Density modelling for hybrid scenario at JET & ITER, preliminary results

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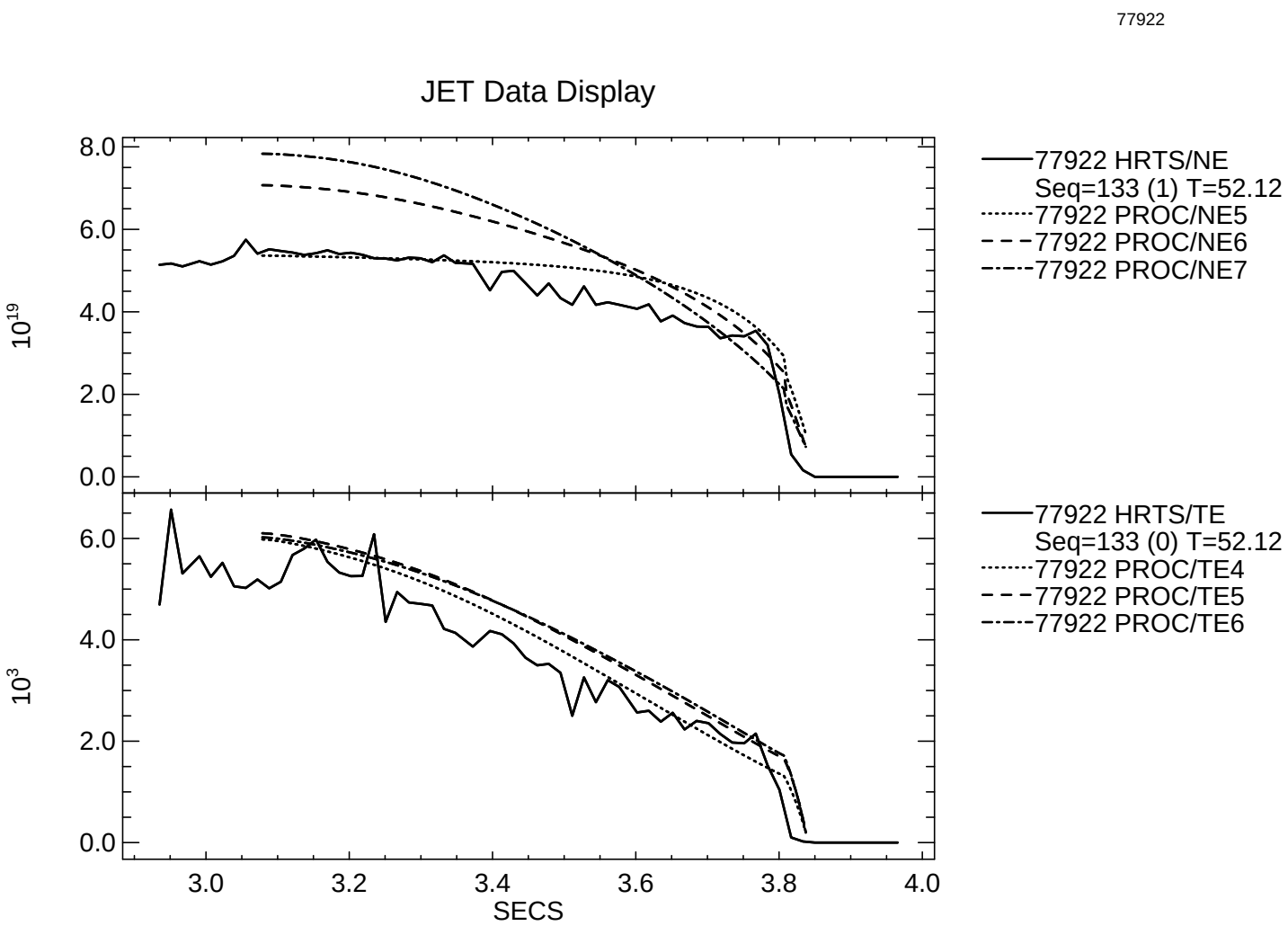
Plan

- Fully predictive simulation (including density and fuelling) of JET and ITER hybrid scenarios.
- JET shot 77922.
- ITER start from CRONOS simulations (shot 100, sequence 174).

