UNIVERSITY OF Southampton

CFD Capability for Urban Environments

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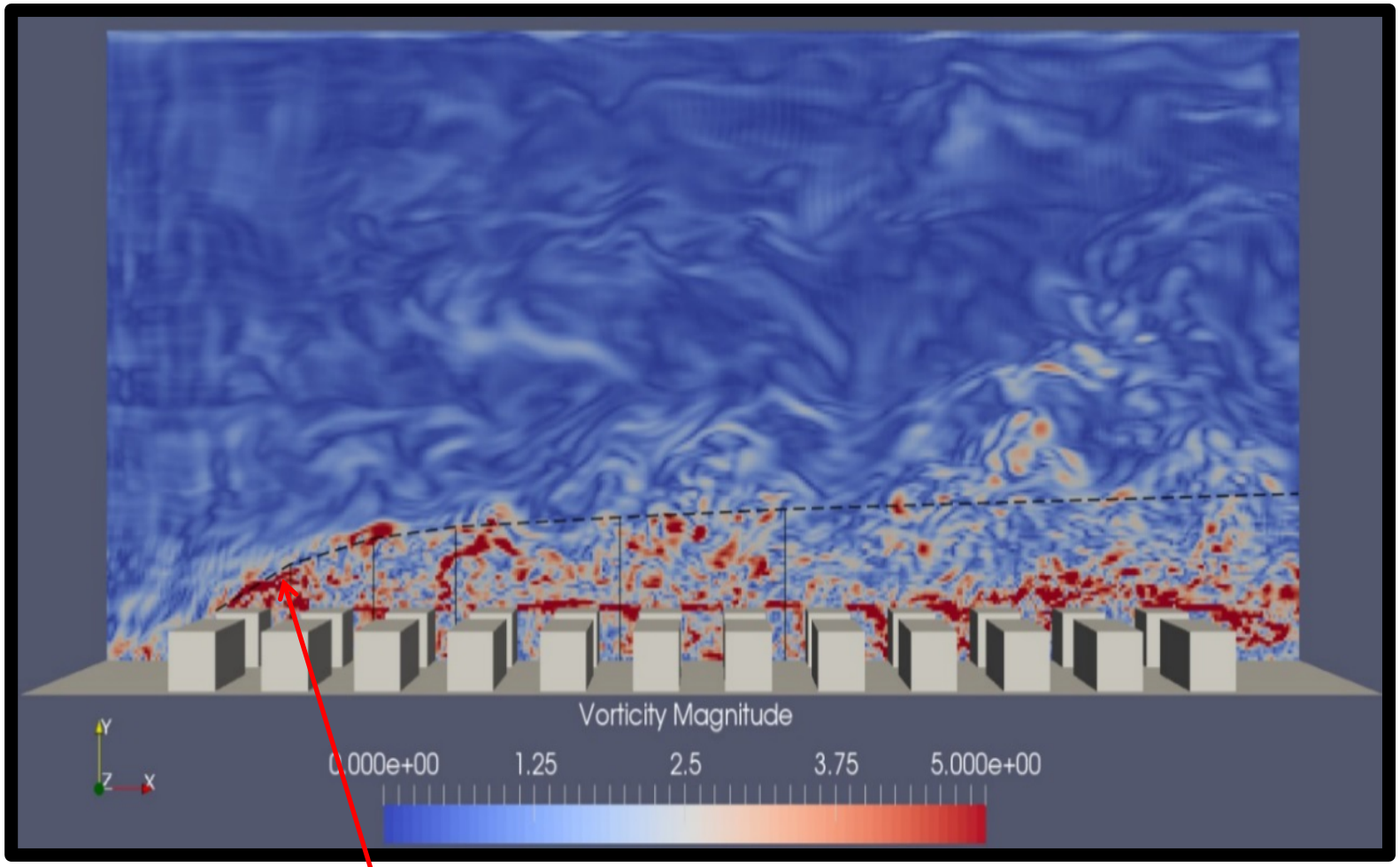
Building and boundary layer interaction in neutral and non-neutral stratification



