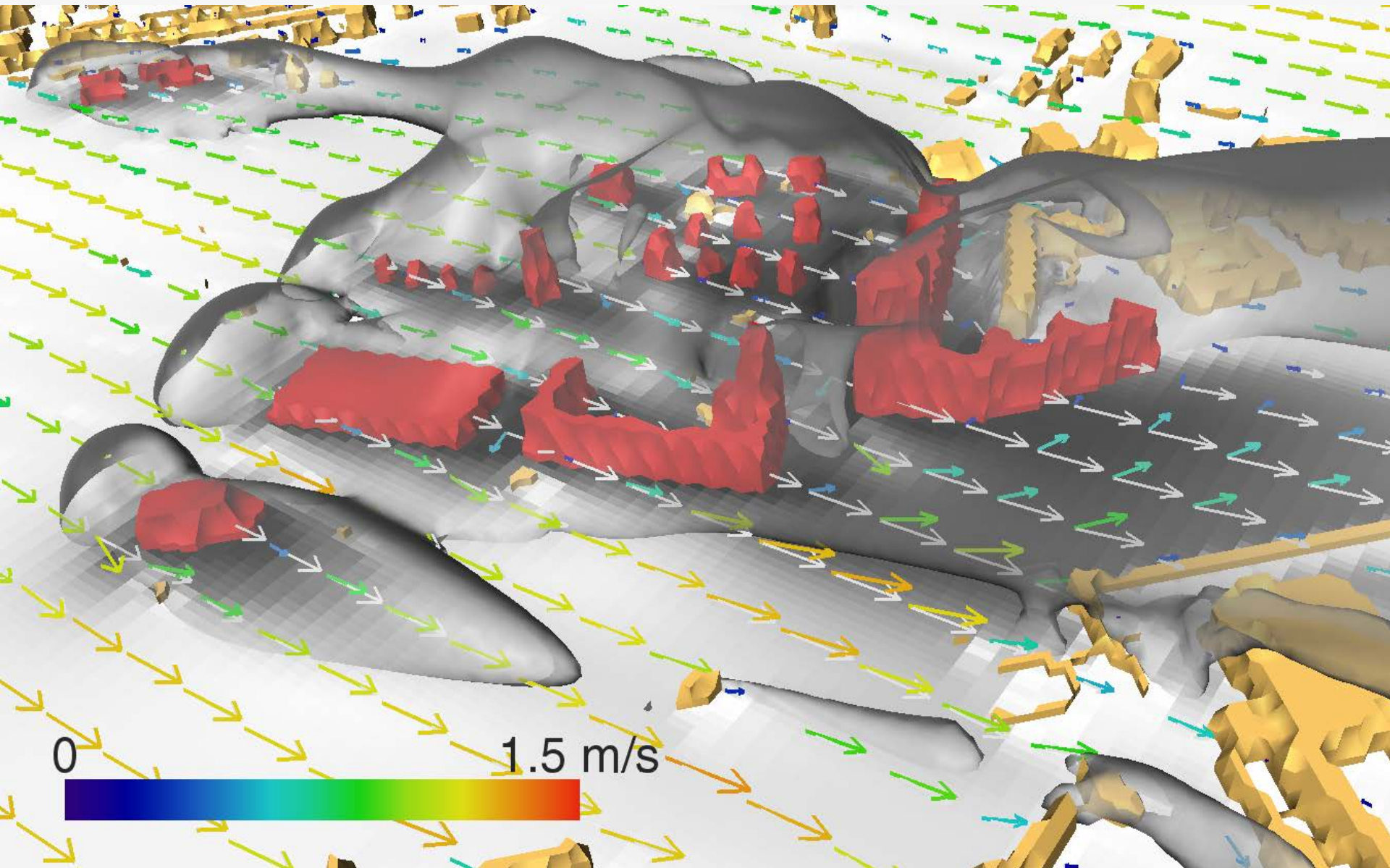


Comparative visual analysis of 3D Urban Wind Simulations

Niklas Röber, Mohamed Salim, David Grawe, Bernd Leitl, Michael
Böttinger, Heinke Schlünzen
Deutsches Klimarechenzentrum (DKRZ), University of Hamburg

