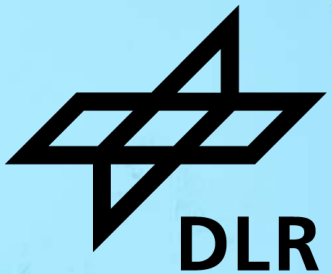
ADAPTIVE MULTIRESOLUTION

Exploring Data Using Adaptive Multiresolution Datastructures

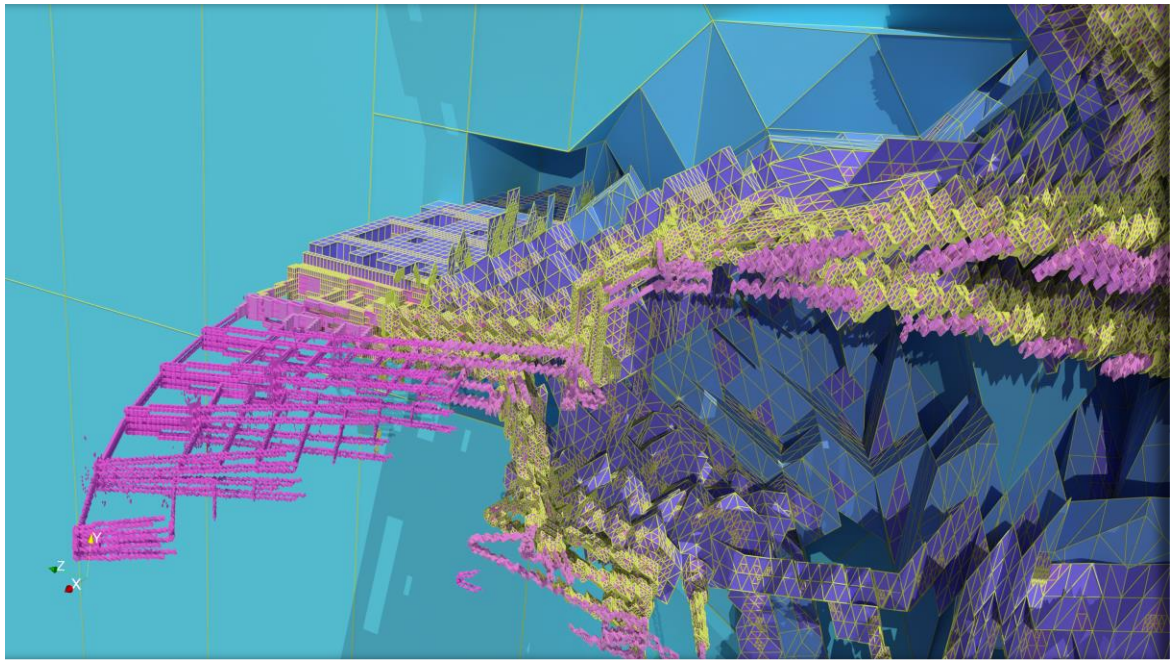


David Knapp, DLR

BIG DATA FOR BIG PICTURES?