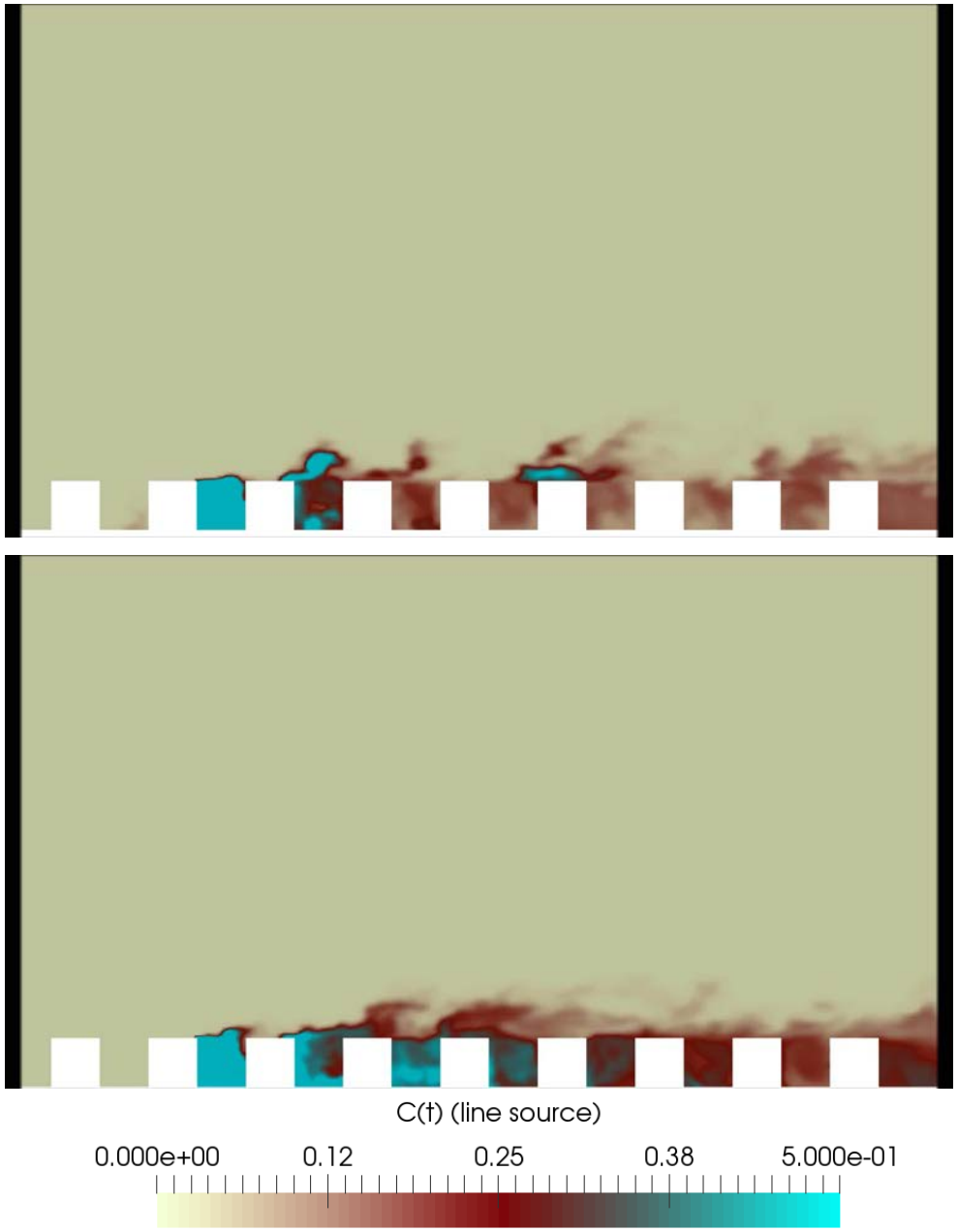
Sessa et al (2018, 2019)

Growing internal boundary layer from the leading edge (first row of buildings)

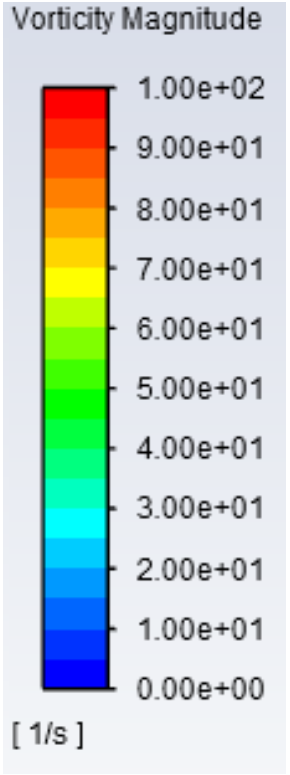
Line source dispersion across the blocks

