

SCIENTIFIC VISUALIZATION AT SURFSARA

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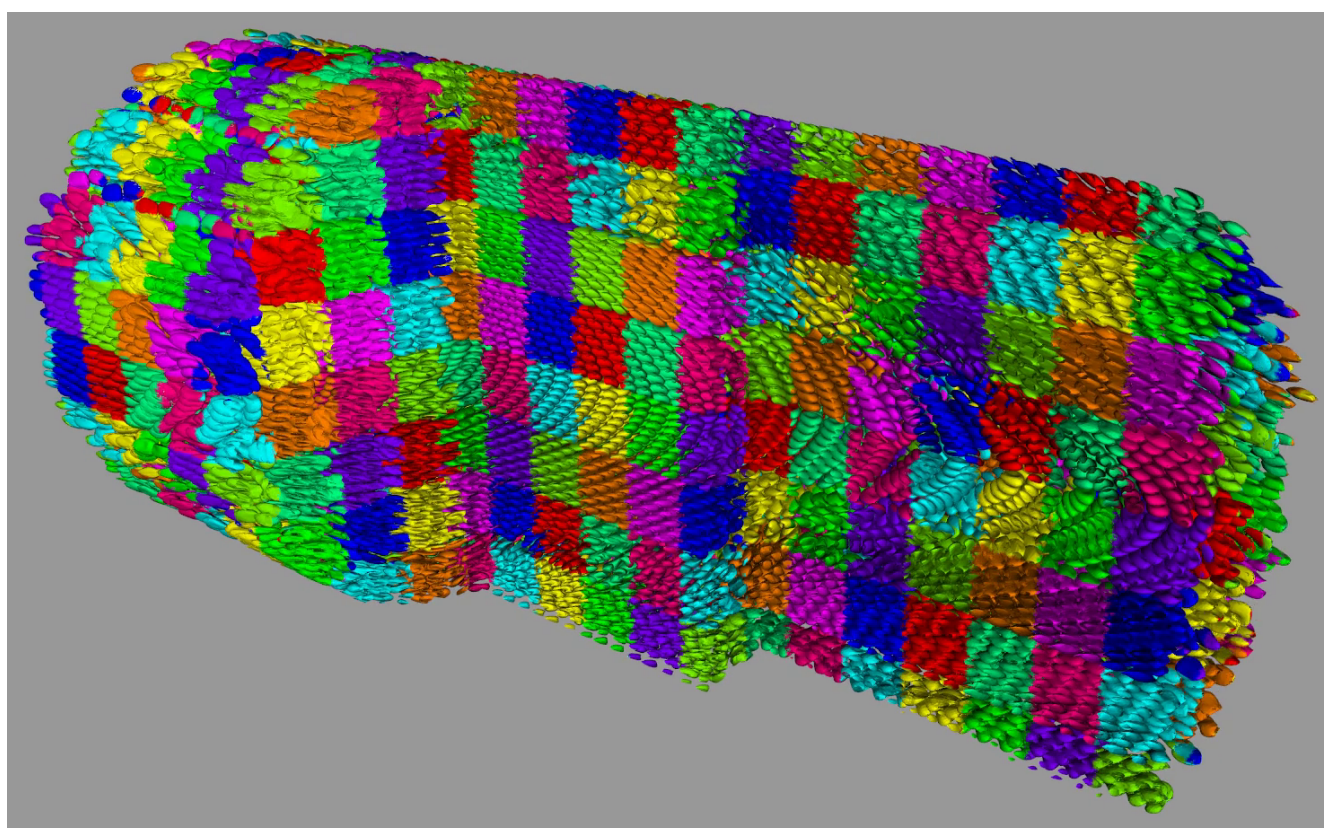
INTRODUCTION

The SURF organization, and in particular SURFsara, provides researchers in The Netherlands with access to and support for high-performance computing infrastructure. Use of this infrastructure is very diverse, ranging from fundamental theoretical research in physics, chemistry and climate modeling to applied research in fields such as information retrieval, life sciences and manufacturing (with many topics in between).