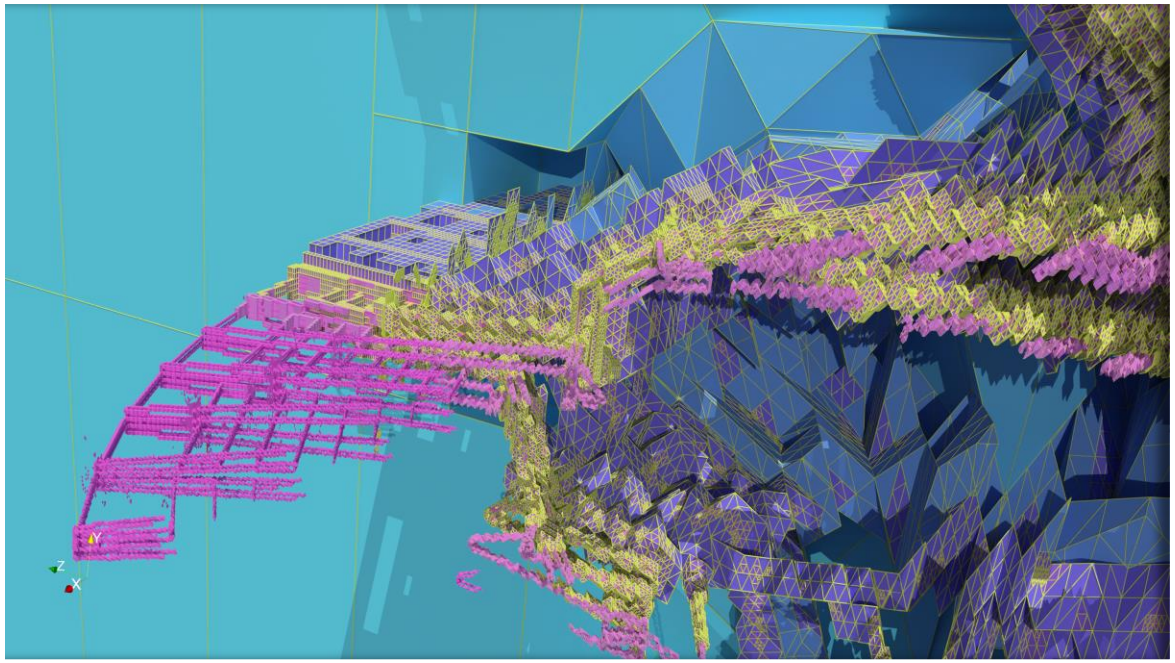
Data-analysis

- Do I need the full resolution to construct my visualization pipeline?
- Can I process my data already on a coarser resolution?
- Is the available resolution necessary?



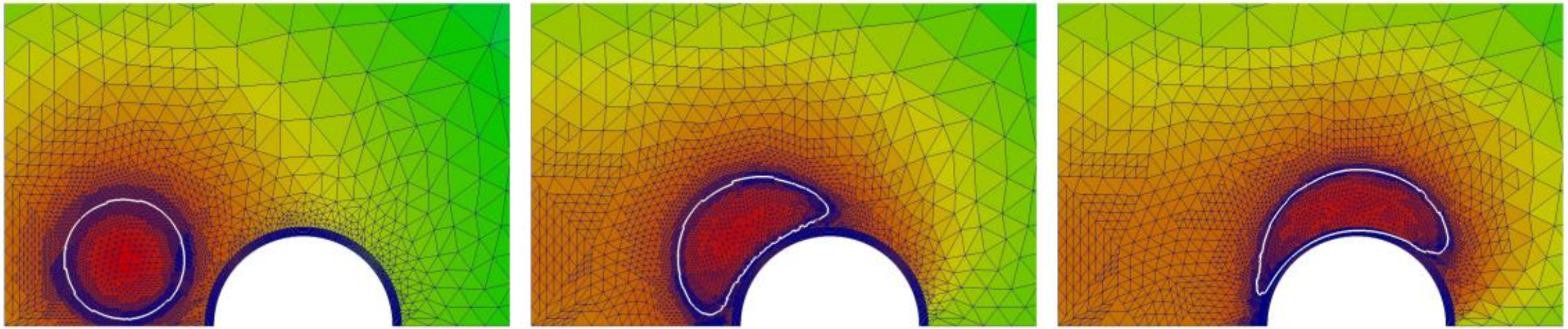
Data-analysis

- Distributed Software Infrastructure inside the DLR to enable the analysis of large scientific Datasets
- Usage of High-Performance computing for fast and efficient data-processing
- Interactive visual analysis at workplace



