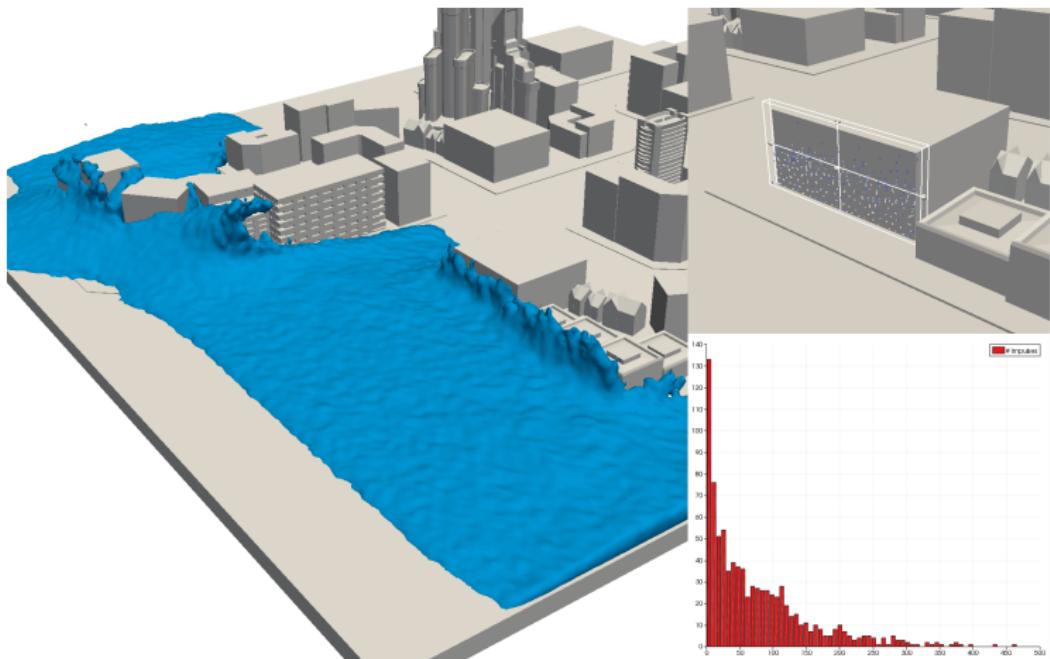


Simulation of Tsunami impact upon Coastline

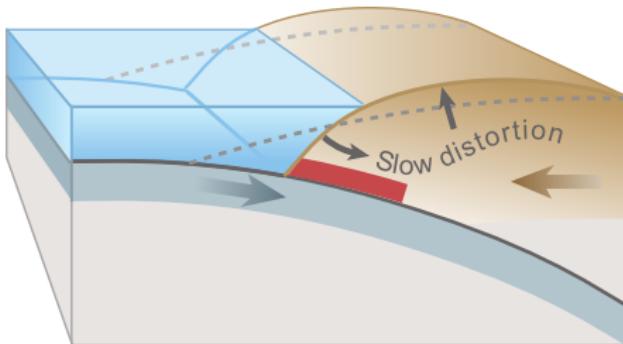
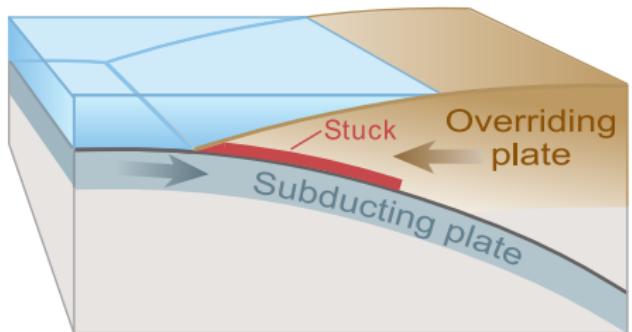


A. Spathis-Papadiotis, K. Moustakas

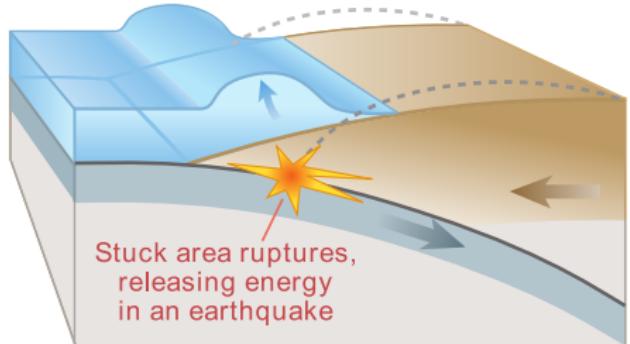
ECE Department, University of Patras

June 15, 2016

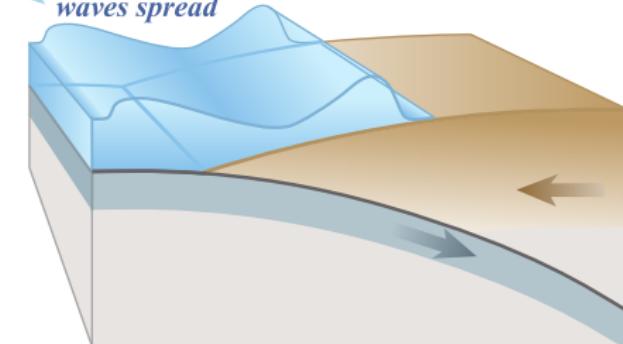
Generation of a Tsunami



Tsunami starts during earthquake



Tsunami waves spread





SPH Advantages

- ▶ Inherent conservation of many important system quantities like mass, momentum, energy.