Ri=0.2

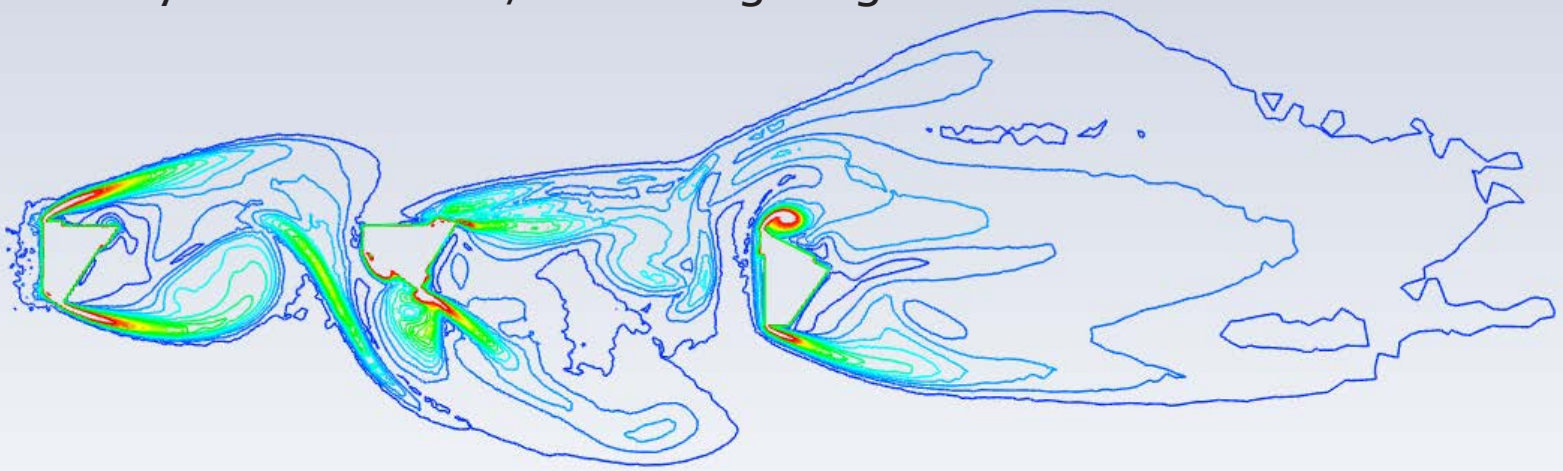
Ri=1



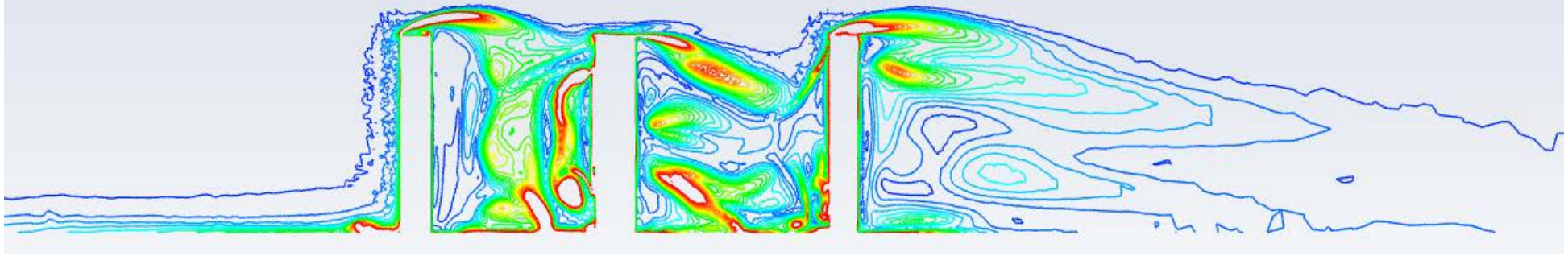
Flow around tall buildings in west wind: Barbican buildings (from a BEng project)