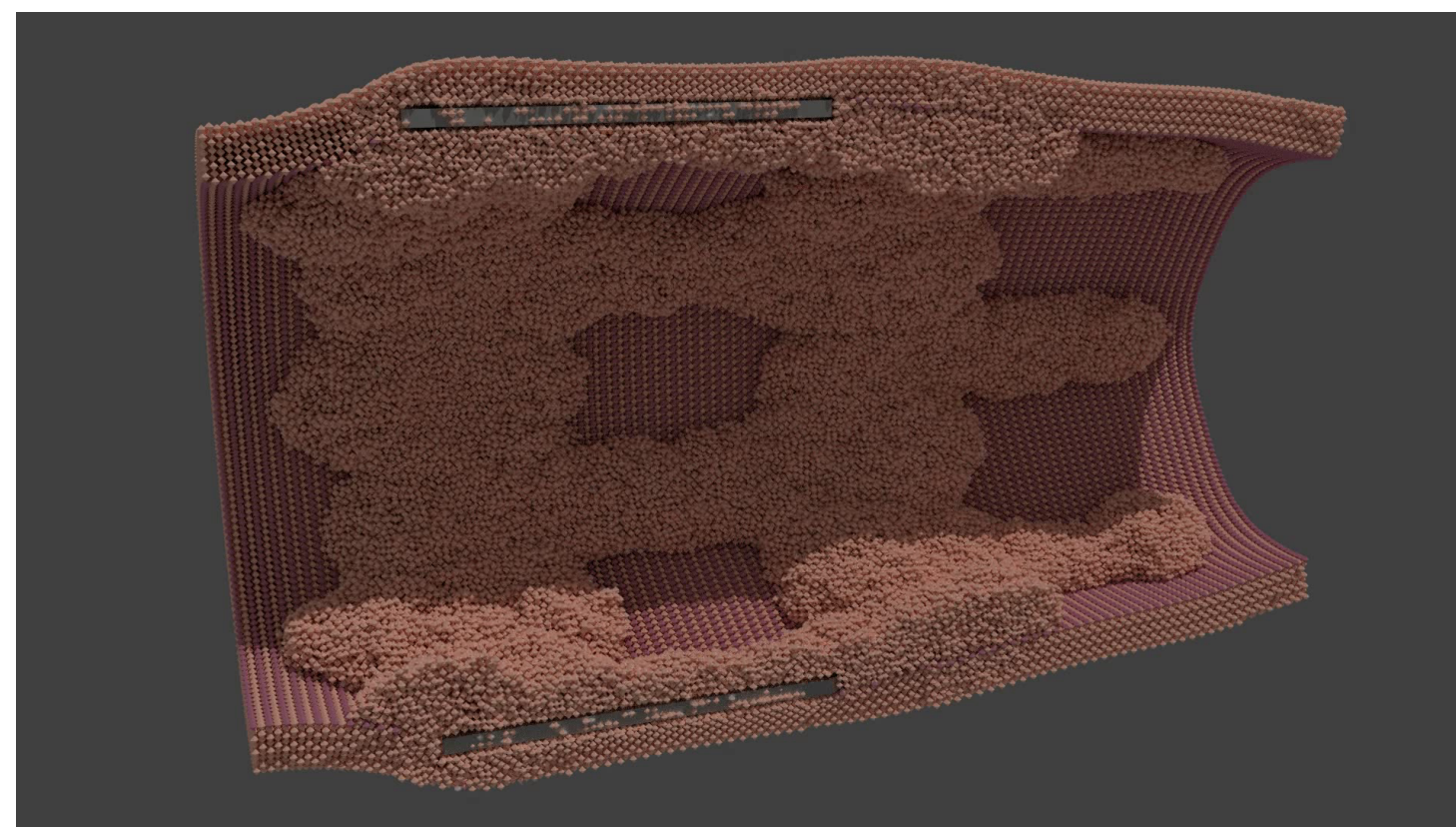
Visualization can be an important tool for exploring scientific datasets, gaining insight and knowledge, debugging and verifying models and software, but also for effective communication and discussion. Here, some of the research performed is shown as scientific visualization showcases. In some cases researchers have created these autonomously on the SURFsara e-Infrastructure, in other cases assistance was provided by SURFsara. Apart from providing access and support to visualization infrastructure, SURFsara also performs scientific visualization projects for users, which can range from performing data visualization to creation of tools and applications.