SPH Advantages

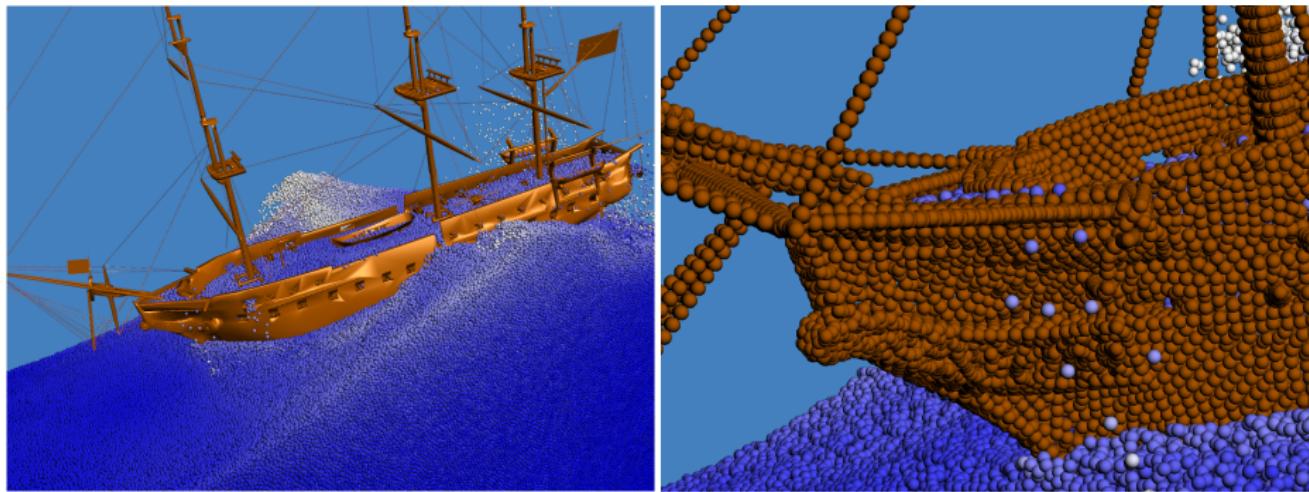
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- ▶ Natural treatment of boundary conditions and special interactions in multiphase/multicomponent applications through particle interactions.



SPH Formulation

The central notion of SPH is the spatially weighted interpolation:

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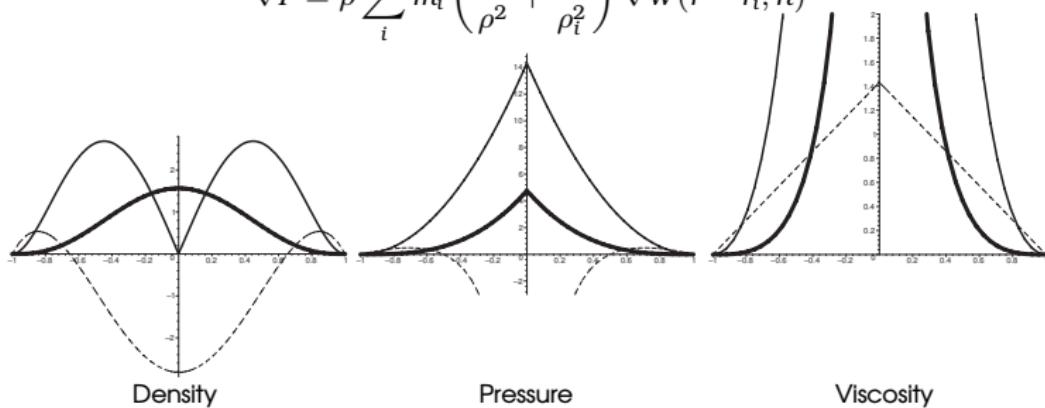
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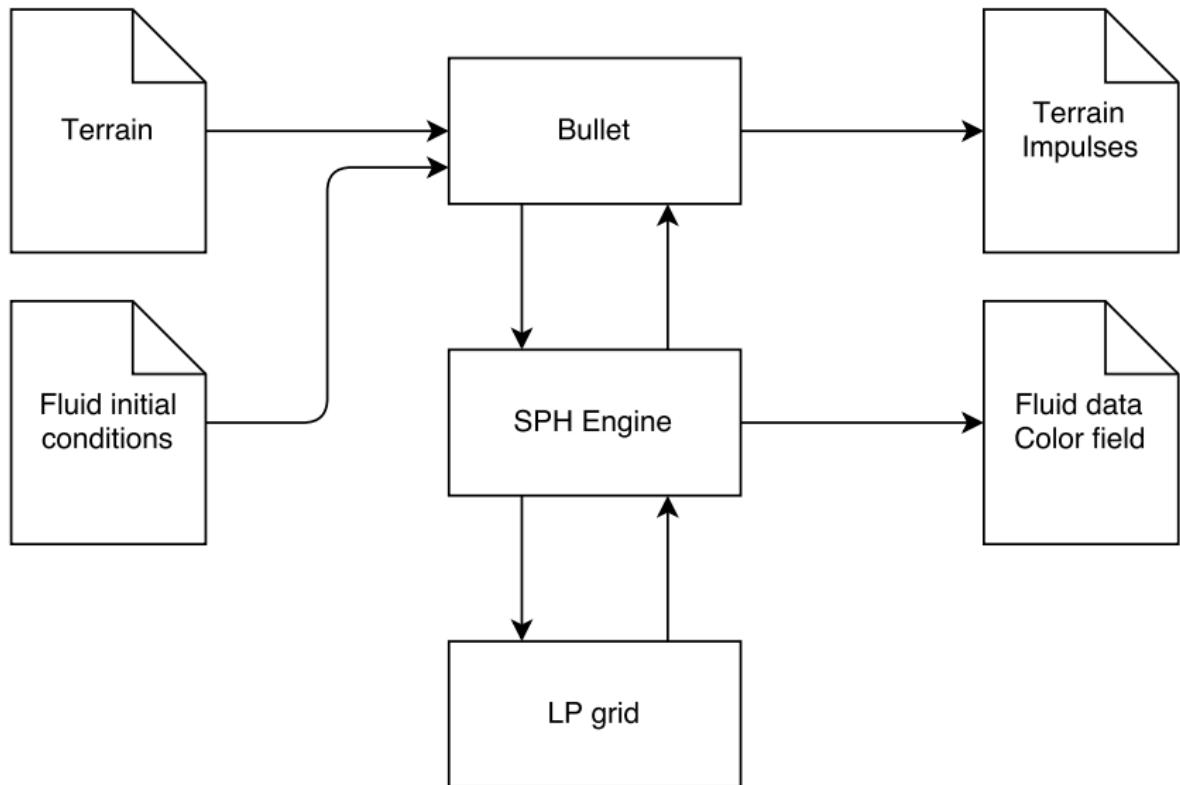
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Architecture



SPH Engine – LP grid

SPH Engine calculates fluid forces according to SPH:

Density → State Equation → Pressure → Pressure Gradient	⇒	Pressure Forces
Velocity → Velocity Laplacian	⇒	Viscosity Forces

which are integrated back to the particle system through Bullet.