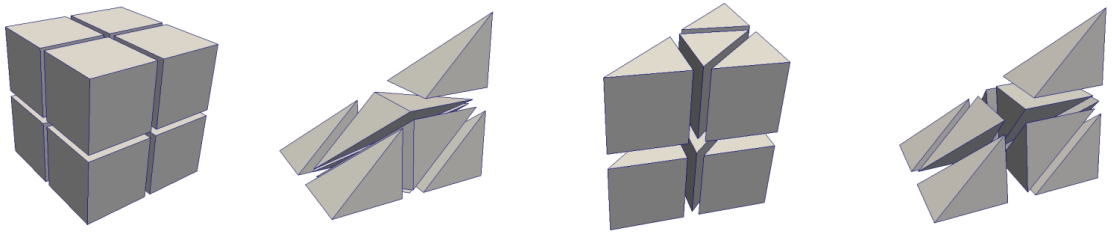
t8code

- Supports all standart elements in 1D, 2D, 3D
- Scales up to 1 mio. MPI Prozesse and up to 1 Billionen (10^12) elements

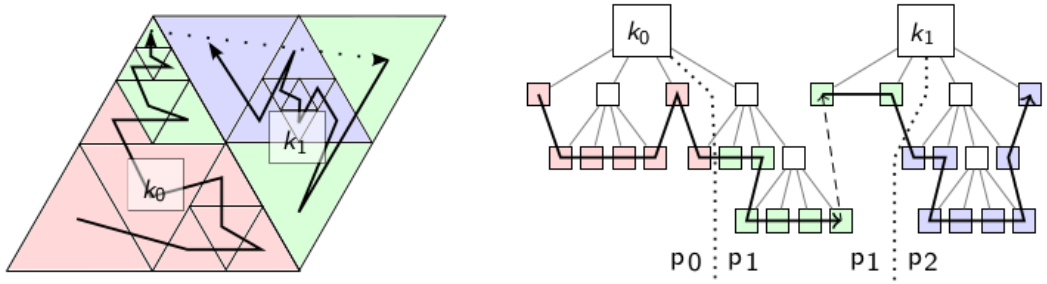


t8code – hierachical datastructure

- „Coarse“-elements with recursive refinement structure

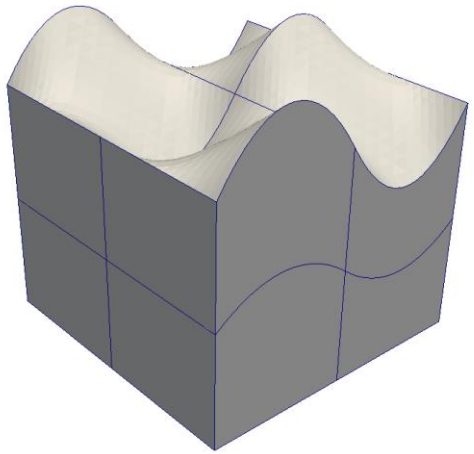


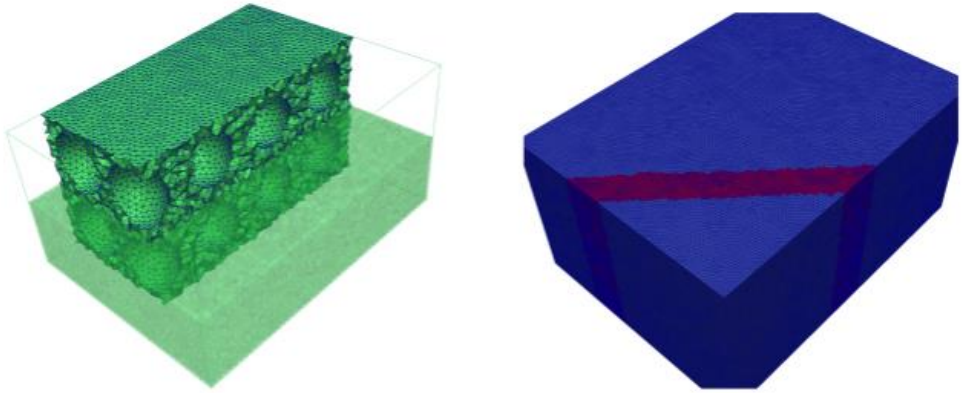
- Usage of SFC for efficient indexing and parallelization of the data