Computational Science Lab (Institute for Informatics, Faculty of Science, University of Amsterdam)

L. Mountrakis,
"Transport of blood cells studied with fully resolved models"



C. Bona-Casas, J. Borgdorff, H. Tahir, A.G. Hoekstra,
"A 3D model for in-stent restenosis"

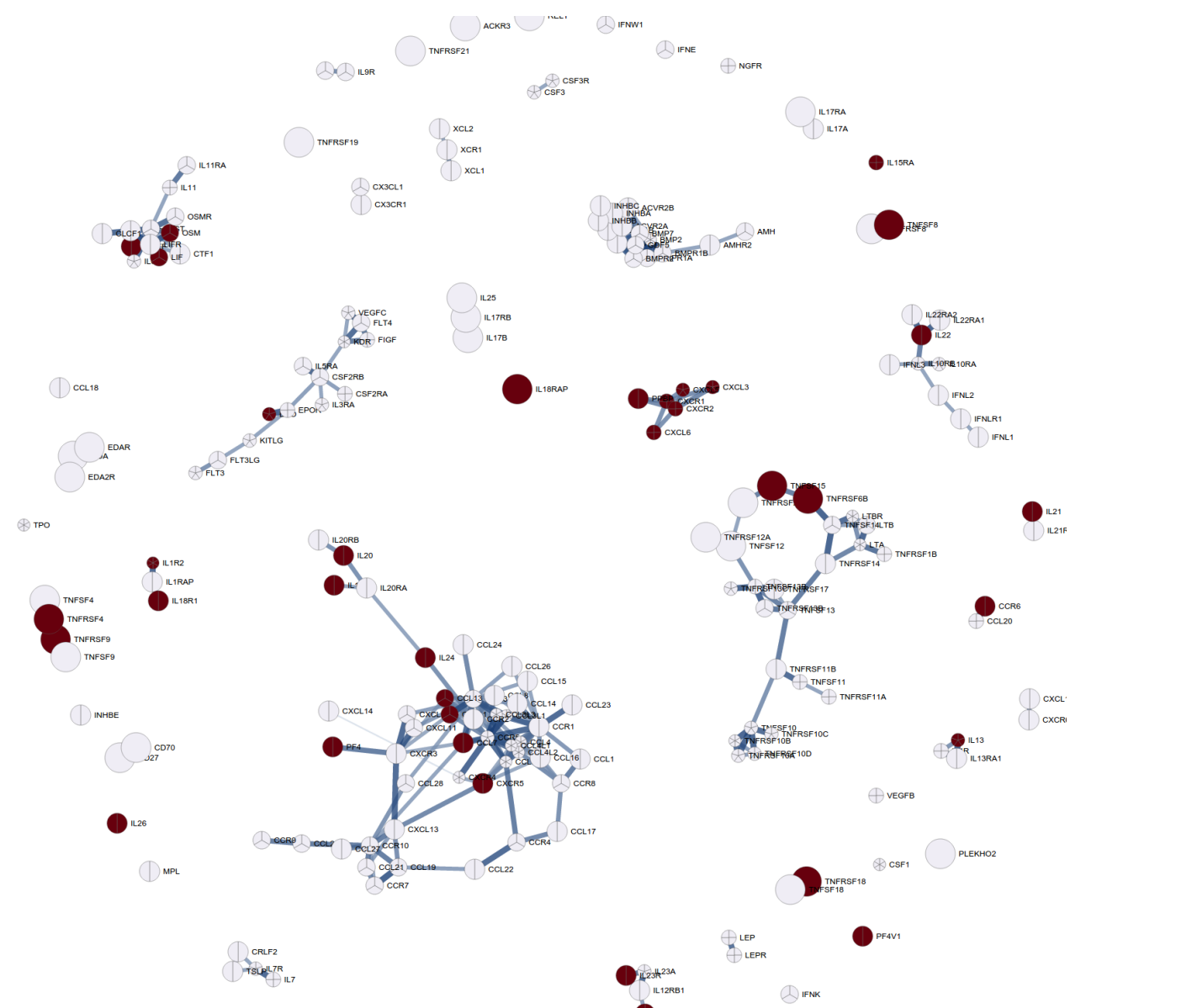
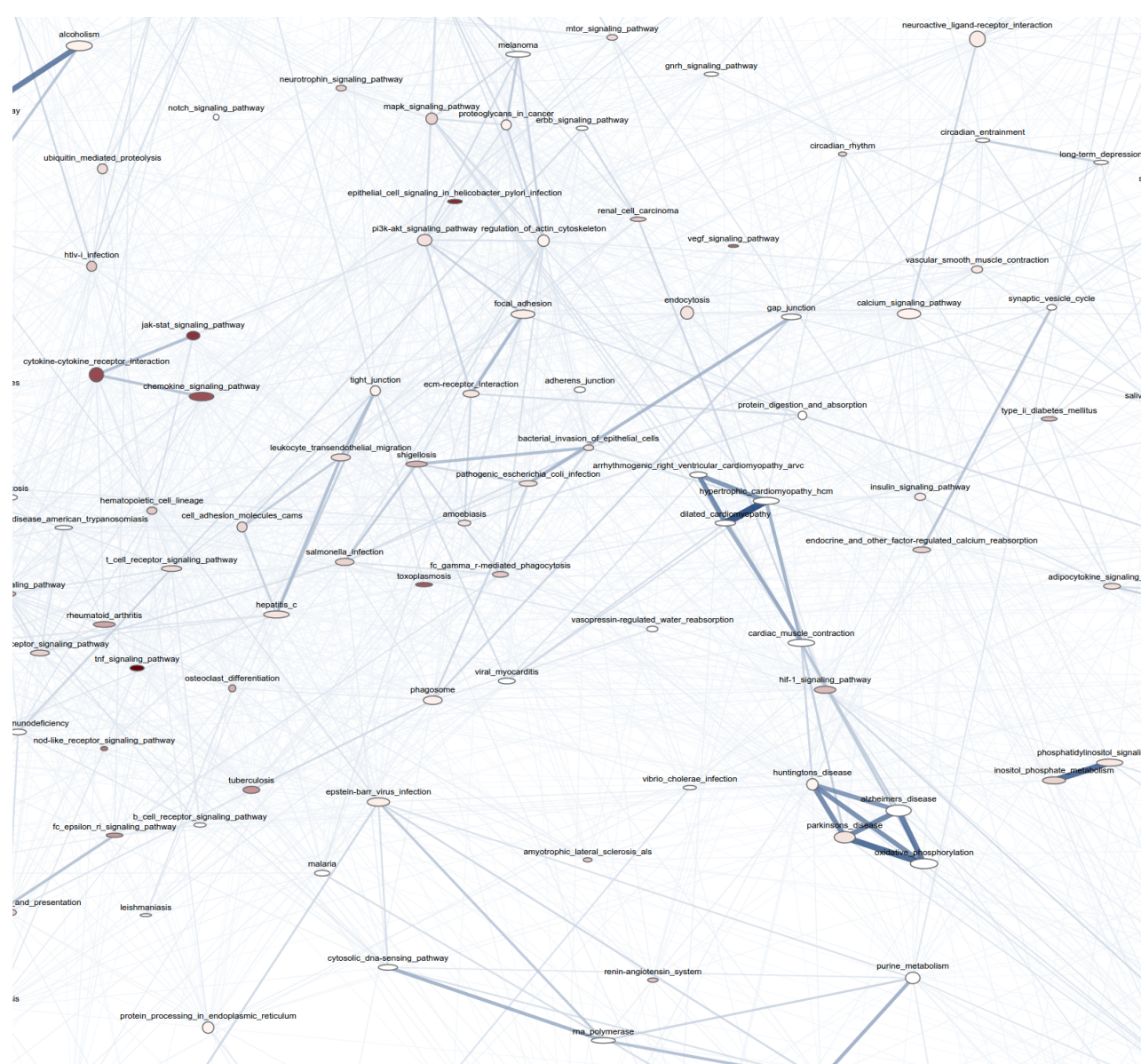