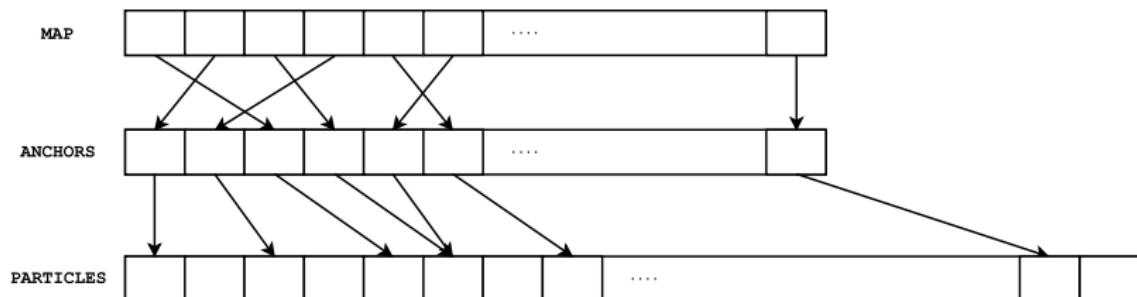
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Spatial hashing data structure (LP grid) for the optimization of particle access:



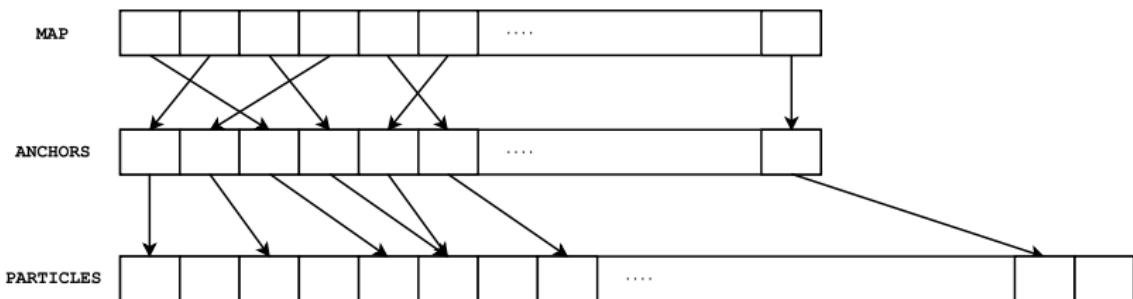
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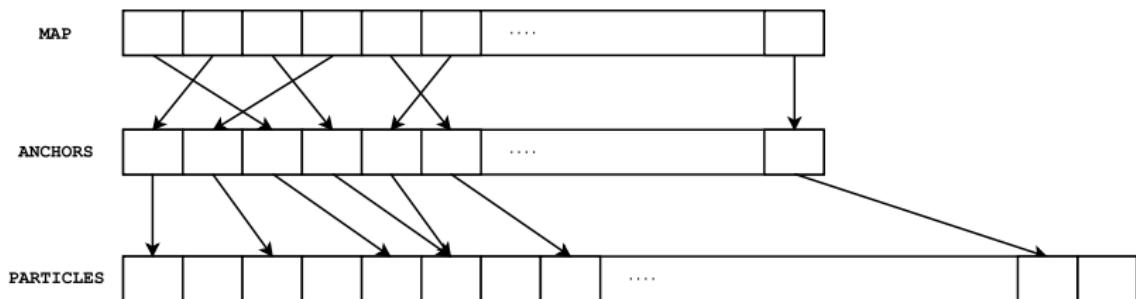
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- ▶ Cohesive particle storage.
