

Co-visualization and Visual Analytics of climate/weather-prediction simulation & spatial data.

Postdoc – 16 months

IGN-France, LaSTIG, [GeoVIS](#) Team

Visual reasoning for climate simulation understanding,
based on co-visualization of climate and spatial data.

We are seeking a postdoc on **covisualization of climate simulation & spatial data** for the [ERA4CS](#) European project **URban CLIMate Services (URCLIM)**. [URCLIM](#) (2017-2020) aims at designing methods and tools to assess the impacts of the climate change on urban spaces, based on the simulation and analysis of complex and imprecise phenomena, through space and time. Researchers in Meteorology and in Geographic Information Sciences (GI Sciences) converge to visually integrate, interact with and analyze, geographic data describing the urban spaces and data simulating the climate (Fig. 1, 2).



Fig.1: Flow modelling in urban boulevard in Helsinki: 1-instantaneous wind field; 2- dispersion of traffic emissions on and around a planned city boulevard¹ (Kurppa et al. 2019 - Finnish Meteorological Institute and Helsinki University).

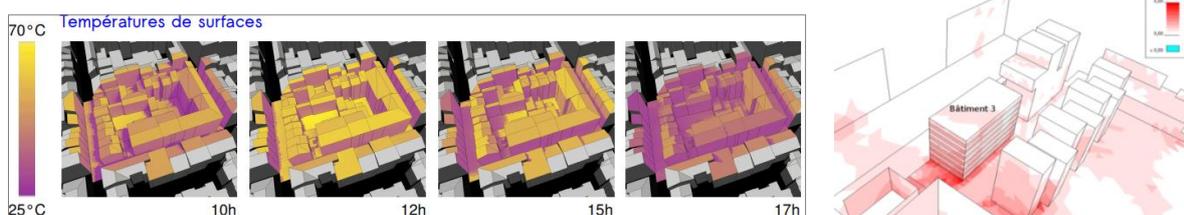


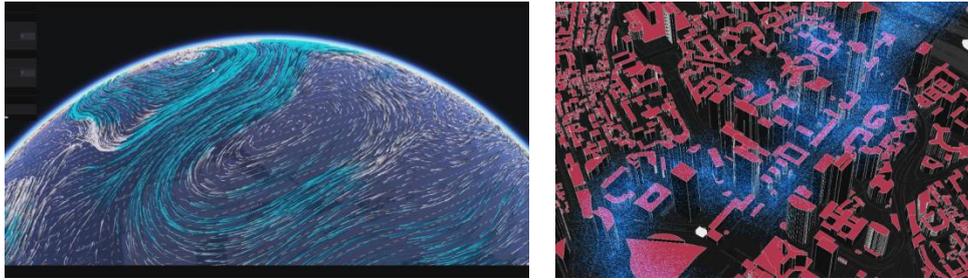
Fig.2 Existing visualizations of climate scenarios co-visualized with 3D city models (Groleau et al. 2003, Bouyer 2009)

The purpose of the post-doc is to facilitate the **interactive exploration of spatial data and climate simulation results** with various points of view, in order **to support visual spatio-temporal reasoning**. The visual analysis of the interactions between climate/weather-prediction and topography, such as climate models explanation and comparison, require methods at the city block level:

- to **co-visualize** such **heterogeneous data** (temporality, precision, dimension, uncertainties).
- to **identify, detect** and **explain** breaks, change events and interactions between data.
- to **explore** and **compare simulation scenarios** and **cities** to support decision.

Innovative interaction and visualization methods have to be designed, in order to handle, adapt and optimize the geovisualization of climate data, accordingly to various use contexts and stakeholders of the [URCLIM project](#), mainly meteorology researchers but also urban planners and citizens.

¹ <https://en.ilmatieltenlaitos.fi/computational-fluid-dynamics>



iTowns 3D geovisualization : <http://www.itowns-project.org/> and <https://github.com/itownsResearch>

Tasks

The approach in the project is to cross knowledge on spatial, topographic and climate/weather-prediction data, based on visualization scenarios for urban climate services elaborated within the UrCLIM project.

The main task concerns the co-visualization of climate and spatial data, mainly at the city block level, in 2D or 3D, enabling visual reasoning of climate phenomena.

The post-doc will propose how to improve the visual analytics of the possible interactions between climate and topographic data, in managing their visual integration and their graphic representation. Issues of **3D graphic semiology, real time rendering, and interactive techniques** are at stake here, in order to explore urban climate, data models and phenomena. A particular focus will be given on the control of the visual propagation of uncertainties, based on graphic semiology knowledge and/or innovative interaction techniques to explore, highlight or analyze uncertainties.

The post-doc will implement the methods into the existing open source iTowns 3D geospatial data visualization framework², that we have been extending at the IGN LaSTIG Geovis Team into [iTowns Research](https://github.com/itownsResearch).

Expected profile & skills

PhD thesis in Geographic Information Sciences, Information Visualization, Human-Computer Interaction or Computer Graphics.

Geographic Information Systems (GIS) **or** Web Visualization (Javascript, WebGL) **or** Rendering techniques.

Interests for climate change and meteorological simulations.

Location

The postdoc is funded by the ERA4CS URCLIM project and will take place at the Laboratory of Sciences and Technologies in GI Sciences (LaSTIG) of IGN-France, [GeoVIS](#) team, in Saint-Mandé (94, close to Paris), France. **16 months, starting as soon as possible in 2019.**

Application

To apply, please submit a CV, a motivation letter and a link to the PhD thesis and main publications to [Sidonie Christophe](mailto:sidonie.christophe@ign.fr), senior researcher in GI Sciences & Geovisualization at the IGN/LASTIG: sidonie.christophe@ign.fr.

References

Bouyer J. Modélisation et simulation des microclimats urbains - Étude de l'impact de l'aménagement urbain sur les consommations énergétiques des bâtiments. Energie électrique. Université de Nantes, 2009. Français.

Groleau D., Fragnaud F., Rosant J.M., Simulation of the radiative behavior of an urban quarter of Marseille with the Solene model, University of Lodz, Faculty of geographical sciences, Department of meteorology and Climatology, 2003.

Kurppa M., Hellsten A., Auvinen M., Kousa A., Kauhaniemi M., Kaski N. 2016, LES- virtausmallitarkastelukaupunkibulevardilla, FMI & University of Helsinki, https://www.hel.fi/hel2/ksv/julkaisut/yos_2016-5.pdf

² [iTowns](#) project based on [three.js](#) library to manipulate and render 3D geospatial data.