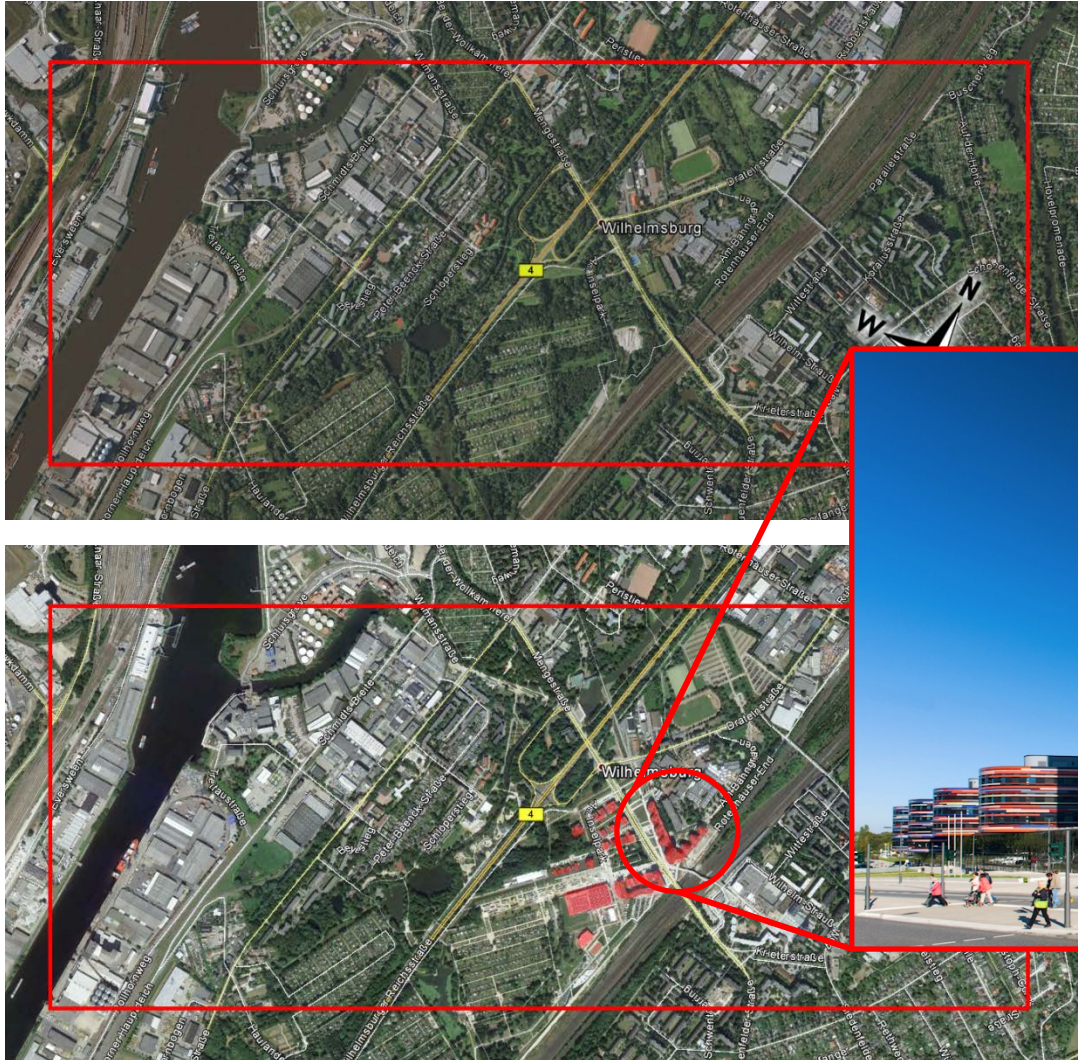
Comparing different Wind Simulations



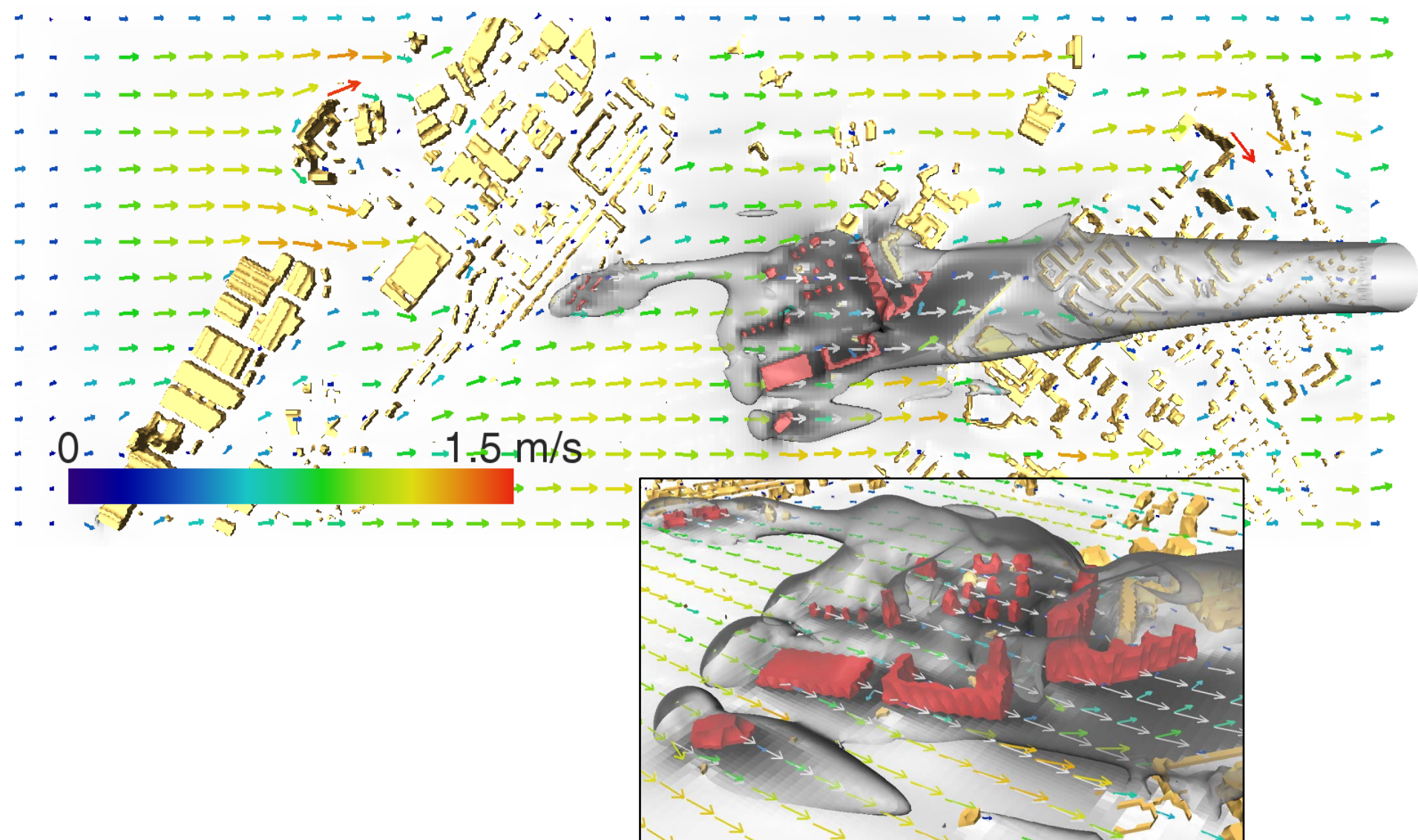
Comparing different Wind Simulations

- Scenario case
- Windtunnel comparison
- Influence of Coriolis
- Tree modelling
- Scalability and stability
- Regular 3D data visualization & analysis techniques (scatterplots, parallel coordinates, linked views)