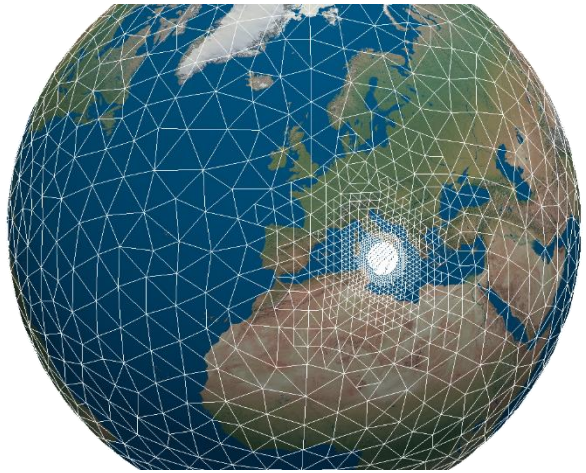
t8code – tree to forest

- Merge multiple trees to a forest.

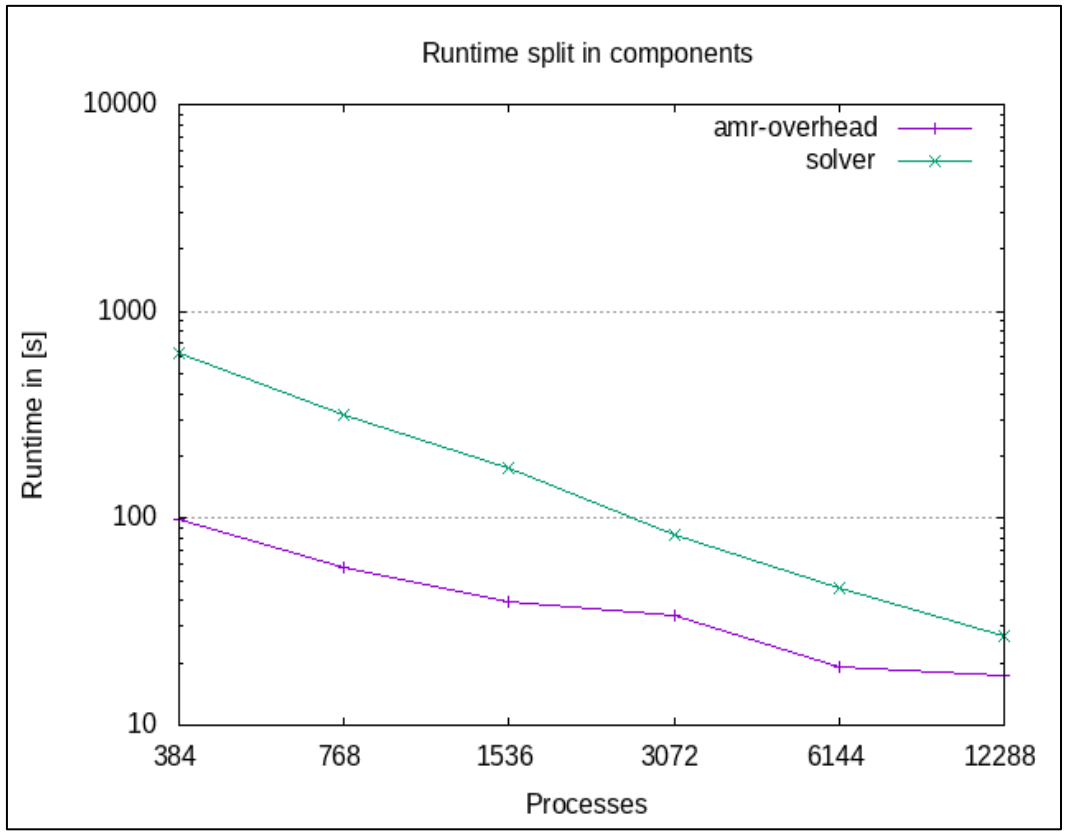




Left geometry: 11k spheres, 383 million tetrahedra
Right adaptive refinement: 167 billion tetrahedra