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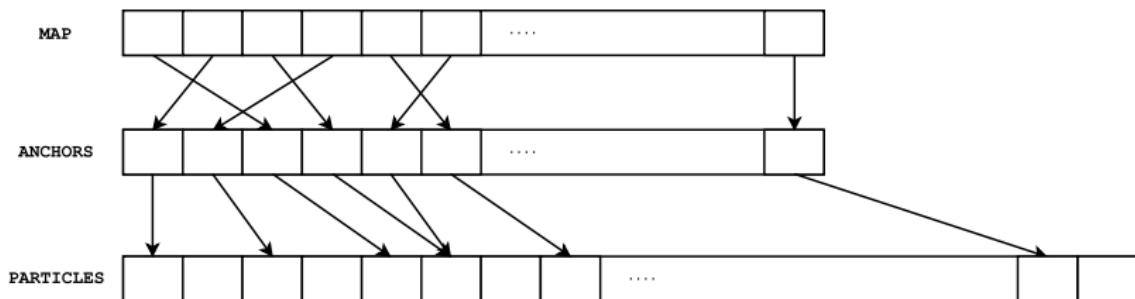
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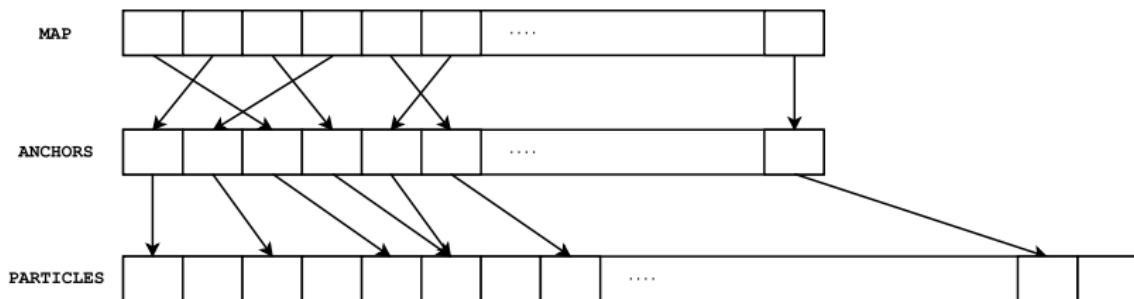
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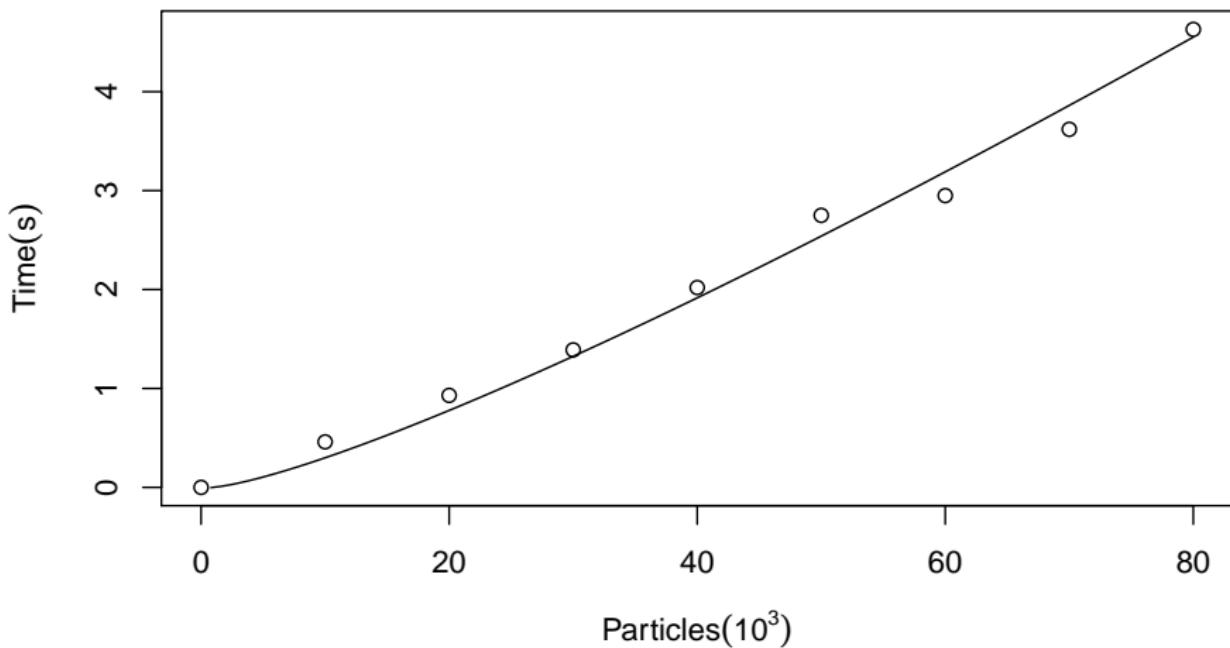
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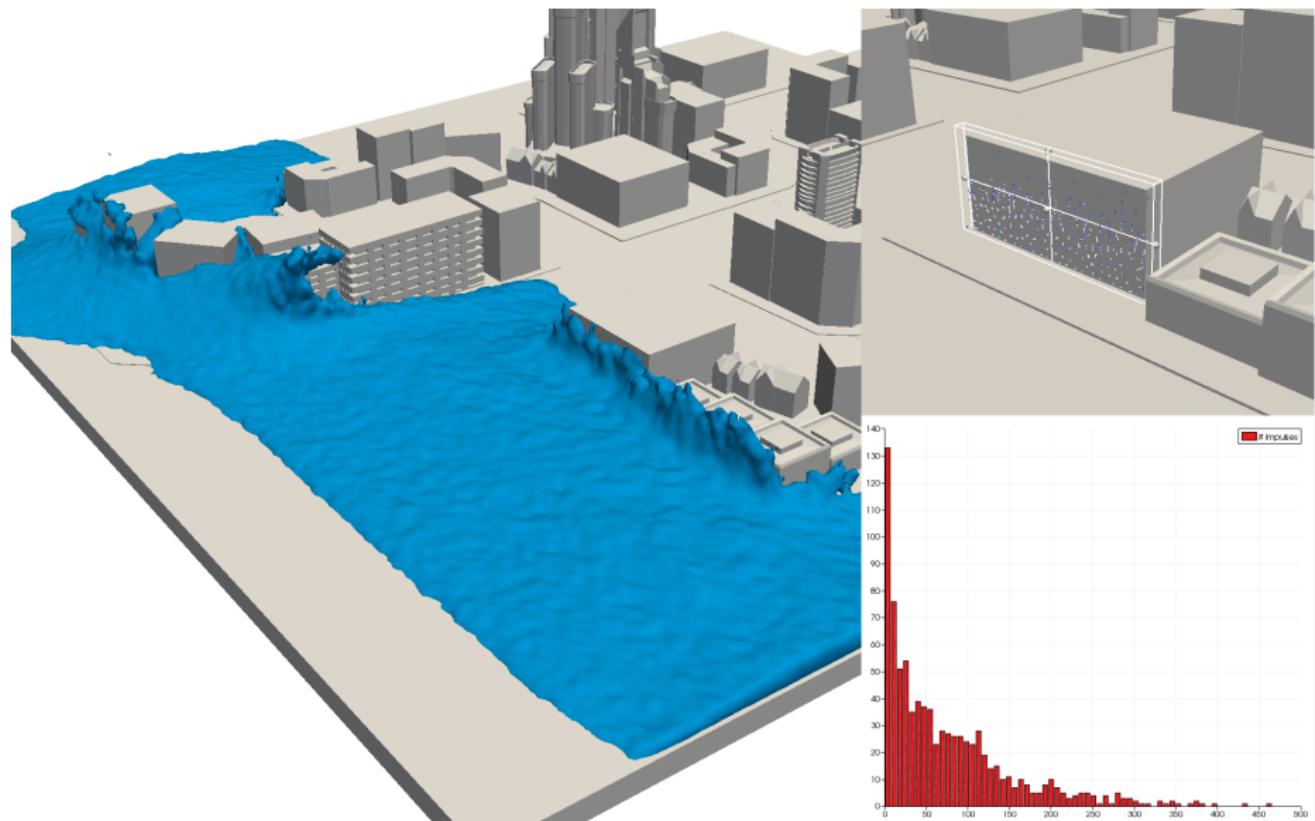