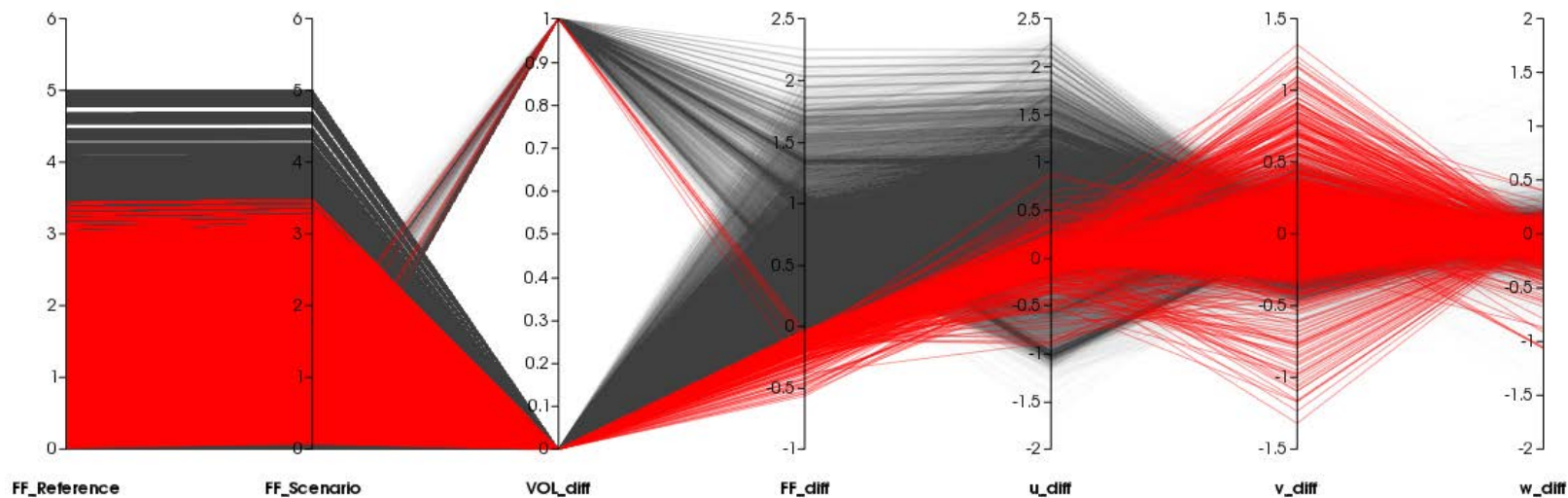
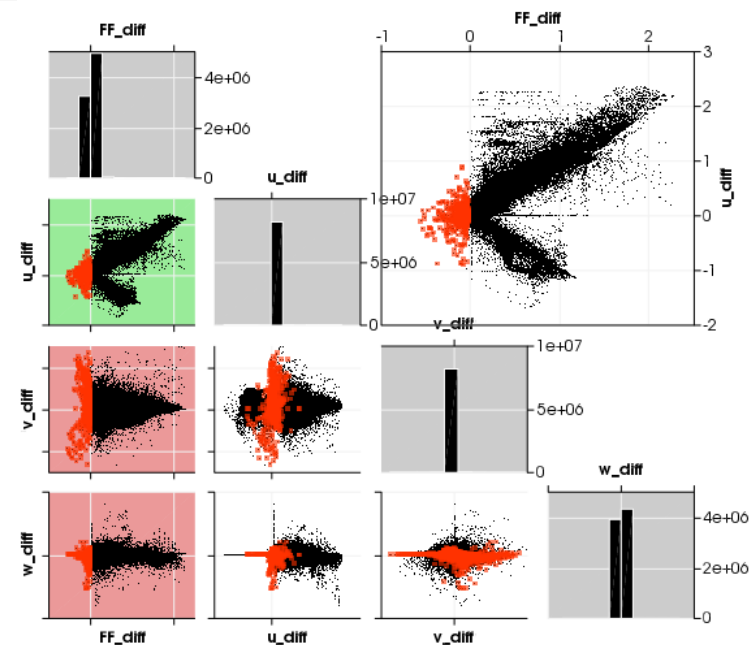
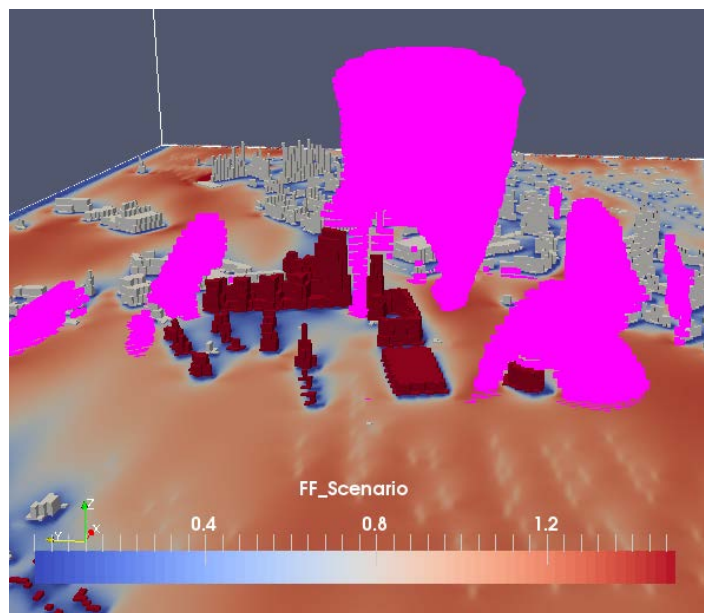
Scenario Case – IGA/IBA 2013



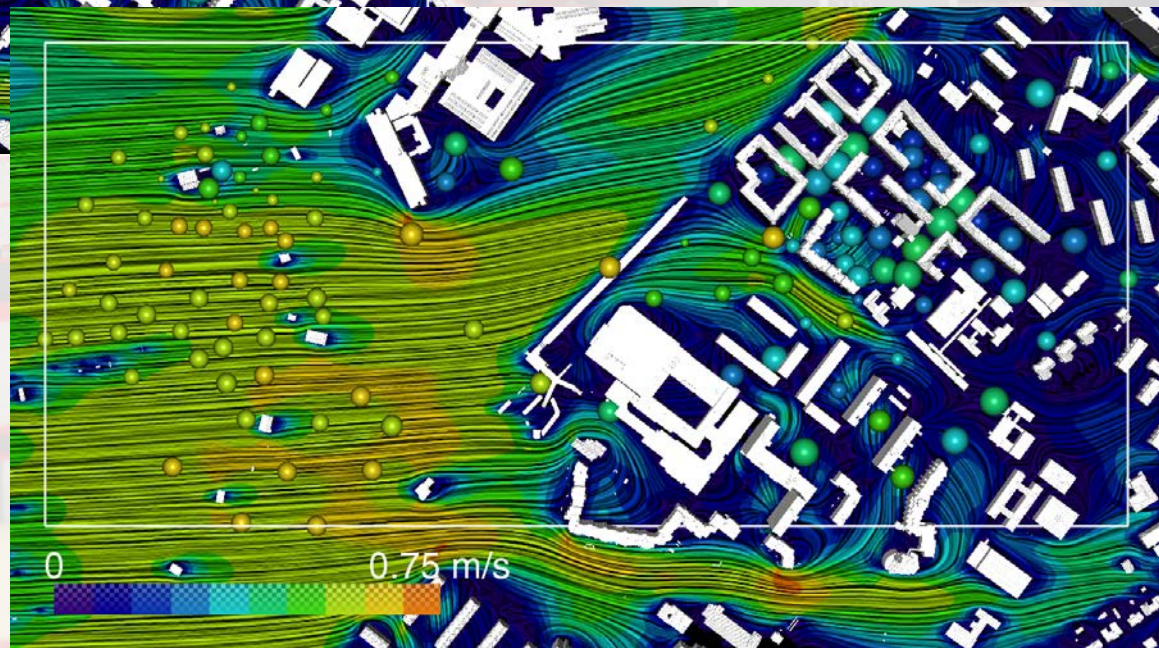
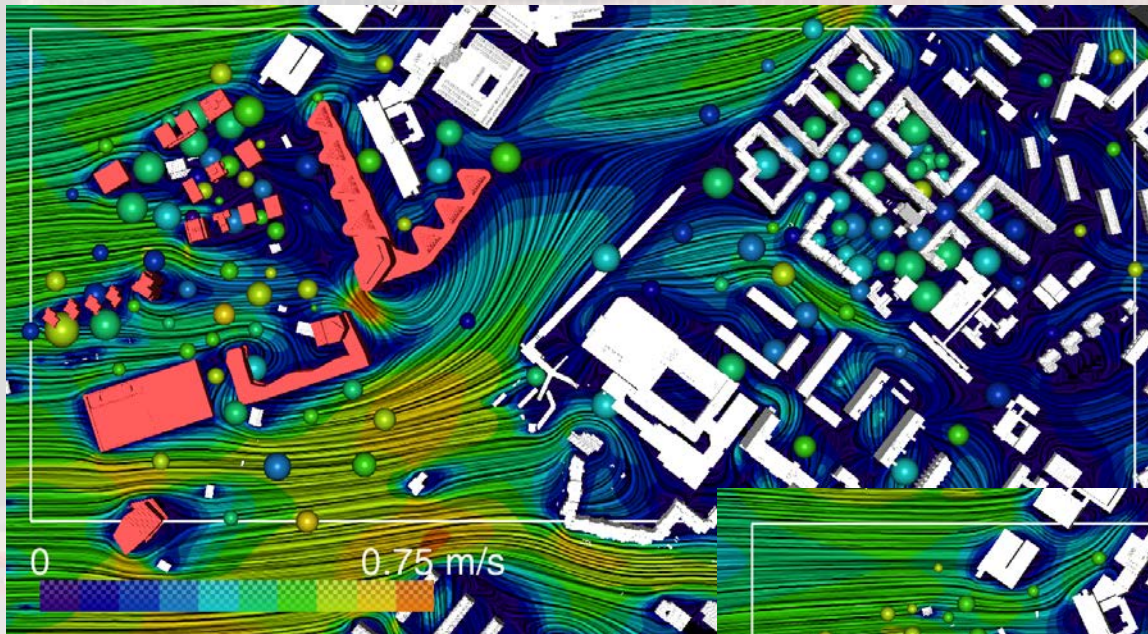
Scenario Case