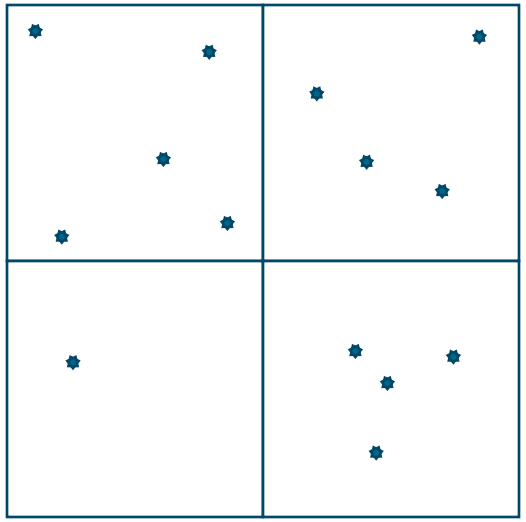
t8code is an enabler of simulations



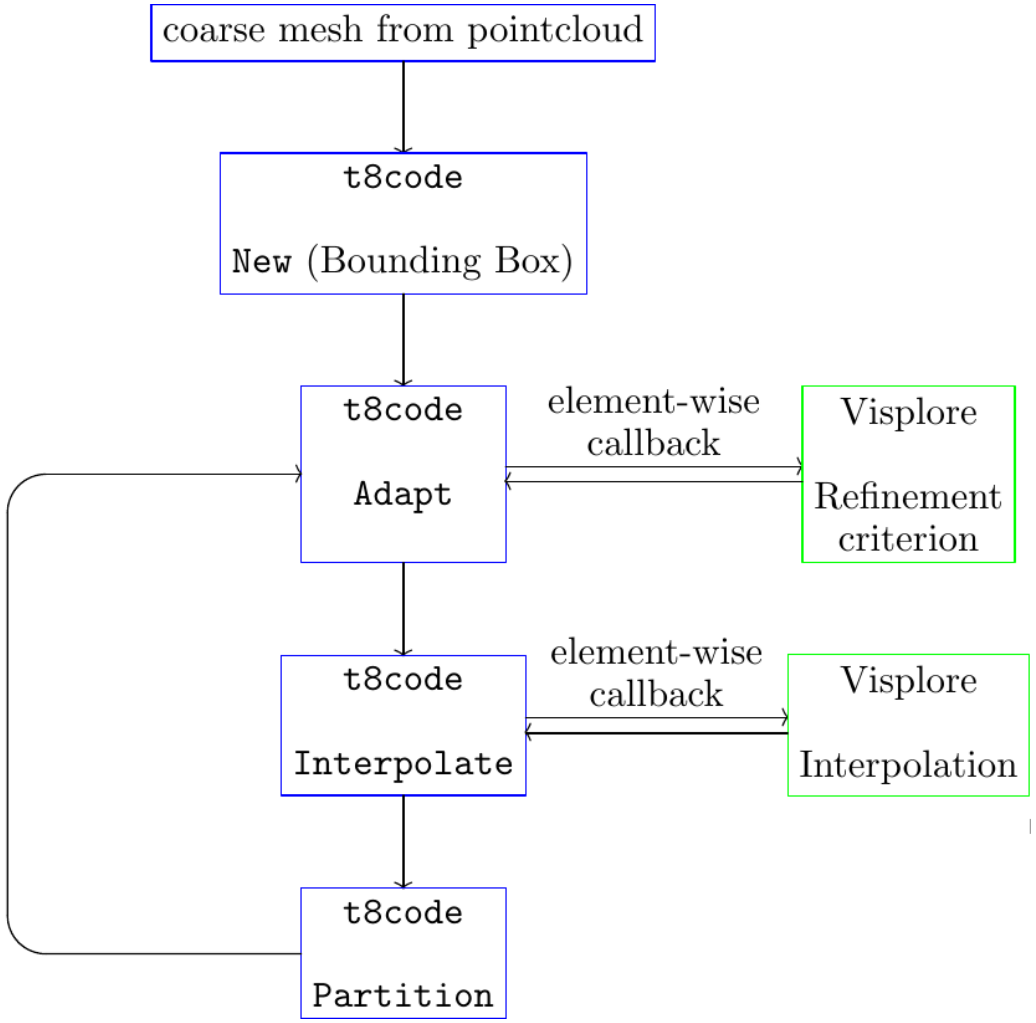
	Runtime	Error	#DOFs
Uniform 3D	7057s	1.3e-3	16.777.216
Adaptive 3D	561s	1.5e-3	~1.920.000

