CFD Module: OpenFOAM in Urban Air Pollution Simulation on HPC

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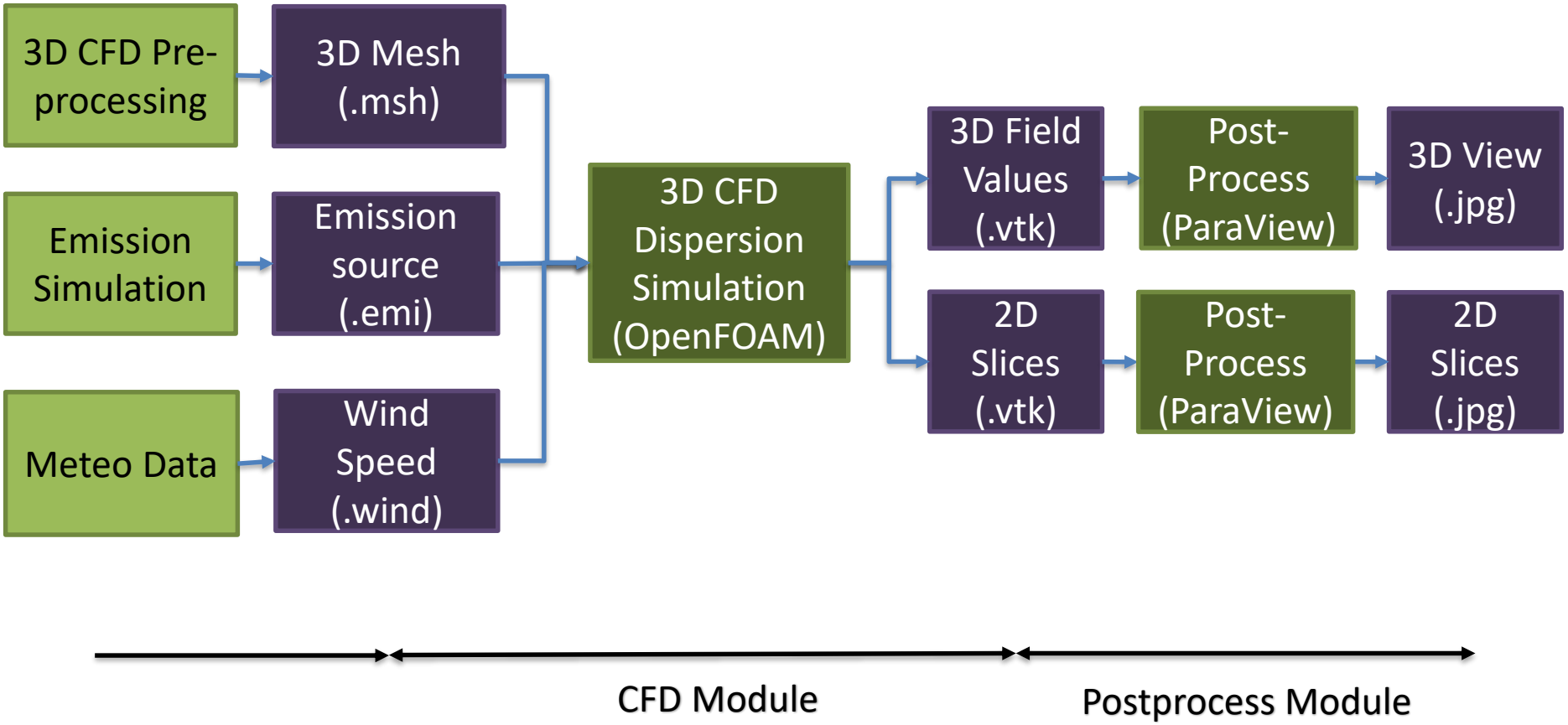
HiDALGO – EU founded project #824115

OpenFOAM

- Versatile C++ Toolbox of numerical solvers and utitilies, including CFD
- GPLv3: Free of charge, Open source
- Highly scalable using MPI
- Community supported
- Widely used in academics and industry
- Version 6 from openfoam.org