Scenario Case

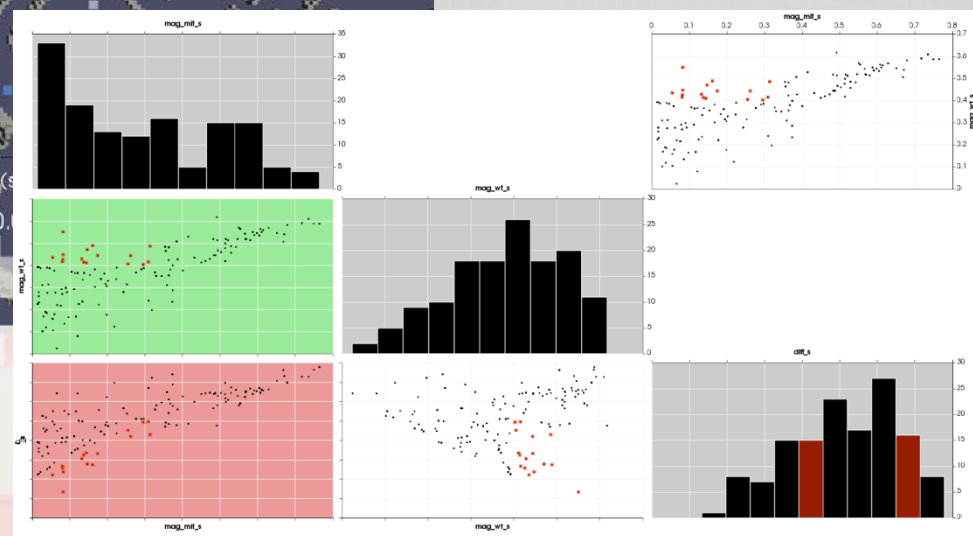
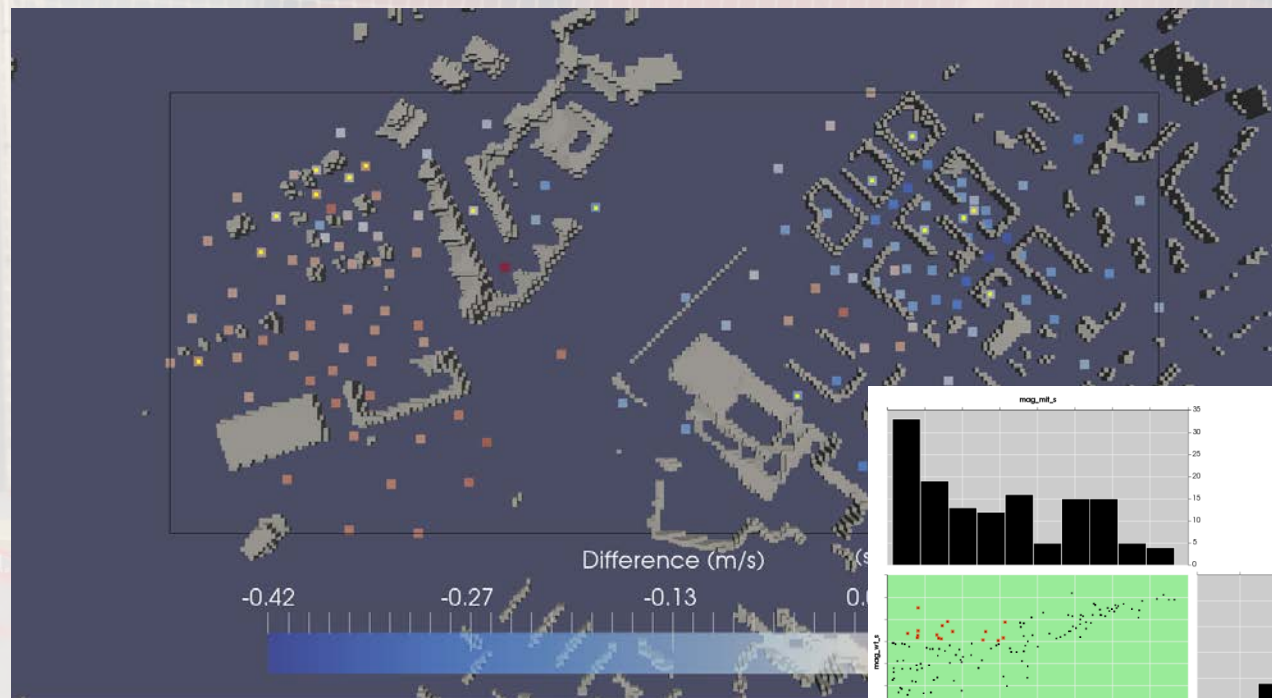


Windtunnel Comparison

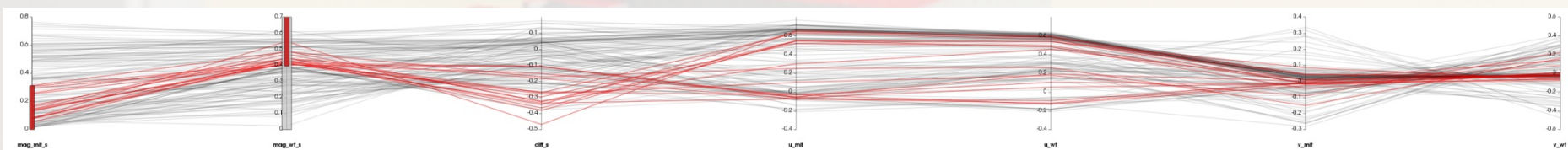


Simulation: LIC plane
 Measurement: Colored spheres
 Sphere volume: Absolute error