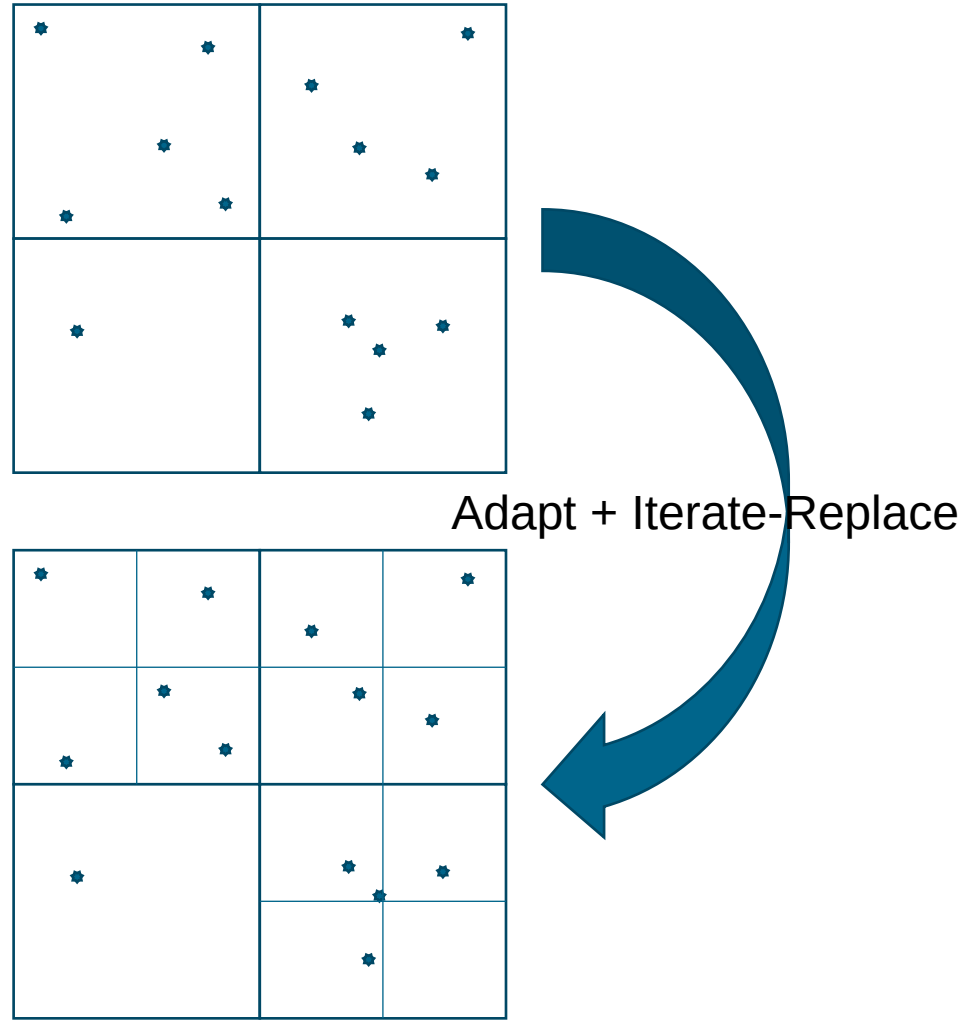
t8code-Pipeline for Multiresolution

1. Use data-points
2. Embedd pointcloud into a bounding box
3. Associate each point with a an element in the bounding box.