OpenFOAM

Input and output Data for Dispersion Simulation



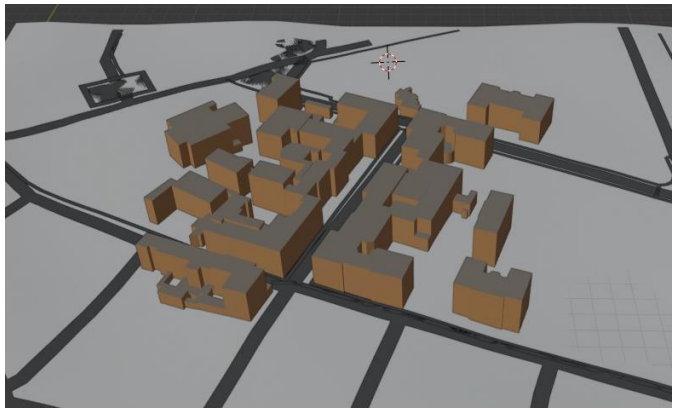
Accessing HiDALGO Cluster

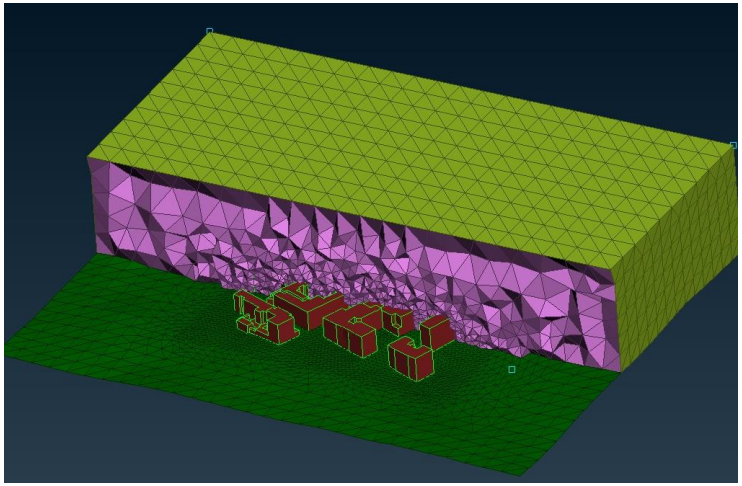
- Download putty (Windows only)
  - https://www.chiark.greenend.org.uk/~sgtatham/putty/
- Connect to Cluster
  - ssh 193.224.130.186 (Mac and Linux)
  - open 193.224.130.186 with putty (Windows)
  - User and pass on paper
- Presentation and command list online
  - http://www.sze.hu/~leslie/hipeac/

Preparing UAP Simulation with OpenFOAM

- Enter OpenFOAM environment
  - of6-native
  - mkdir run && cd run
- Extract simulation files
  - tar zxf /work/OpenFOAM/repo/foam_tutorial.tar.gz
- Copy input files
  - cp -r /work/OpenFOAM/repo/input/bologna/* input