Windtunnel Comparison



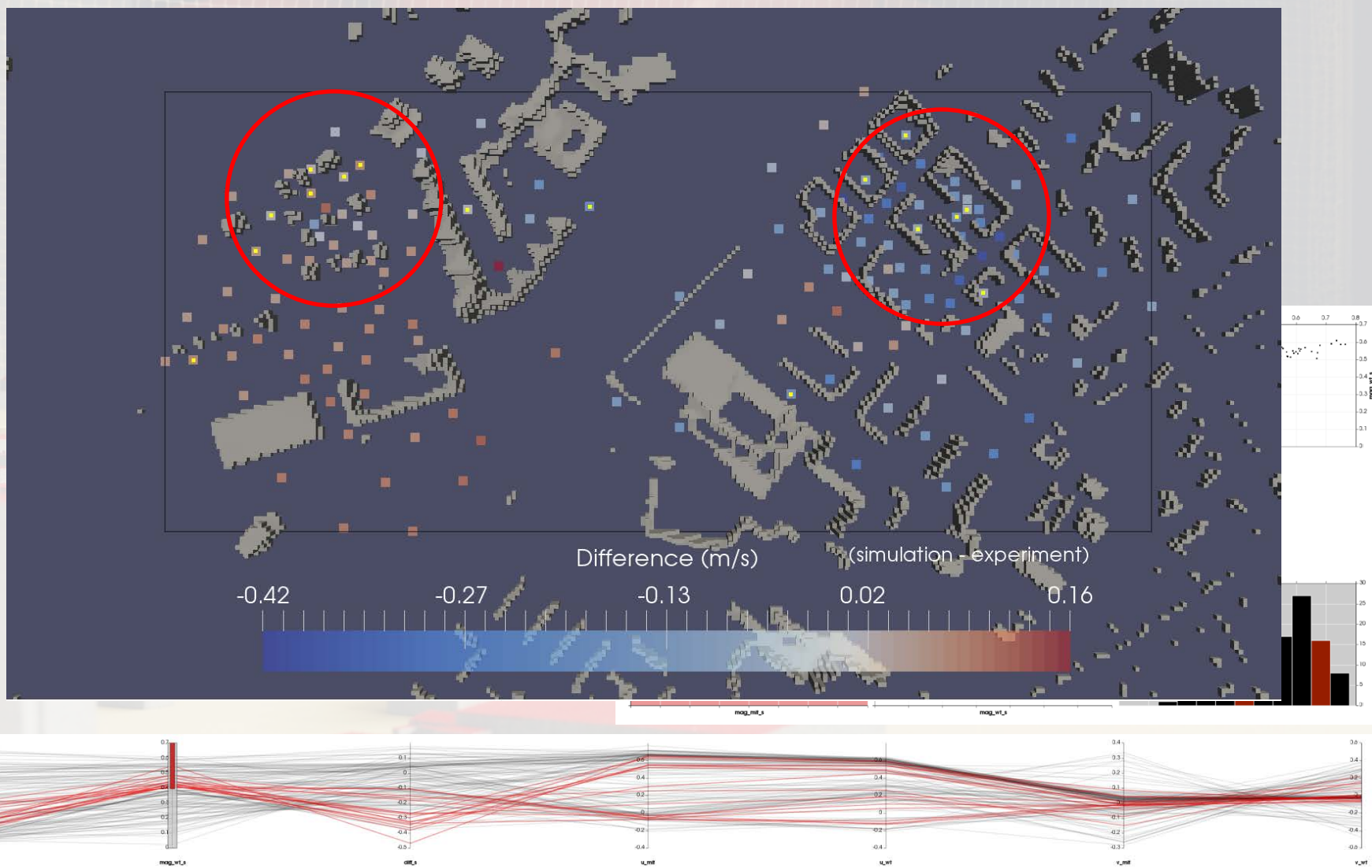
Differences = $Mag.Simulation - Mag.Measurement$



Windtunnel Comparison

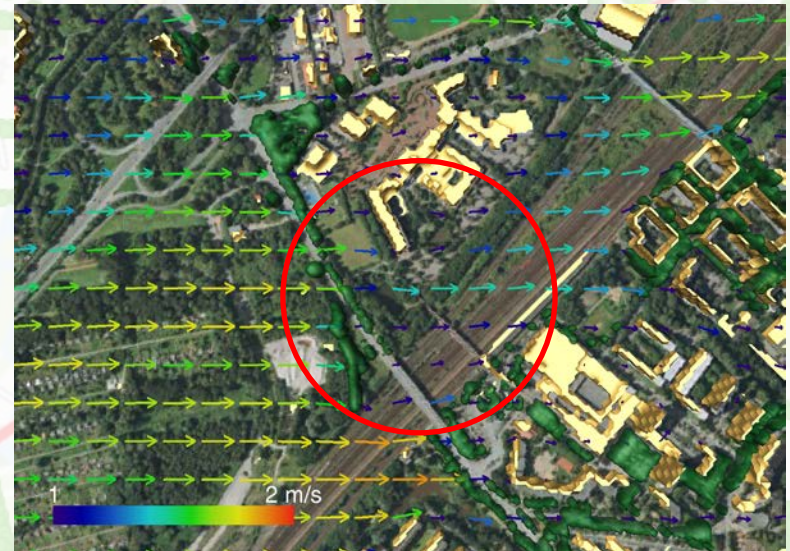
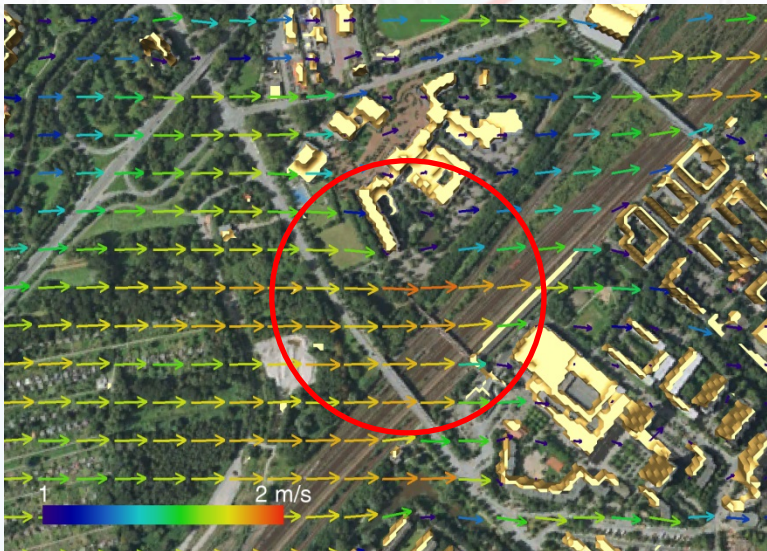