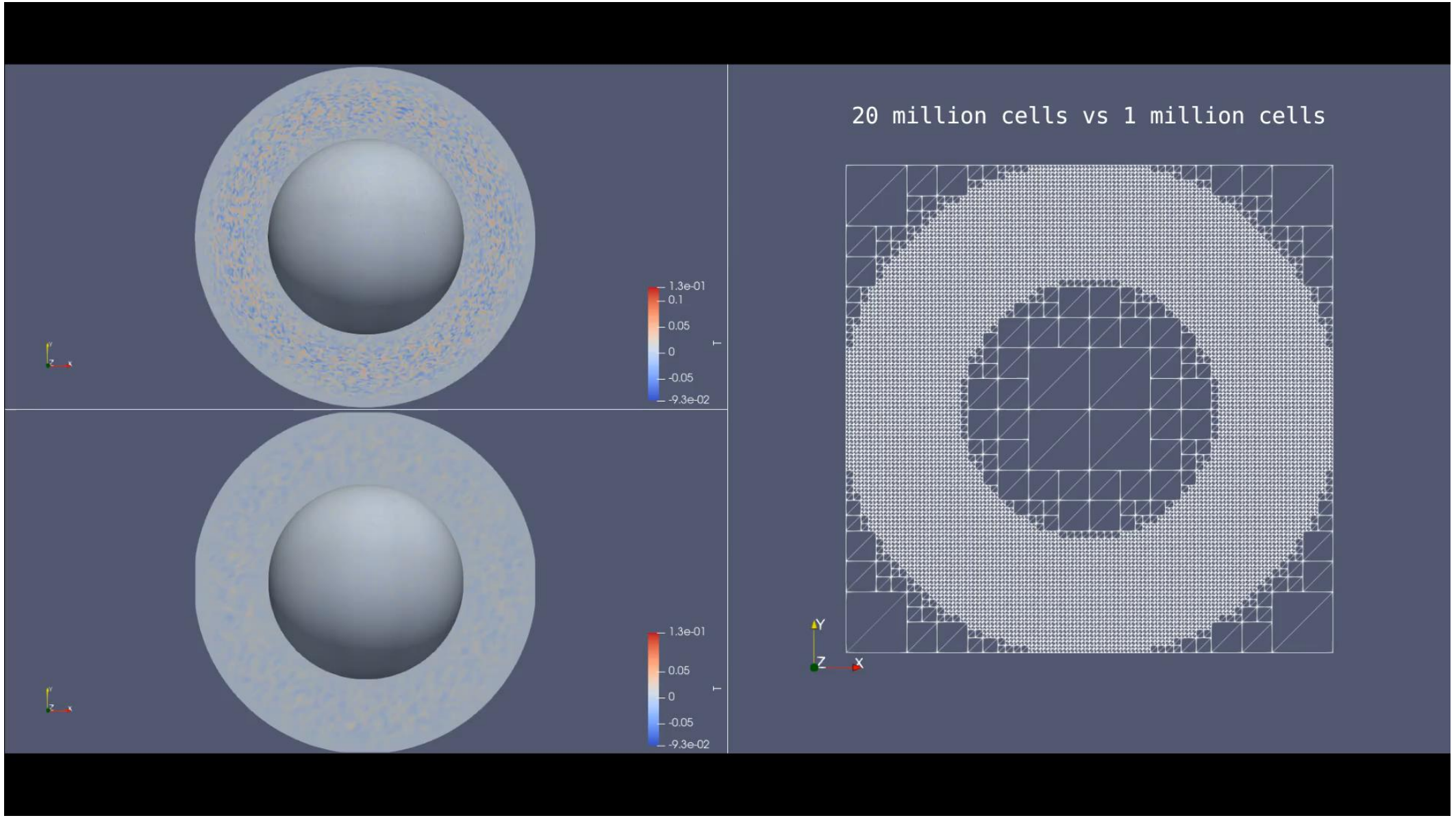


t8code-Pipeline for Multiresolution

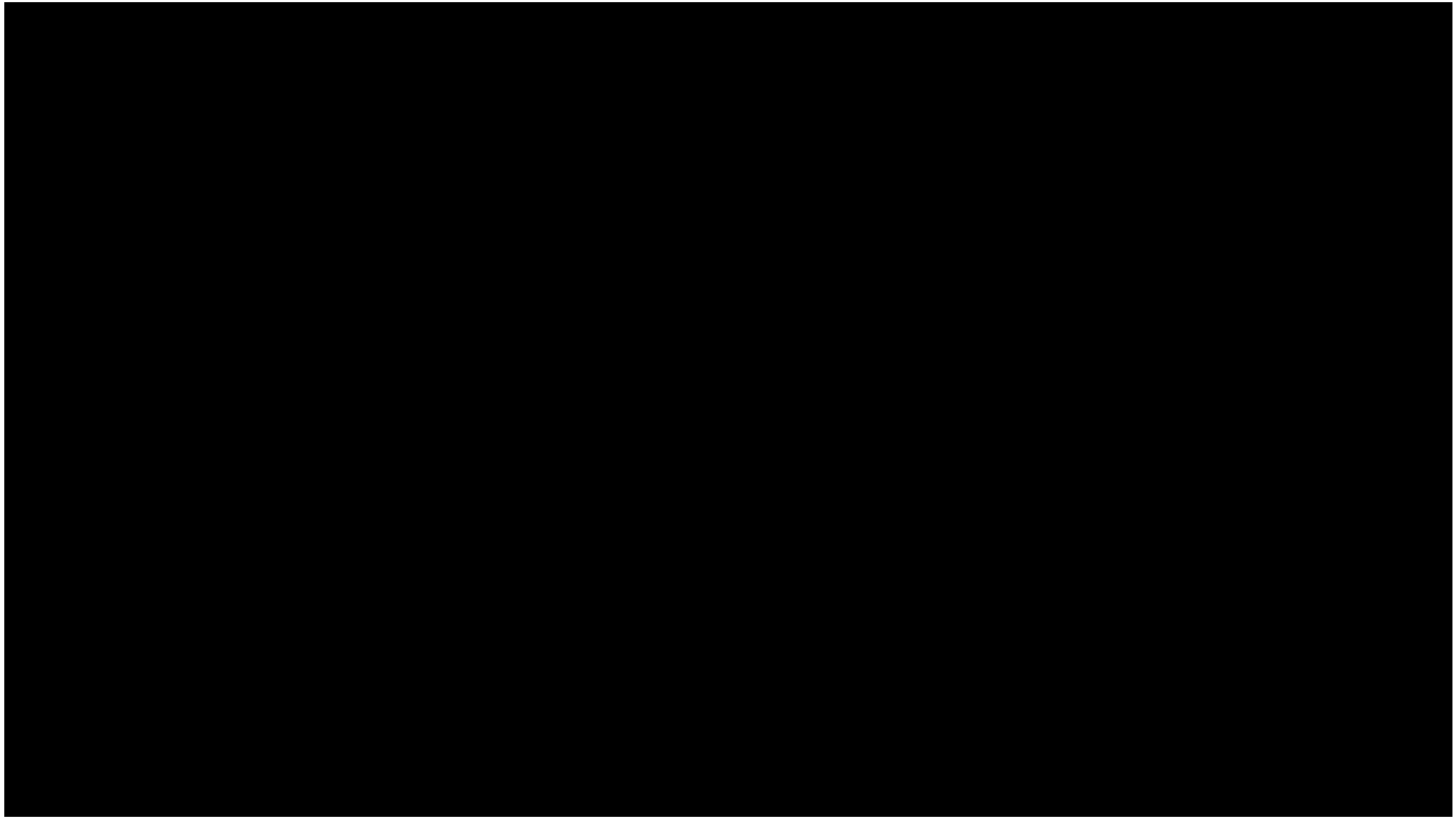




Mantle Convection



Interactivity



Summary

- Represent data at a fraction of its original cost
- We can adapt the resolution fast

More t8code?

Lukas Dreyer,
Space-filling Curve,
Thursday, 12:00,
ID.64

Sandro Elsweijer,
Space Filling
Multilevel,
Thursday, 14:40,
ID.125

Are you adapting?

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