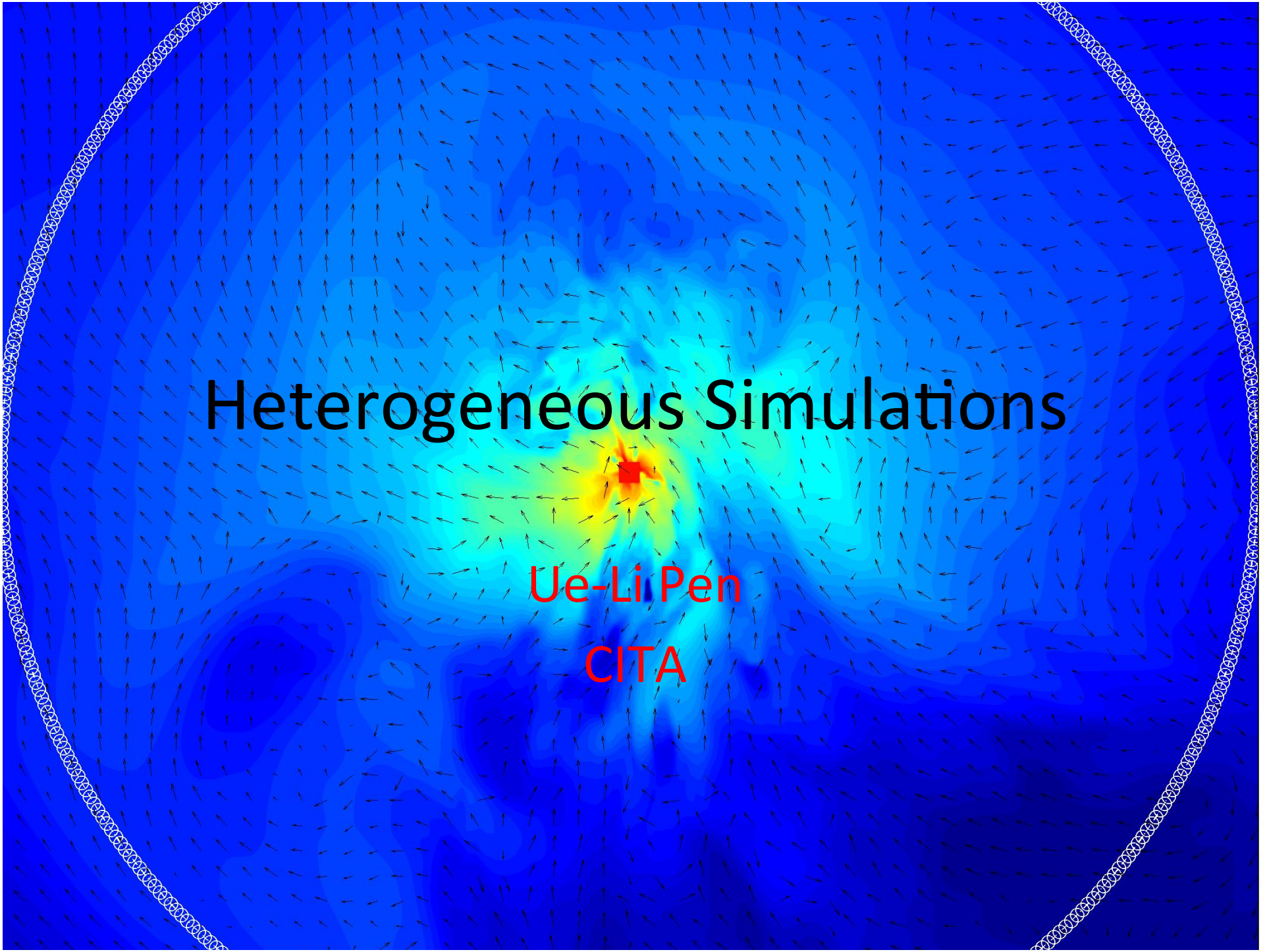

Heterogeneous Simulations

Ue-Li Pen

CITA

Need for Heterogeneous interface

- 4 of top10 machines are GPU/hybrid
- Cumbersome to program, large potential performance
- Won't be porting all analysis tools to GPU cluster
- Huge data volumes
- Need standardized interface

Examples

- Most early/hybrid applications are straightforward algorithms: pure N-body, ideal hydro/MHD
- Roadrunner (Cell), Tianhe-1 (Nvidia), LOEWE (ATI-AMD)
- MPI-OpenCL-fortran-C: Toronto effort on MHD/P3M (arxiv 1004.1680)

Interface needed

- Need for exchange of HPC (large) data between simulations
- Sharing infrastructure: Initial condition generators, halo finders, merger trees, power spectra, covariances, lensing, error bars, etc
- Shipping of data: tapes, disks, etc
- More ambitious: in-core modules, AMR

Benefits

- Give researchers access to wider suite of software and hardware platforms
- Easier entry point for graduate students to enter simulation field
- Standard interface for teaching

Some considerations

- Format conversion (HDF5?)
- Parallel performance
- Expandability: N-body, gas,

This group

- Could generate a common data format working on represented codes
- Perhaps start with N-body data: positions, velocities. Gas?