## Activities in IMP4

- serving turbulence codes as MPI actors to other workflows
- built `turbulence` CPO for transport/dynamics studies
- built `langmuirdiag` CPO for edge fluctuation studies
- built HDF5 read/write routines for `turbulence`
    - code specific part is work in progress
- serving transport modules (small models) to ETS workflows
- serving neoclassic codes as well
- showed a few cases on HPC2K for HPC workflows in 2012
    - still work in progress

- IMP4 benchmark cases
    - IMP4 Shot 1/1, with edge 2/1, with 4 ions 3/2
    - JET hybrid scenario shot 77922/2 from ISM
    - ASCII files up to 4.09a, ITMDB for 4.10a

## IMP4 Documentation

- main ITM website

    http://www.efda-itm.eu/

- main IMP4 website (click on Restricted Area, then IMP4)

    https://www.efda-itm.eu/ITM/html/imp4_public.html

- links to files in usual places

    http://home.rzg.mpg.de/∼bds/cyclone/

- on the TWIKI (login, click on TWIKI, then on IMP4)

    http://www.efda-itm.eu/

# IMP4 Workflows

- standard workflow for turbulence/transport actors
  - reads case (JET shot 77922/2 from J Ferreira) from UAL
  - uses EQUPDATE actor to fill input profiles in `equilibrium`
  - runs equilibrium code (eg, GKMHD) to fill metric
  - runs actor (eg, GEM) and writes `coretransp` CPO into UAL
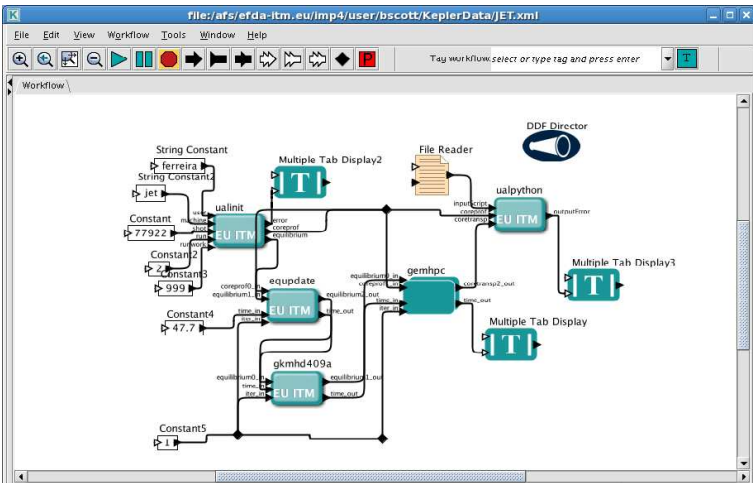
- these work well with standard Kepler setup
- for turbulence codes we require HPCFF/IFERC
- HPC2K is a system to create relevant actors
  - these submit actor as batch job, await file return
  - job should remain live if workflow is a loop (in progress)
- main physics projects still await some bug fixes in protocols
- HPCFF retires in May 2013 (IIRC)
- semi-political barriers to use on IFERC will be serious

## IMP4 Benchmarks

- benchmarking has to stay active for obvious reasons

- IMP4 standard cases (shots 1,2,3, runs 1,2)
- for ISM/IAEA purposes we've used JET shot 77922, run 2
    - CPOs coreprof and equilibrium from the ITMDB
    - equilibrium actor to fill equilibrium%coord sys metric
- codes read the CPOs via UAL
    - benchmark output is the CPOs turbulence and coretransp
    - one or both of these may be produced via post process
- author responsibility for model description, especially ...
    - equations
    - geometry
    - energy theorem
- ... at least a cite to a derivation for all three

- no code can be supported in ITM without doing this

## Turbulence CPO

- the name of the CPO is `turbulence`
- information on turbulent fluctuations apart from `coretransp`
- 0d time traces, including energetics/conservation info
- 1d profiles, parallel envelopes, spectra
  - some of this can be used in experimental validation studies
- 2d visualisations, axisymmetric averages
- 3d fields for subsequent statistical study by other actors
- some velocity-space info on fluxes for kinetic codes
- standard writing routines for HDF5 provided