Windtunnel Comparison

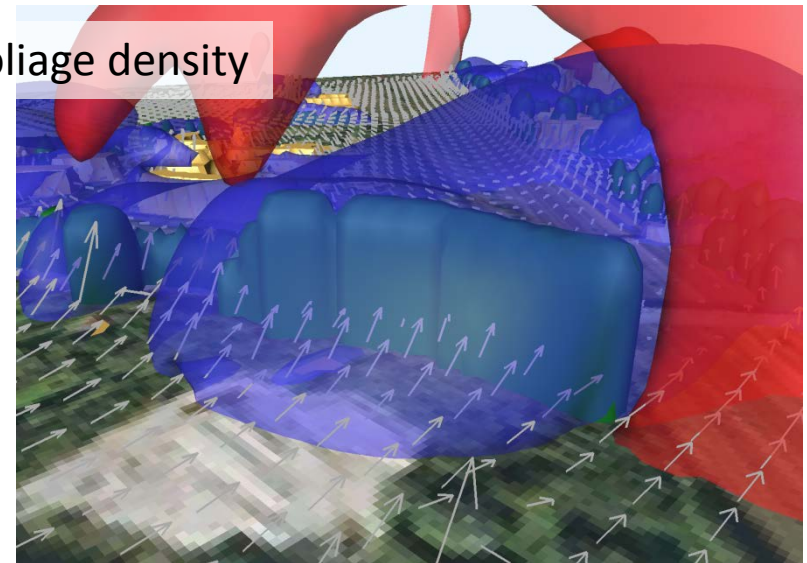
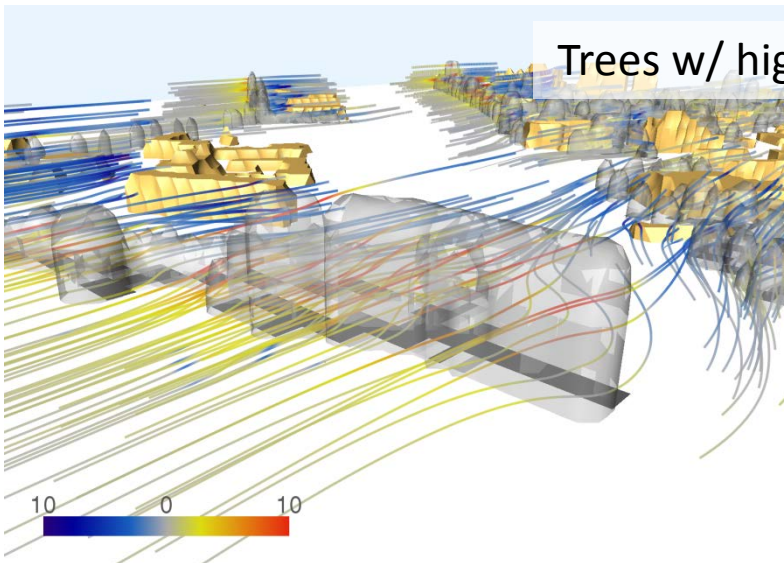
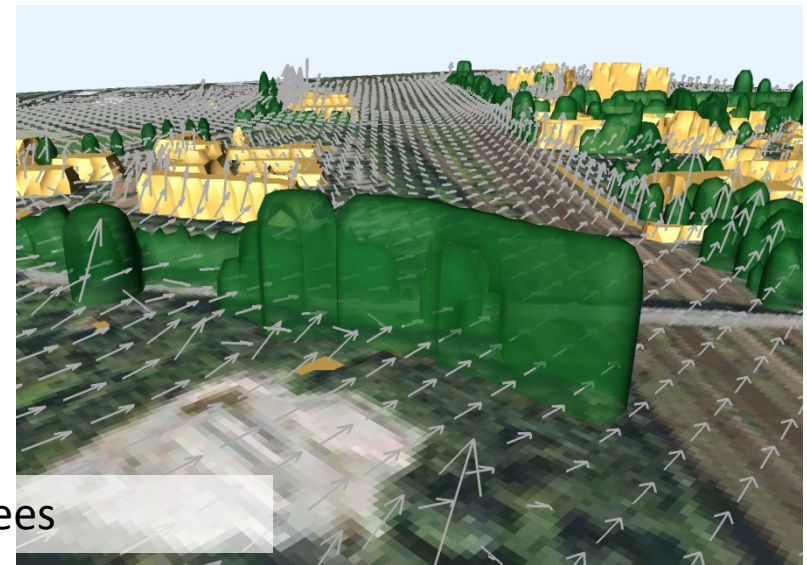
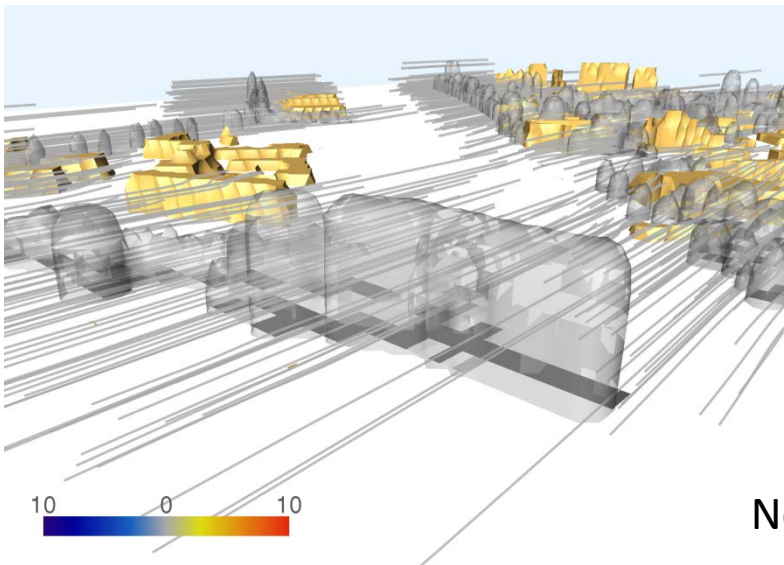