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- ▶ Optimized cache memory usage during particle interaction scanning owing to the LUT-encoded locality preserving mapping from the 3D domain to linear storage, obtained by spatial sorting of the grid cells.

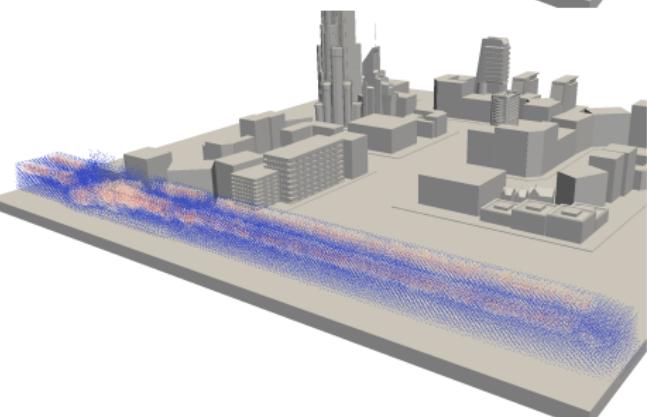
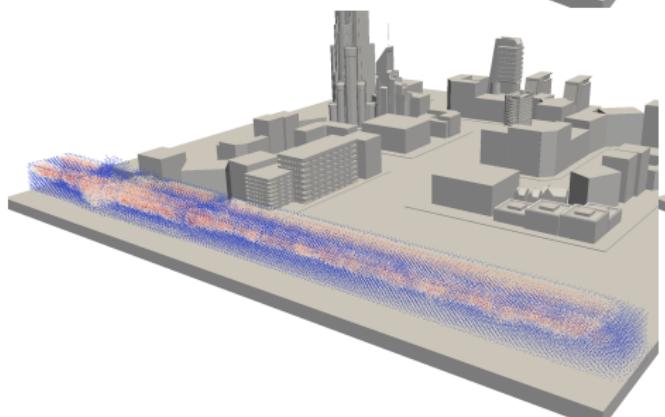
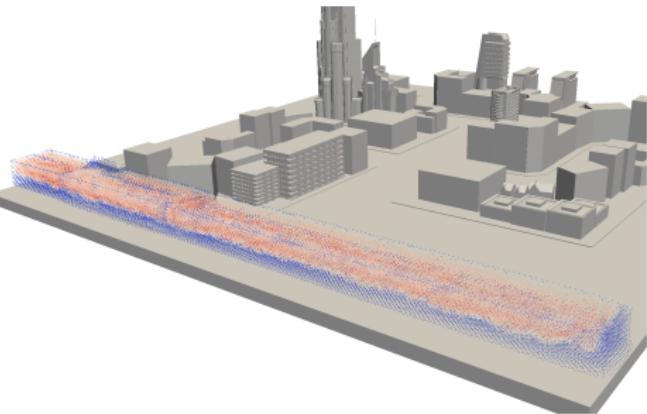
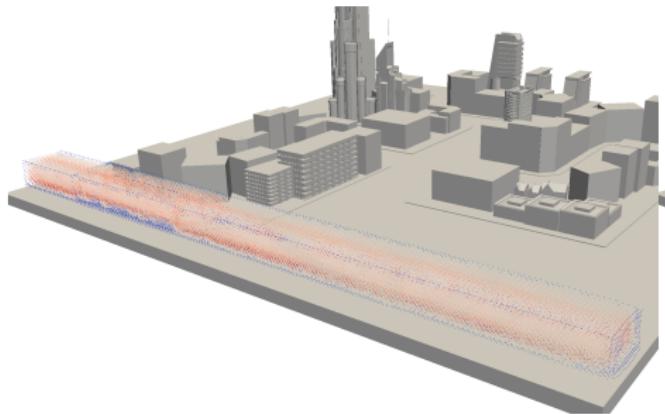
Performance



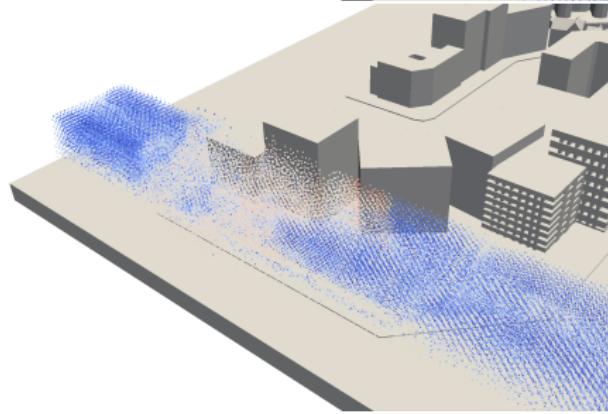
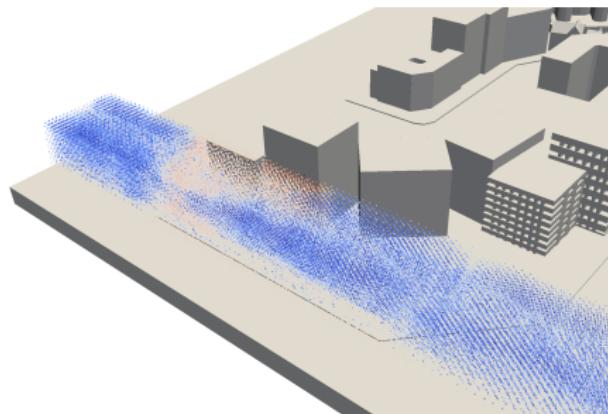
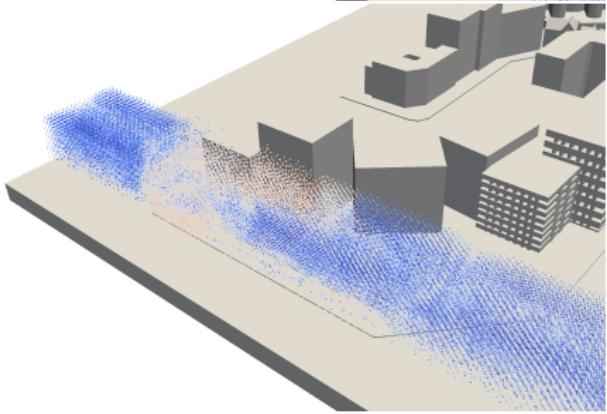
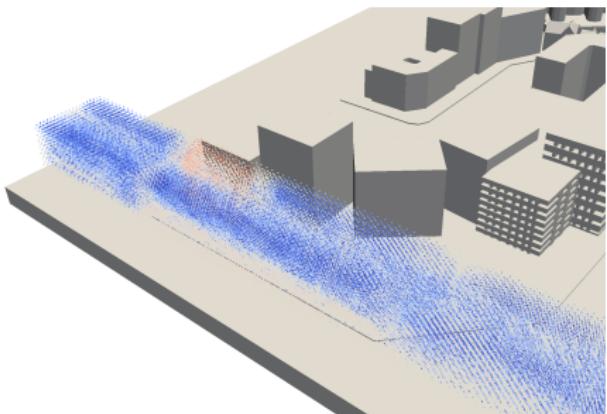
Interactive visualization



