and domain workflows via the Internet. To make sense of the heterogeneous, often large-sized or even dynamically generated and modified files originating from C3Grid, a highly flexible and user-friendly analysis software is needed to run on different high-performance computing nodes within the grid environment, when requested by a user.

Because visual analysis tools directly address human visual perception and therefore are being considered to be highly intuitive, two distinct visualization workflows have been integrated in C3Grid-INAD, targeting different application backgrounds. First, a GrADS-based workflow enables the ad-hoc visualization of selected datasets in respect to data source, temporal and spatial extent, as well as variables of interest. Being low in resource demands, this workflow allows for users to gain fast insights through basic spatial visualization.

For more advanced visual analysis purposes, a second workflow enables the user to start a visualization session via Virtual Network Computing (VNC) and VirtualGL to access high-performance computing nodes on which a wide variety of different visual analysis tools are provided. These are made available using the easy-to-use software system SimEnvVis. Considering metadata as well as user preferences and analysis goals, SimEnvVis evaluates the attached tools and launches the selected visual analysis tool by providing a dynamically parameterized template. This approach facilitates the selection of the most suitable tools, and at the same time eases the process of familiarization with them. Because of a higher demand for computational resources, SimEnvVis-sessions are restricted to a smaller set of users at a time.

This architecture enables climate scientists not only to remotely access, but also to visually analyze highly heterogeneous data originating from C3Grid for different purposes. The analysis products, such as images and videos, can then be exported and shared with the community, enhancing scientific communication and therefore accelerating scientific research.