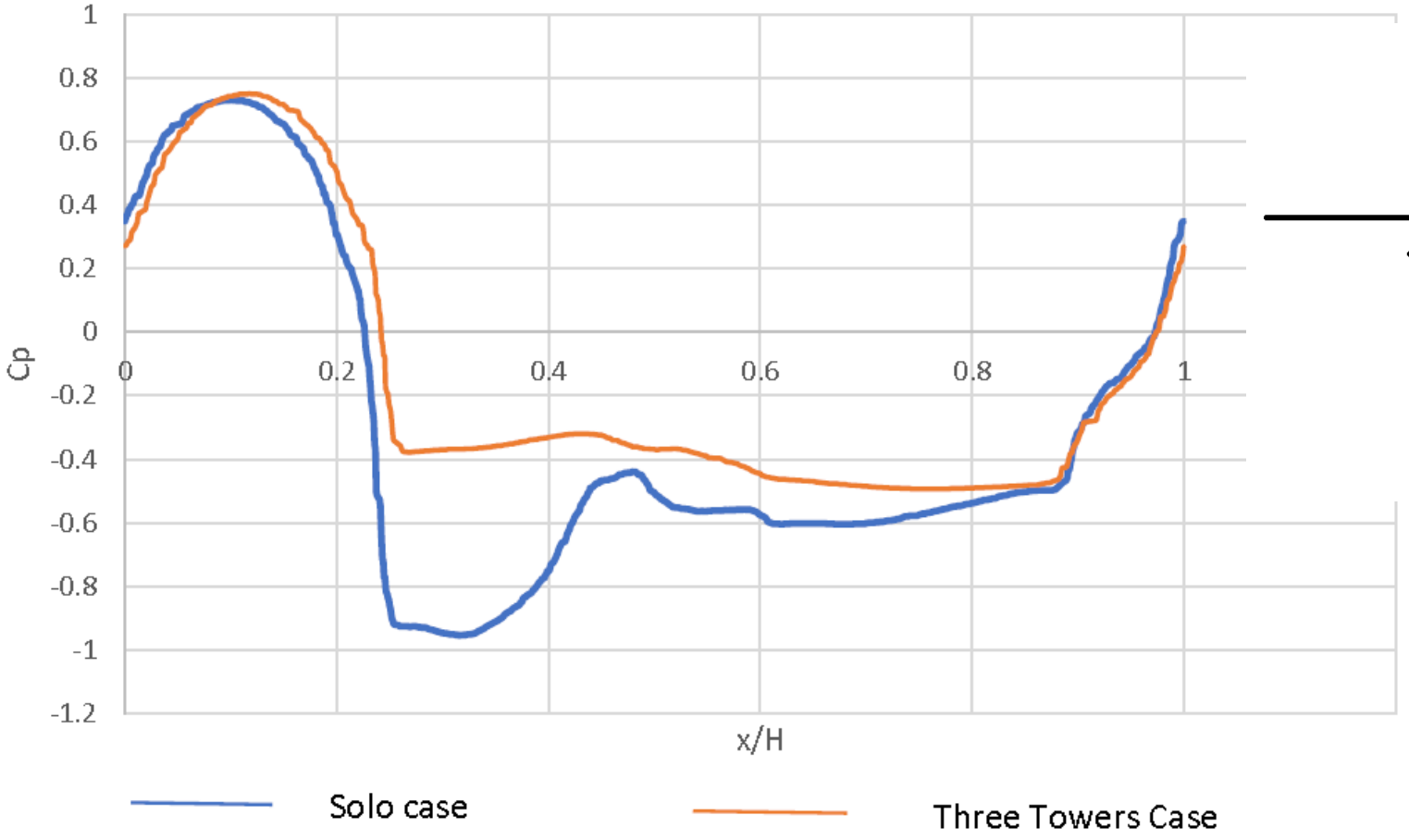


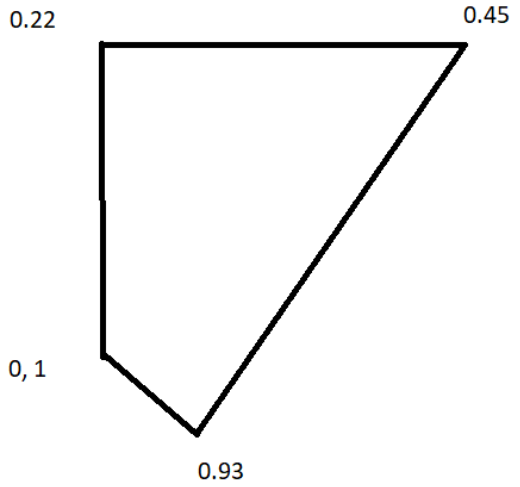
Vorticity contours at 2/3 building height