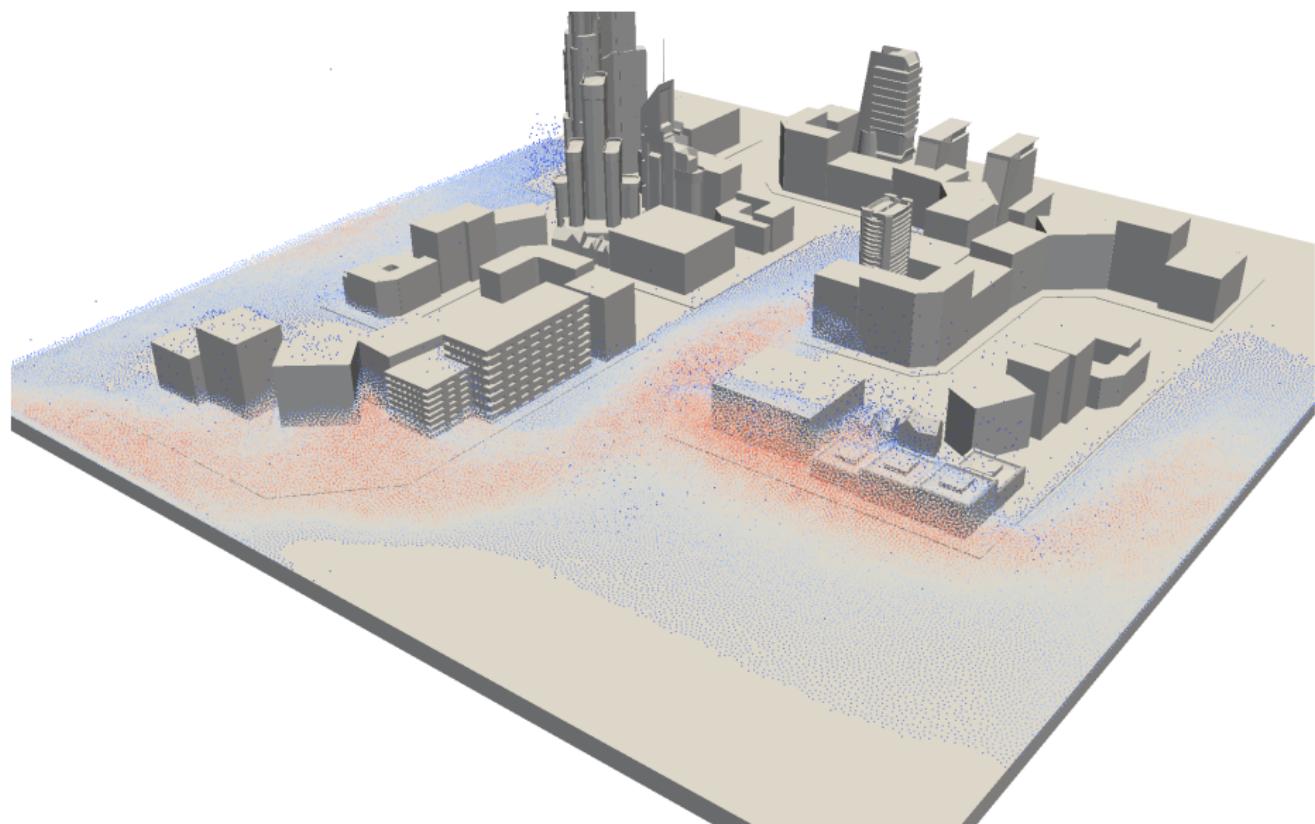
Pressure



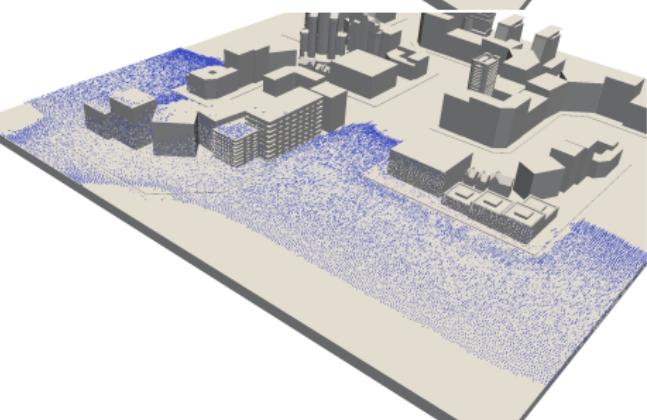
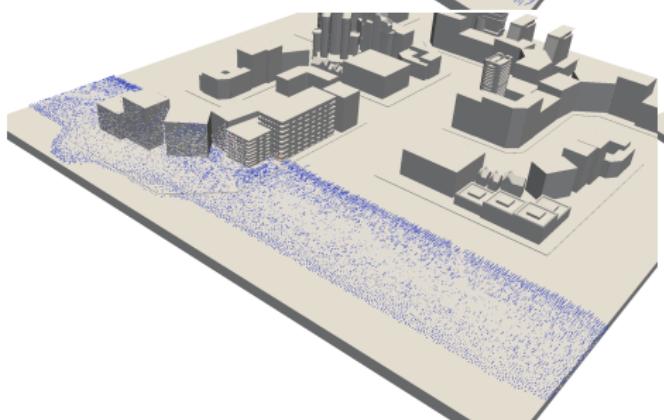
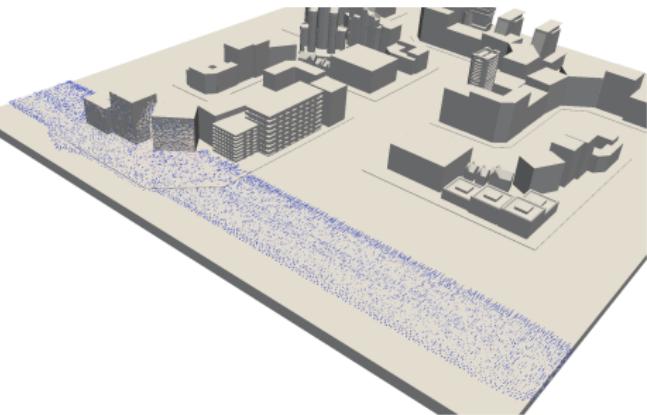
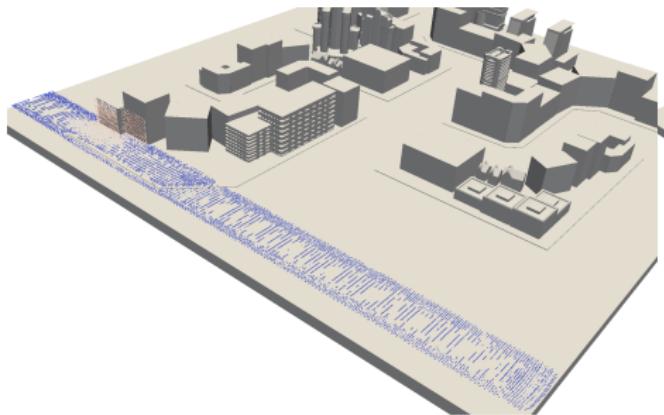
Viscosity