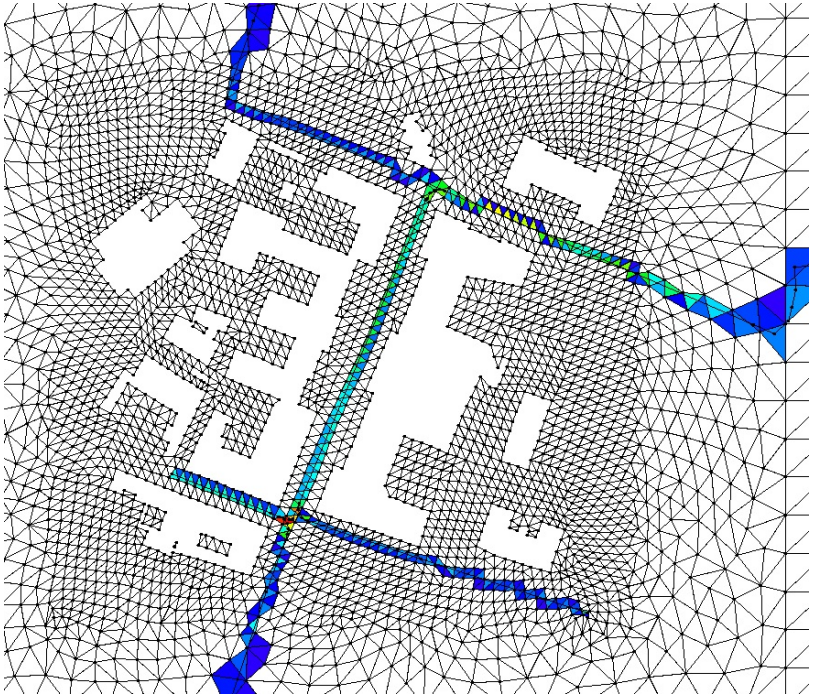
Import 3D Geometry for OpenFOAM





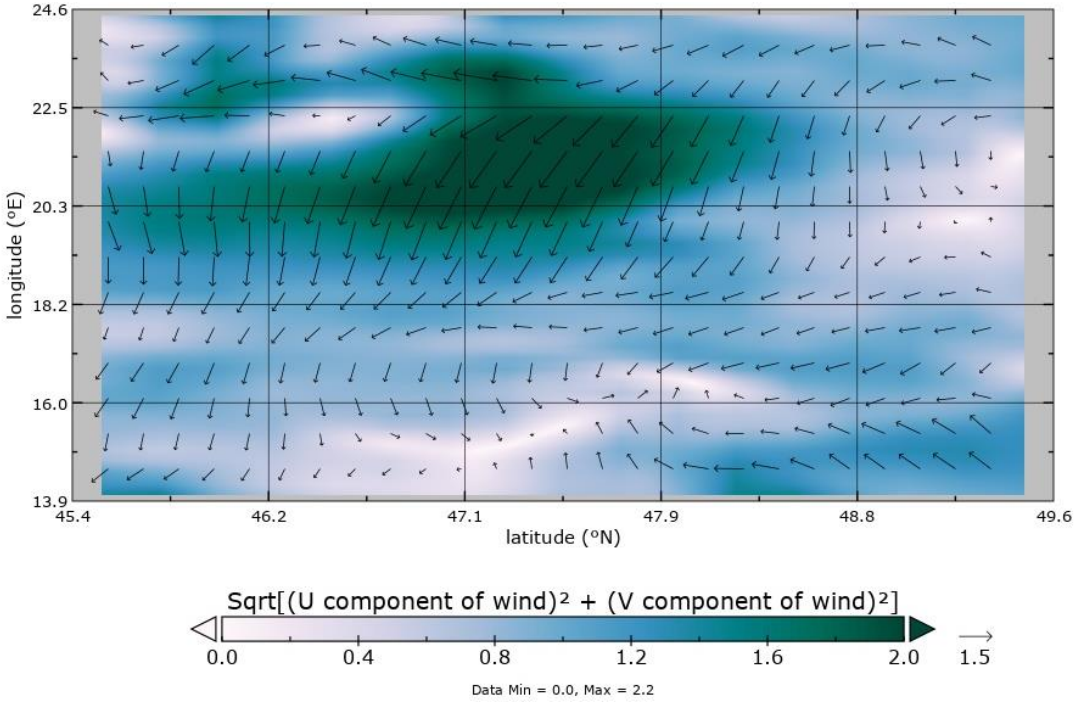
fluent3DMeshToFoam input/bologna.msh

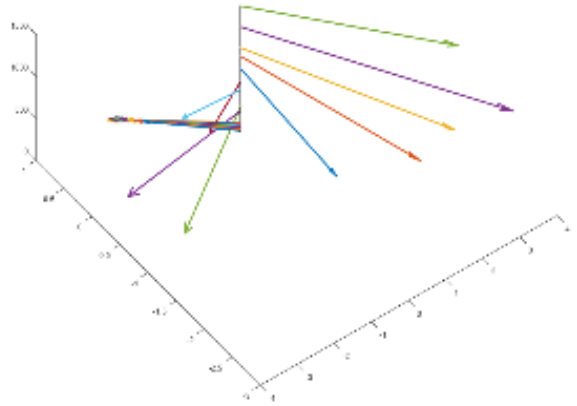
Import pollution source for OpenFOAM



emi-import input/bologna.emi system/

Import wind speed boundary for OpenFOAM



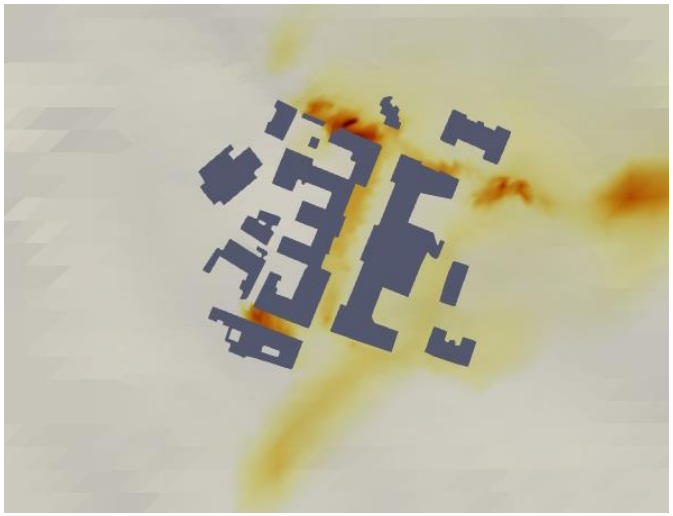


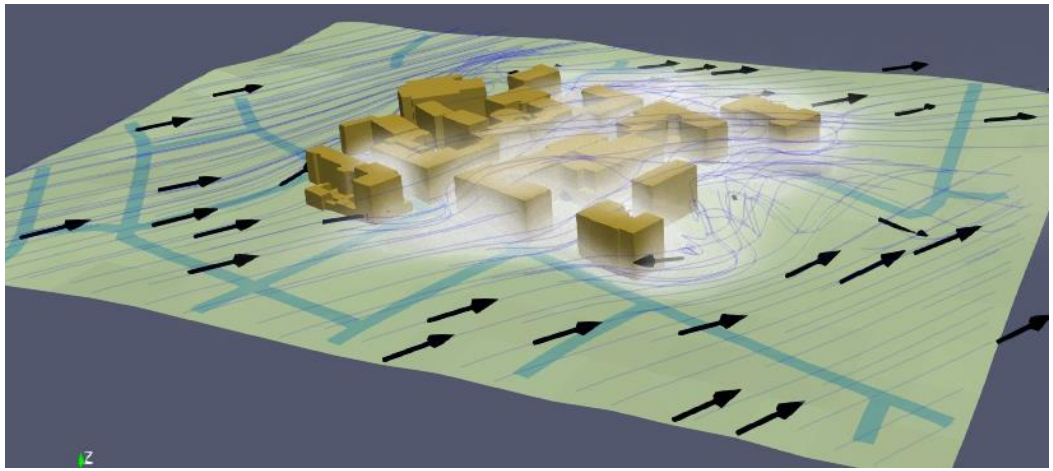
wind-import input/bologna.wind? 0.clr/include

Running UAP Simulation with OpenFOAM

- Copy surfaces for postprocess
  - cp input/ground_?m.stl constant/triSurface
- Set number of cores
  - Edit system/decomposeParDict
  - numberOfSubdomains 12;
  - Edit Allrun
  - nodes=1, ntask-per-nodes=12
- Submit simulation sbatch ./Allrun
- Check queue squeue
- Check runtime cat slurm.??.???.out

Postprocessing and viewing the Results





- Do automated postprocess
  - ./pp.sh
- View results (workshopdemo12)
  - ruby -run -ehttpd JPG -p8012
  - view 193.224.130.186:8012 in browser

THANK YOU !

QUESTIONS ?

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