- the name of the CPO is `langmuirdiag`
- position of the probe tips with respect to the LCFS
- use case: plasma parameters from JET shots 59756 and 59757
- time, probe position from `langmuirdiag`
    - movement of the experimental probe (`langmuirdiag`)
        $\longrightarrow$ actor's numerical probe
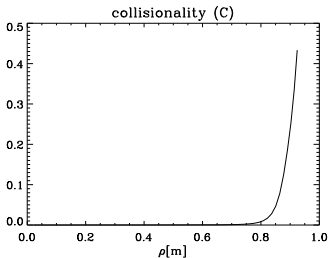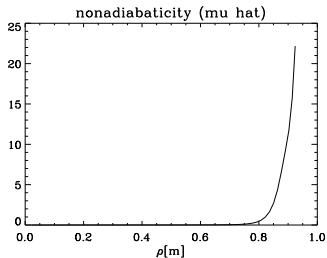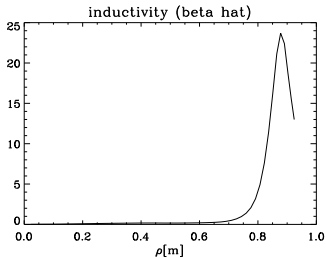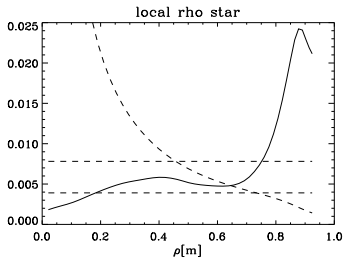    - actor's results stored into `langmuirdiag`

- equilibrium flux surfaces and straight field line angles
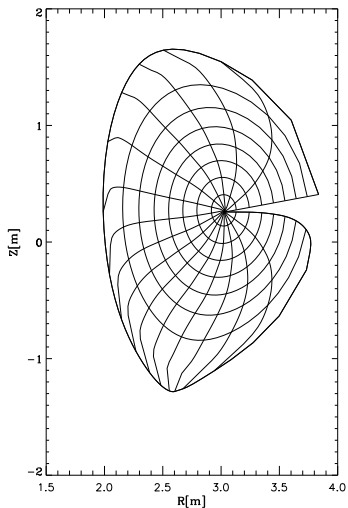
- equilibrium profiles (`coreprof` and `equilibrium`)
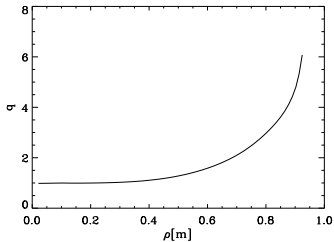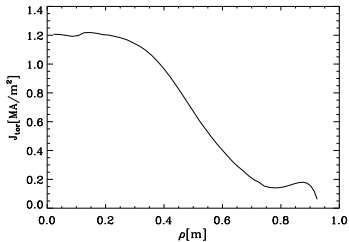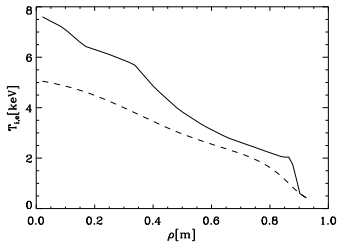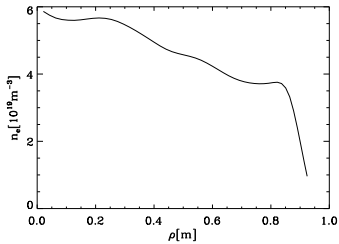
- normalised units

- HPC2K workflows move to IFERC (very ambitious)
- IMP4 MPI codes fully capable in ETS workflows

- edge benchmark with strong temperature gradients
- still would like a cross benchmark with IMP12 (MHD)

- need more participation by neoclassical and linear codes