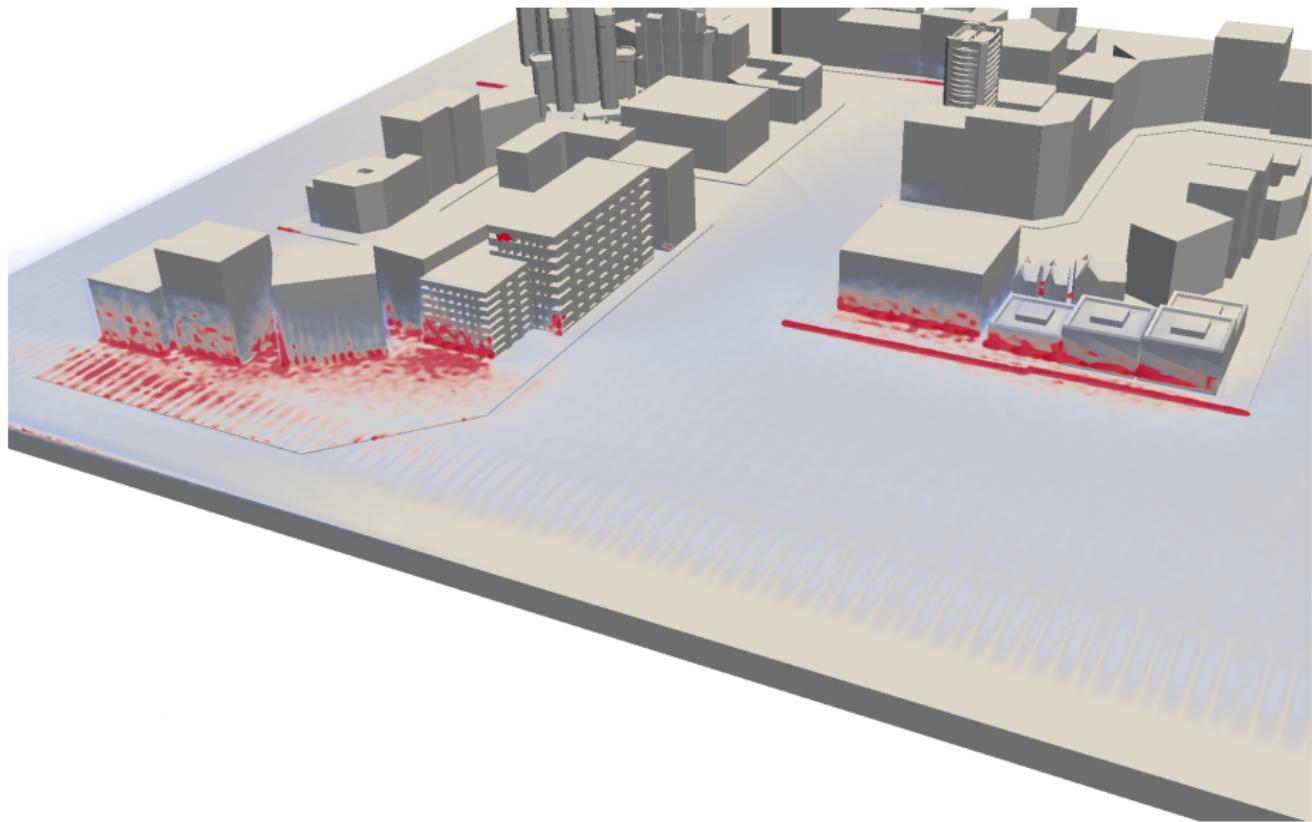
Neighbour particle count



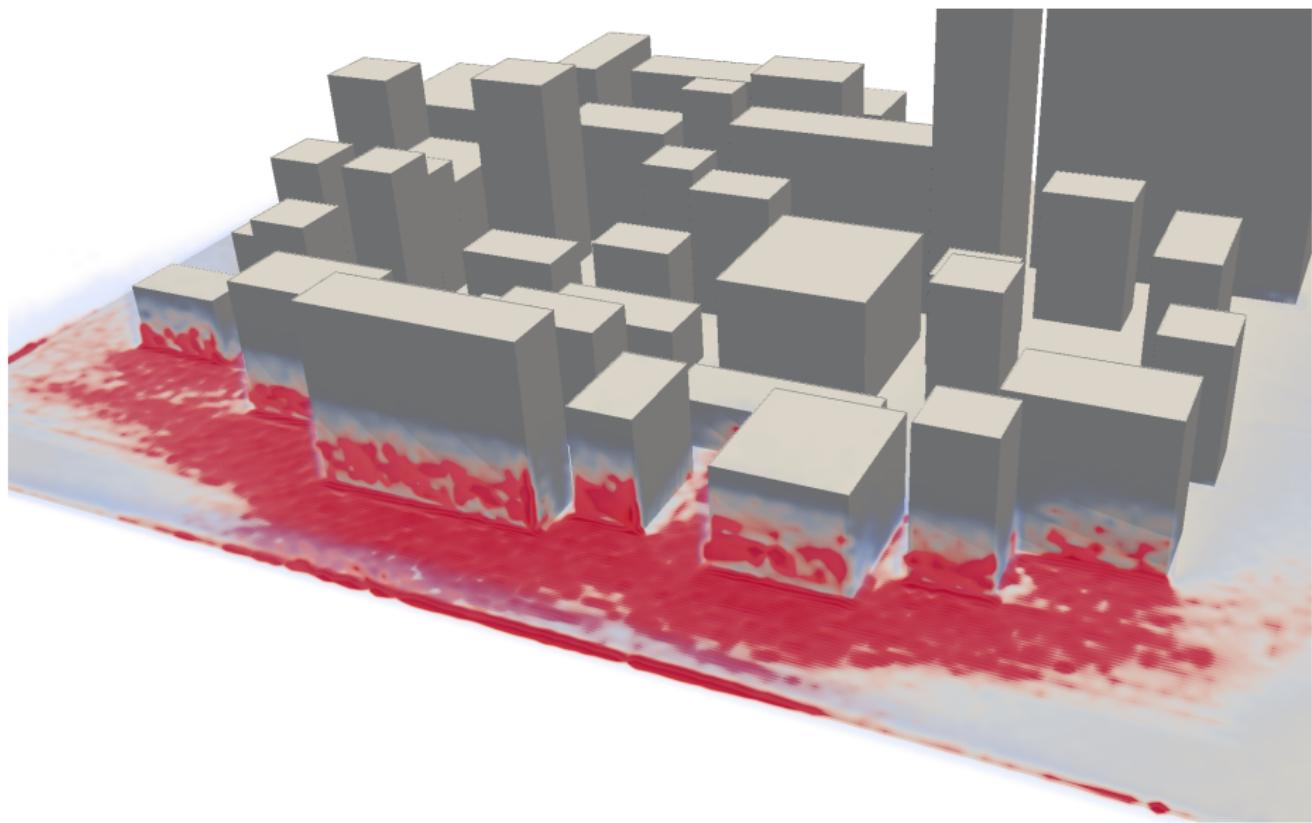
Impulses



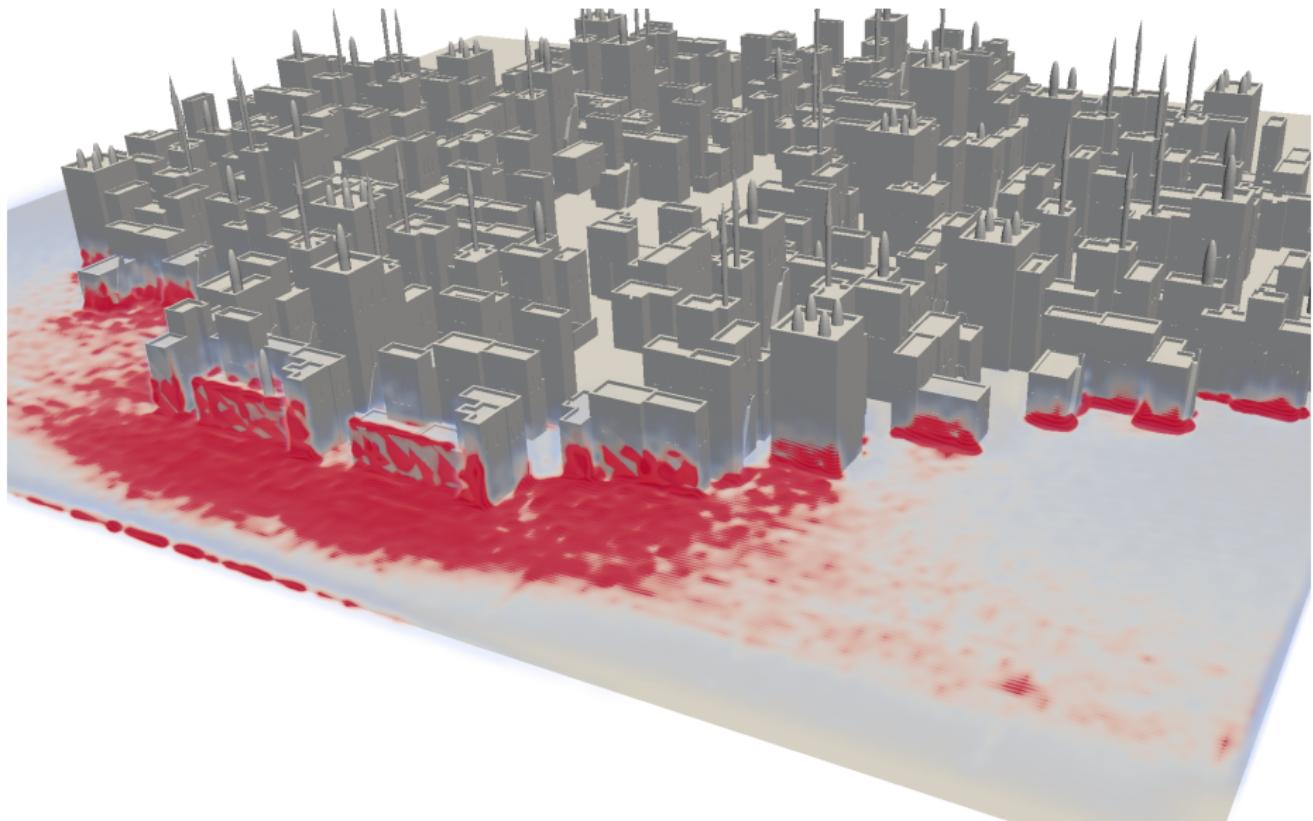