Tree Modelling

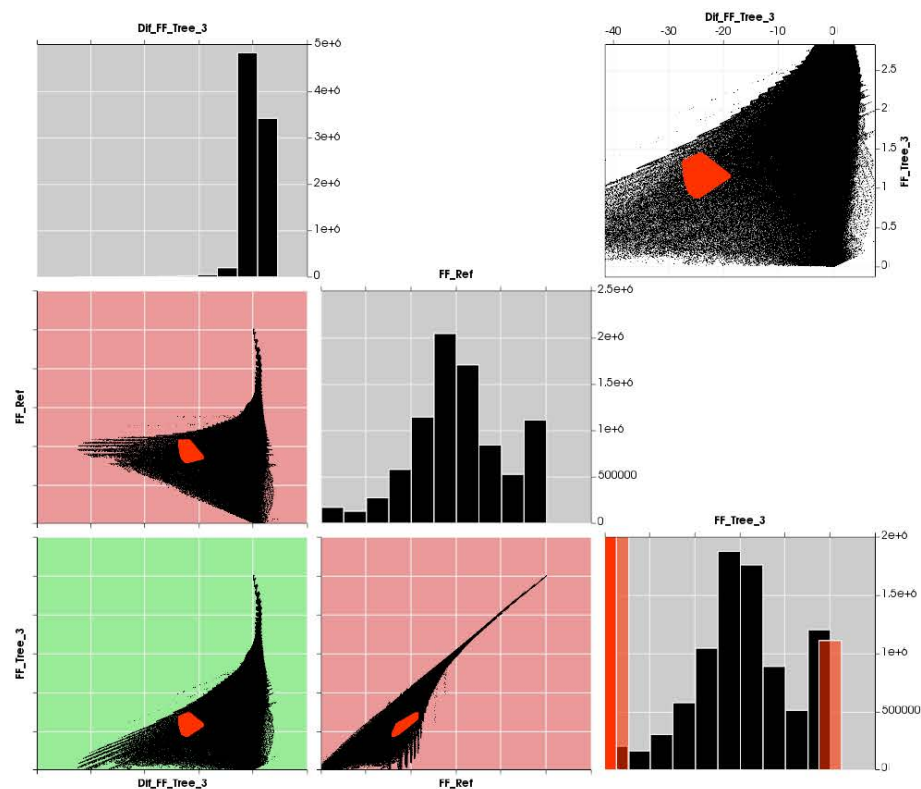
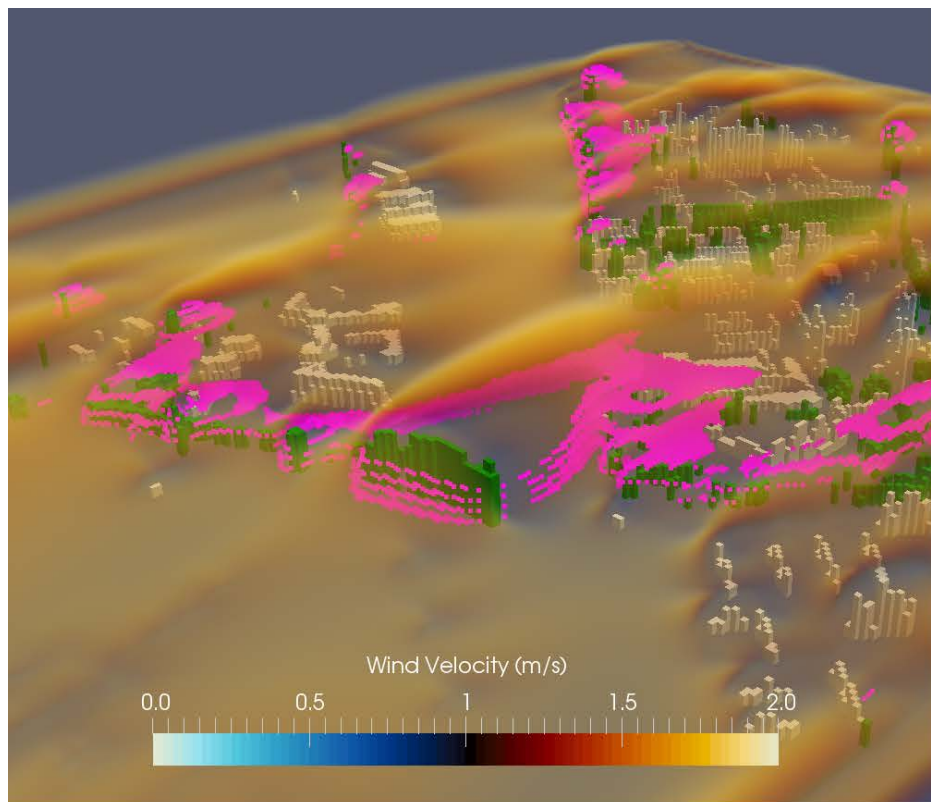
- Neglecting (no trees)
- Parametrization
- Real tree modelling with varying foliage density



Tree Modelling



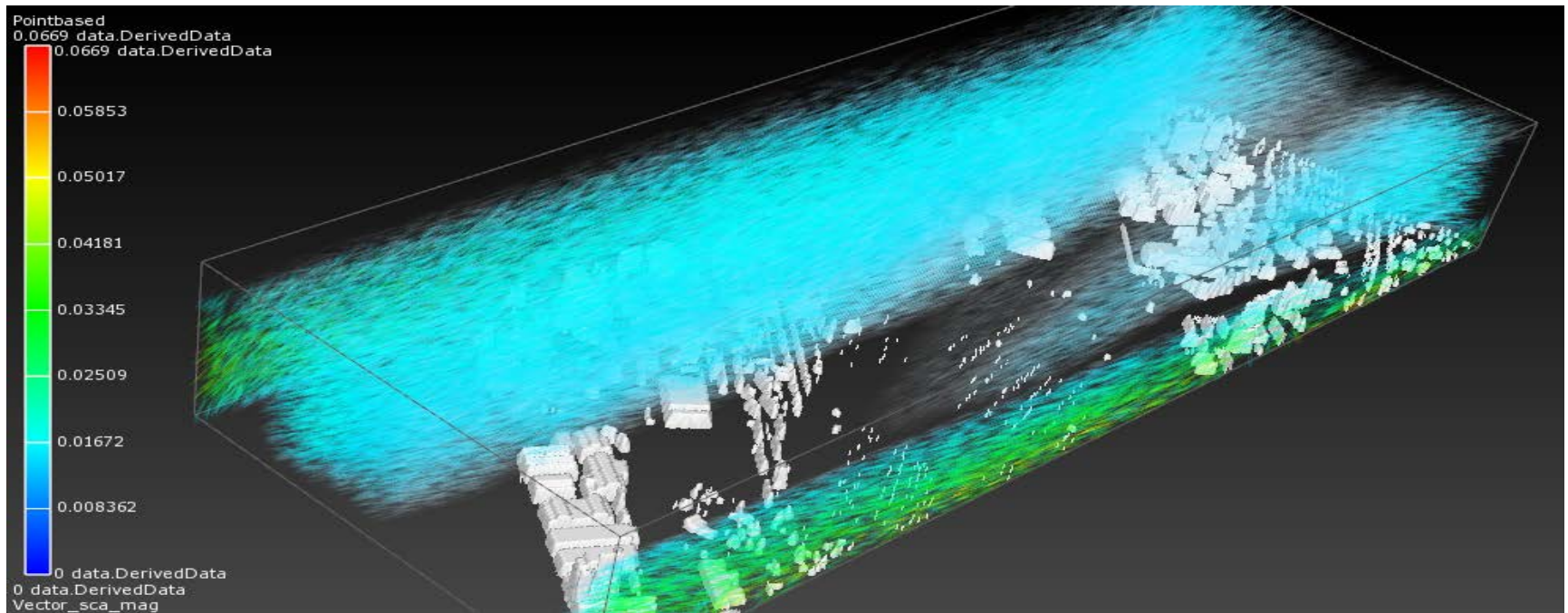
Tree Modelling



Simulation with high foliage density

Selection over two variables: Velocity (0.75 – 1.5m/s); Lower velocity (20 – 30%) comp. to reference case