The Uva Computational Science Lab tries to understand how nature processes information by studying a large variety of dynamic multiscale complex systems with a focus on (but not limited to) Biomedicine. They rely on a variety of modelling approaches (such as Agent Based models, Cellular Automata, Dynamic Complex Networks, particle methods, and models based on differential equations), on multiscale modelling methods that capture the transmission and transformation of information up and down the scales, on formal methods (theories of natural information processing) and on Problem Solving Environments (workflows, visualisation, multiscale coupling libraries and e-science infrastructures for distributed multiscale computing).

Two research showcases are shown to the side: modeling of red blood cells (left) and a simulation of the process of in-stent restenosis (right). SURFsara supported the visualization of both these cases, using the SURFsara e-Infrastructure.

For more information on the research cases, visit <http://uva.computationalscience.nl/>

ClusterView: a visual exploration tool for genetic datasets (VU CNCR)



SURFsara created a data exploration tool with the VU Center for Neurogenomics and Cognitive Research (<http://www.cncr.nl>). This "ClusterView" tool is used to visualize and explore genetic datasets in which probabilistic clustering has been applied. Part of the data generation is performed on the Dutch National Compute Cluster.

The visualization tool allows a two-level exploration:
1) The high-level network of overlapping clusters (shown left)
2) The relations between genes within a single cluster (shown right). Interaction on one level influences the representation of the other level.

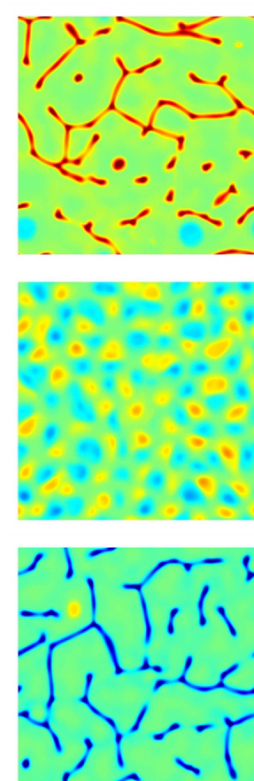
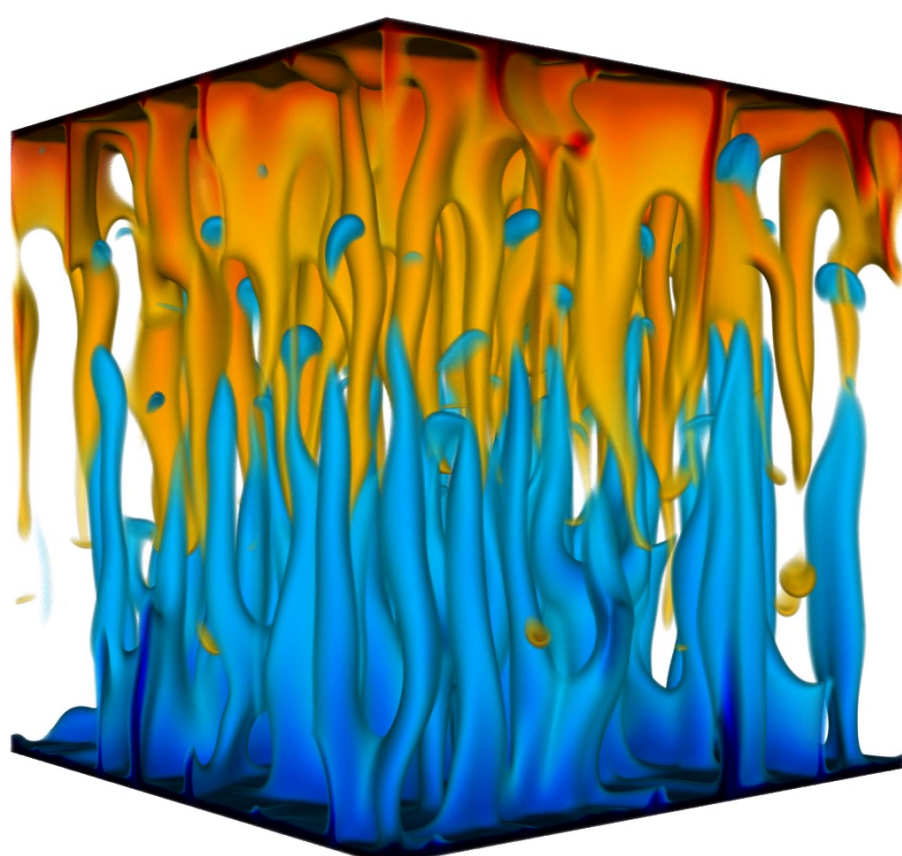
Overlap between two clusters (in number of genes) is shown with a line whose thickness indicates the amount of overlap. The variance of gene probability within a cluster is shown by varying the roundness of a cluster's ellipse (more elliptic means more variance).