Impulse heatmap



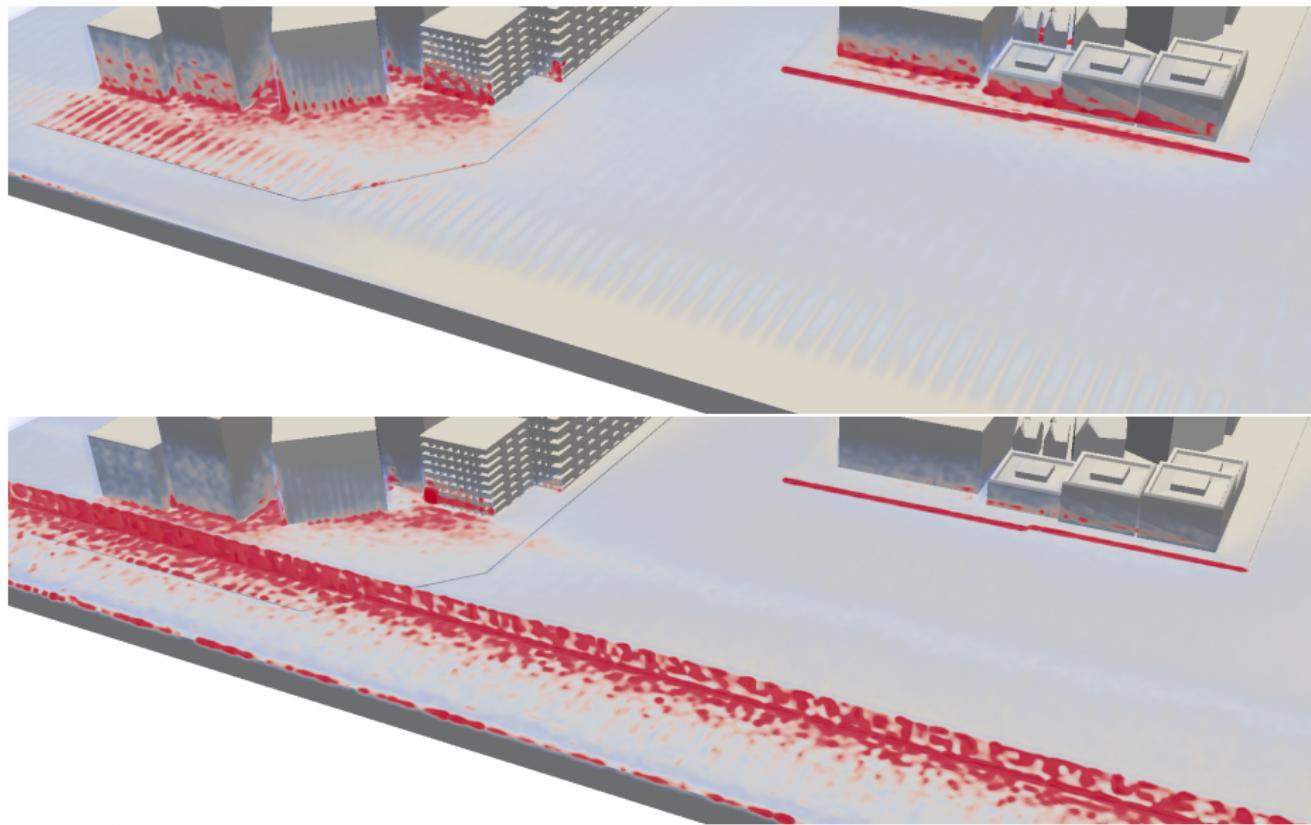
Impulse heatmap



Impulse heatmap



Seawall effectiveness



Thank you!

Questions?