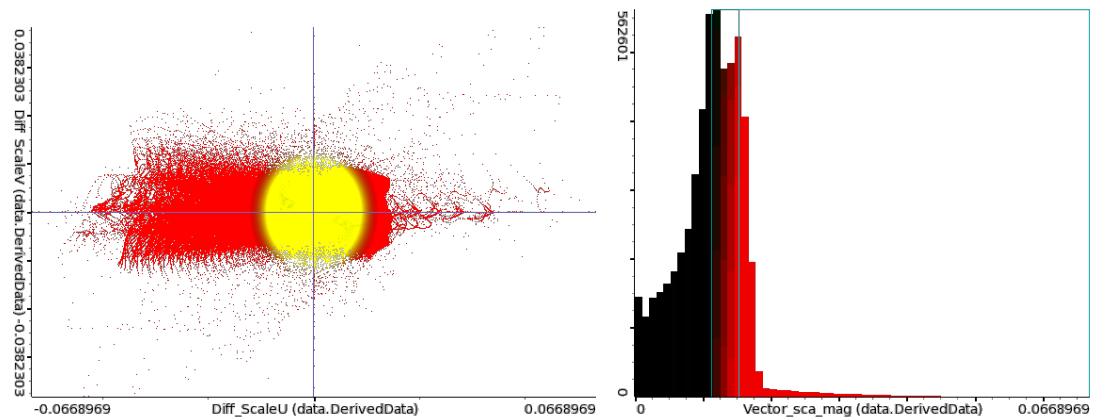
Model Scalability/Stability

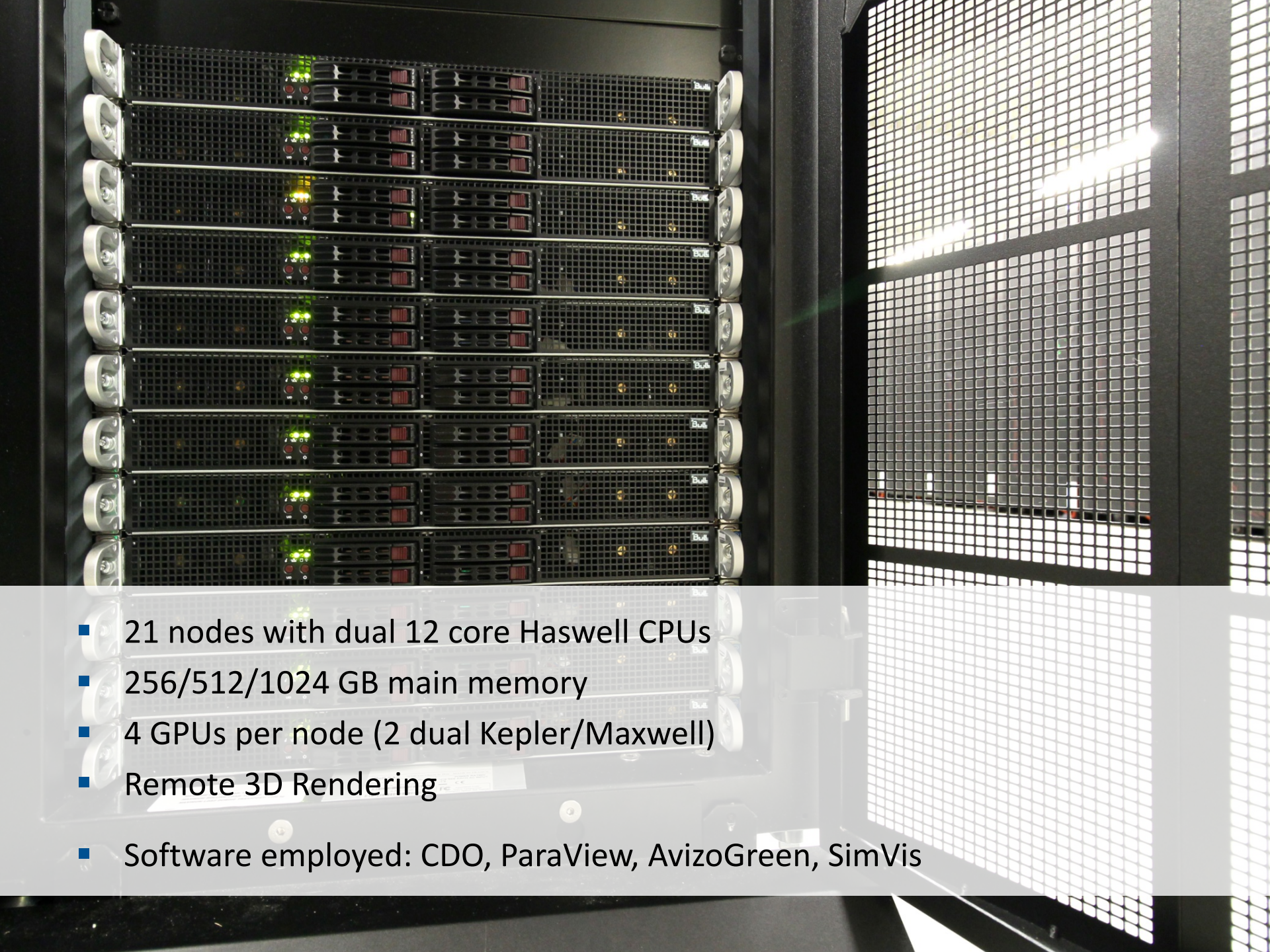


$$u_{diff} = \frac{u_{reference}}{5.0} - \frac{u_{scale}}{10.0}$$

$$v_{diff} = \frac{v_{reference}}{5.0} - \frac{v_{scale}}{10.0}$$

$$magnitude_{diff} = \sqrt{u_{diff}^2 + v_{diff}^2}$$



- 
- 21 nodes with dual 12 core Haswell CPUs
 - 256/512/1024 GB main memory
 - 4 GPUs per node (2 dual Kepler/Maxwell)
 - Remote 3D Rendering
 - Software employed: CDO, ParaView, AvizoGreen, SimVis

Thank you ...

Contact:

Deutsches Klimarechenzentrum
Bundesstraße 45a
D-20146 Hamburg
Germany

www.dkrz.de
roeber@dkrz.de