There is a mode to focus on gene-associations with diseases. More information on specific genes is available through hyperlinks.

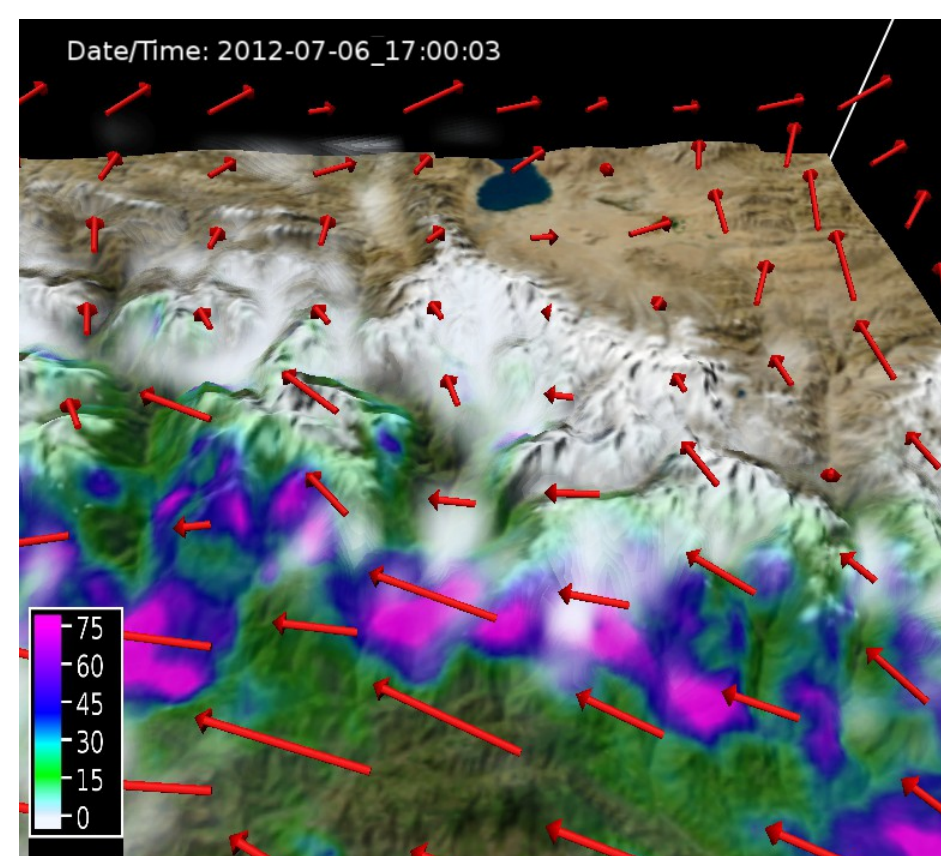
The tool is fully browser-based and made with HTML5, CSS and D3.js

Remote Visualization examples at SURFsara

Yang et al., Physics of Fluids group, University of Twente
"Salt fingers in double diffusive convection bounded by two parallel plates"



Collier et al., Faculty of Geosciences, University of Utrecht
"High-resolution modelling of regional atmospheric dynamics in the Nepalese Himalaya"



The two research cases shown on the left were simulated on Cartesius (the Dutch National Supercomputer). The visualizations were produced using the SURFsara remote visualization cluster ELvis.

Remote visualization allows HPC users to perform (interactive) visualization tasks on large datasets using remote HPC systems.

This has several advantages:

- Data does not need to be transferred from the HPC center to the user, only the visual output is transferred (using a remote desktop)
- The hardware available at the data center is usually more powerful than what a user has "at home", in terms of performance, memory, GPUs, etc.
- The HPC center takes care of HPC system and software maintenance, saving the user time and effort

SURFsara has been providing remote visualization since 2010.

SURF is the collaborative ICT organisation for Dutch research and higher education. SURF offers scientists, students and lecturers in the Netherlands access to the best possible network, data storage and compute resources and technical advice and support.

SURFsara is a subsidiary of SURF that specializes in high-performance computing, data storage, networking, cloud computing, e-Science support and visualization.

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