Vorticity contours across central vertical plane



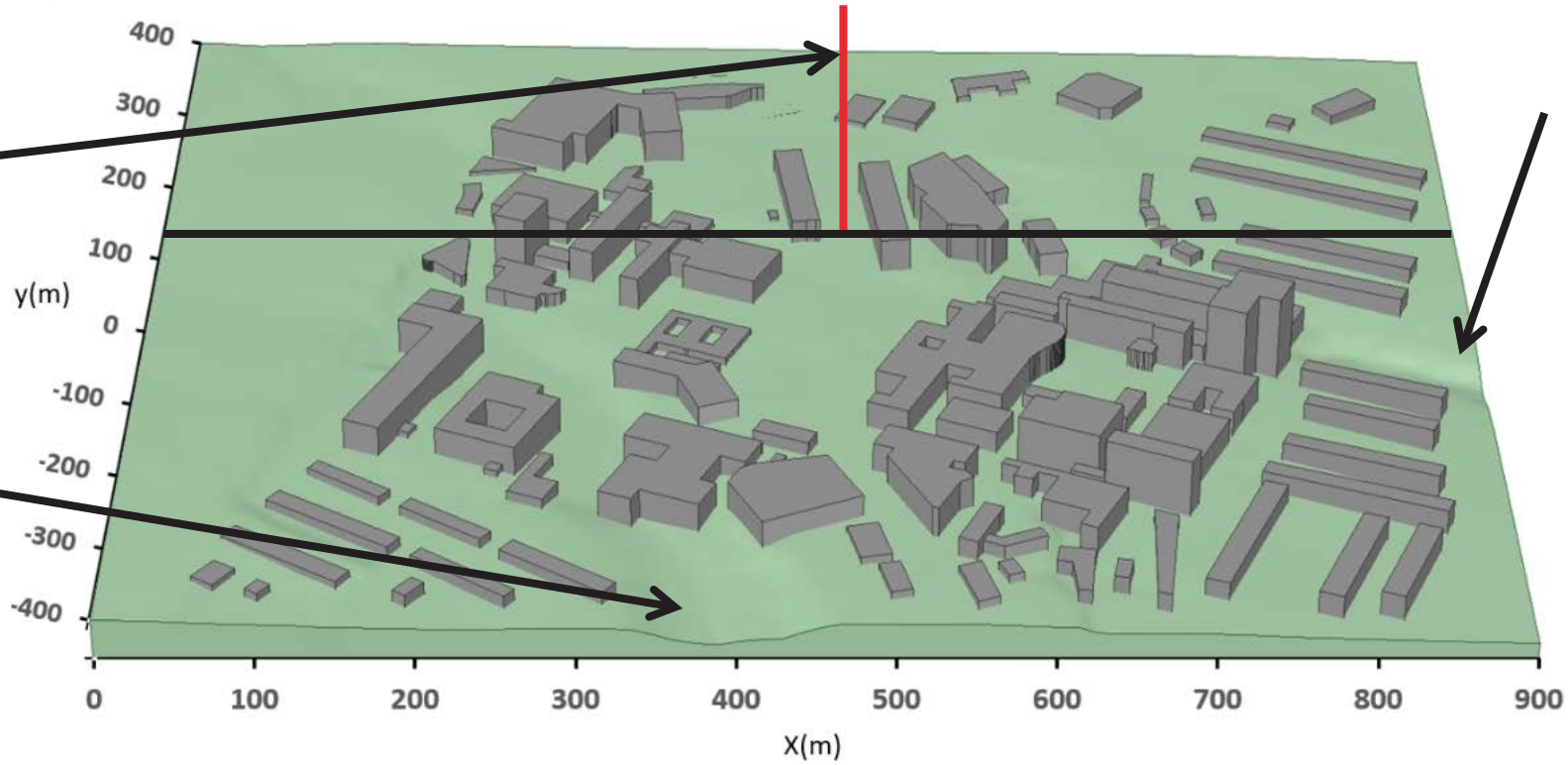




Comparison of pressure coefficient at 2/3H for Lauderdale Tower

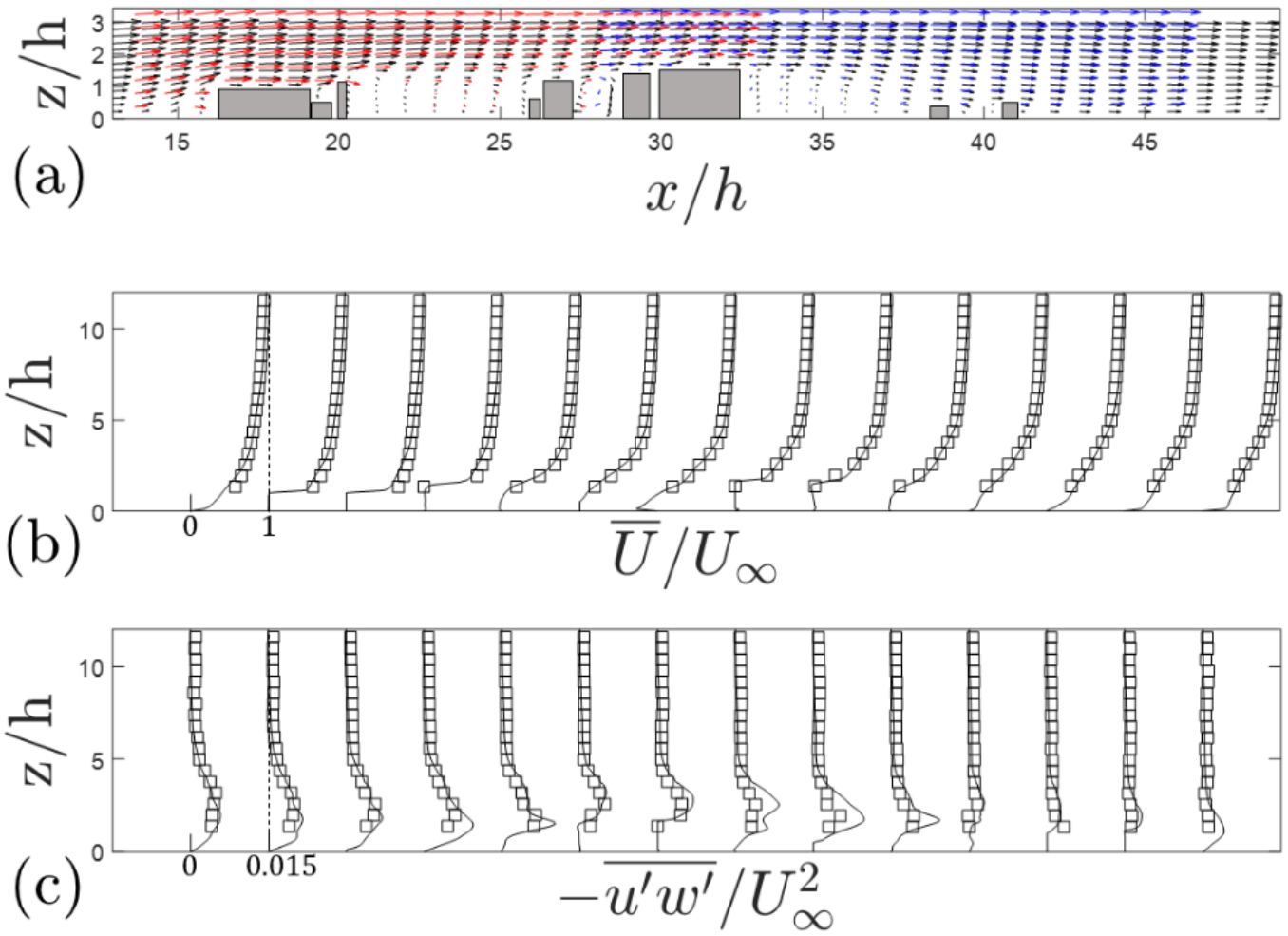
CFD for very complex urban geometry:
Domain of University of Southampton, Highfield (Coburn et al, 2018), using OpenFOAM

- Data taken on the y=104m streamwise-vertical plane, with vertical profiles at 14 locations starting from x = 220m (13.3h) at a 40m interval (Δx = 2.5h)
- Vertical profile location
- Valley

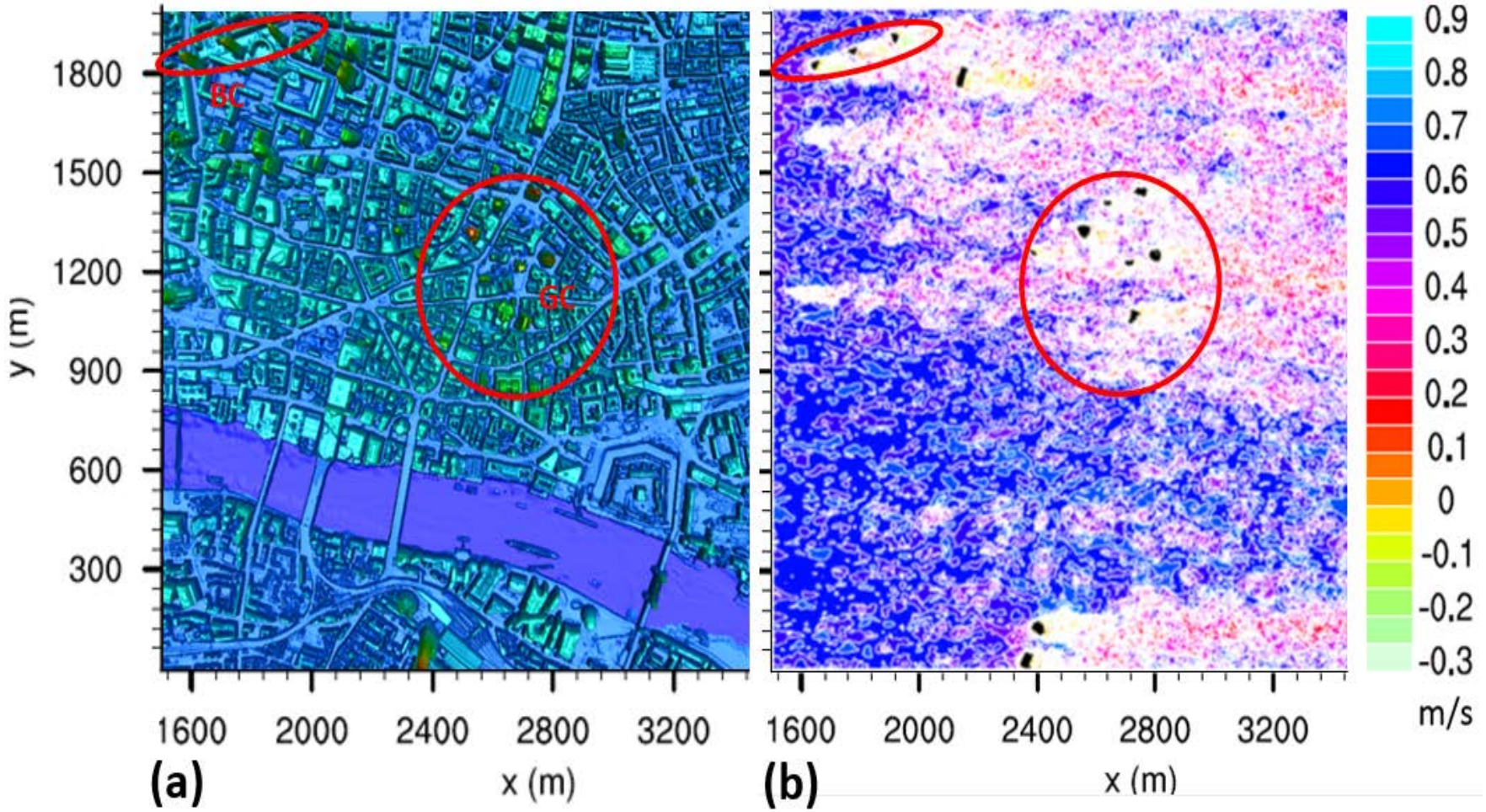


PIV, CFD comparison (with flat ground)

- (a)
  - Exp Camera 2 (Red), Exp Camera 1 (Blue)
  - CFD (Black)
- (b) & (c)
  - Exp (Squares)
  - CFD (Black)



Modelling City of London, using PALM



(a) CFD domain of the City of London with Barbican (red ellipse, BC) and Gherkin (red circle, GC) TB clusters. (b) Low-speed wake regions downstream of TBs at z=114m (instantaneous streamwise velocity). Flow left to right

Conclusion

- **We have started FUTURE**
- …