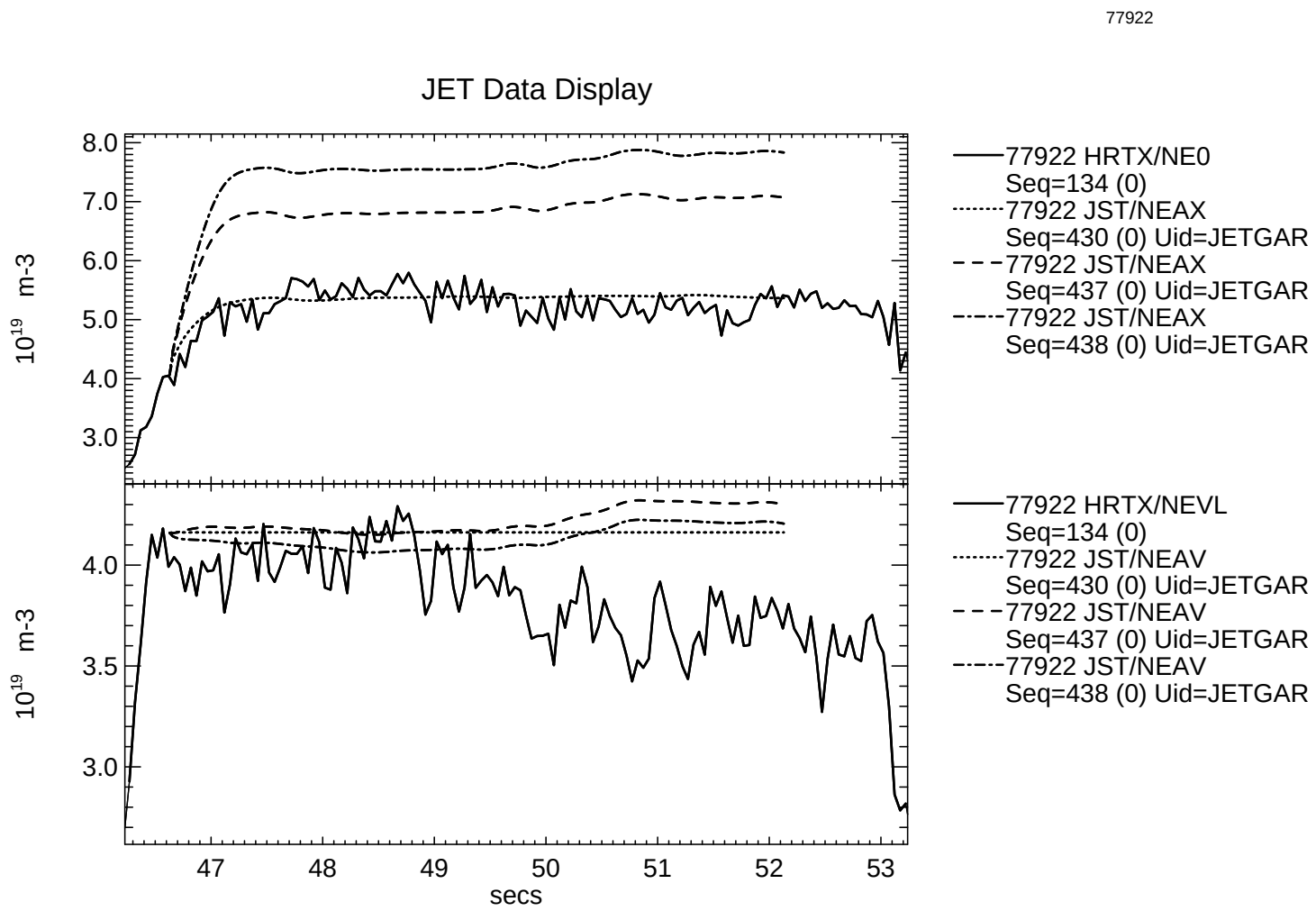
Situation for JET

- JET fully predictive simulation from 46.63 s to 53.13 s with Bohm/gyro-Bohm completed
  - seq 430: recycling R=1 no NBI source (flat-ish density profile, rest seems ok).
  - seq 437: NBI source switched on, reduced recycling.
  - seq 438: anomalous pinch v_{inw}=0.5 D r/a^2.
- Numerical problems with GLF23 under investigations.

Examples


77922
JET Data Display
8.0
6.0
4.0
2.0
0.0
10^{19}
77922 HRTS/NE
Seq=133 (1) T=52.12
77922 PROC/NE5
77922 PROC/NE6
77922 PROC/NE7
6.0
4.0
2.0
0.0
10^{3}
77922 HRTS/TE
Seq=133 (0) T=52.12
77922 PROC/TE4
77922 PROC/TE5
77922 PROC/TE6
3.0
3.2
3.4
3.6
3.8
4.0
SECS

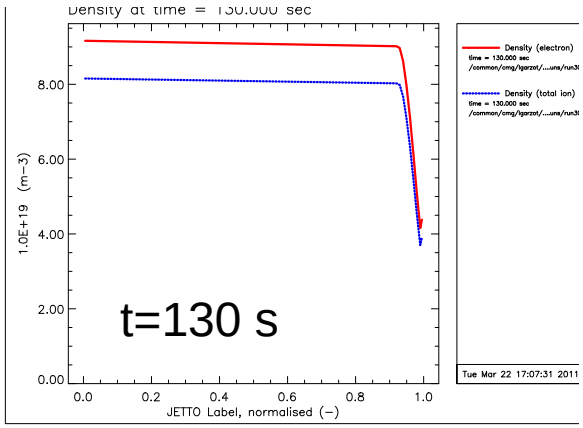
Examples

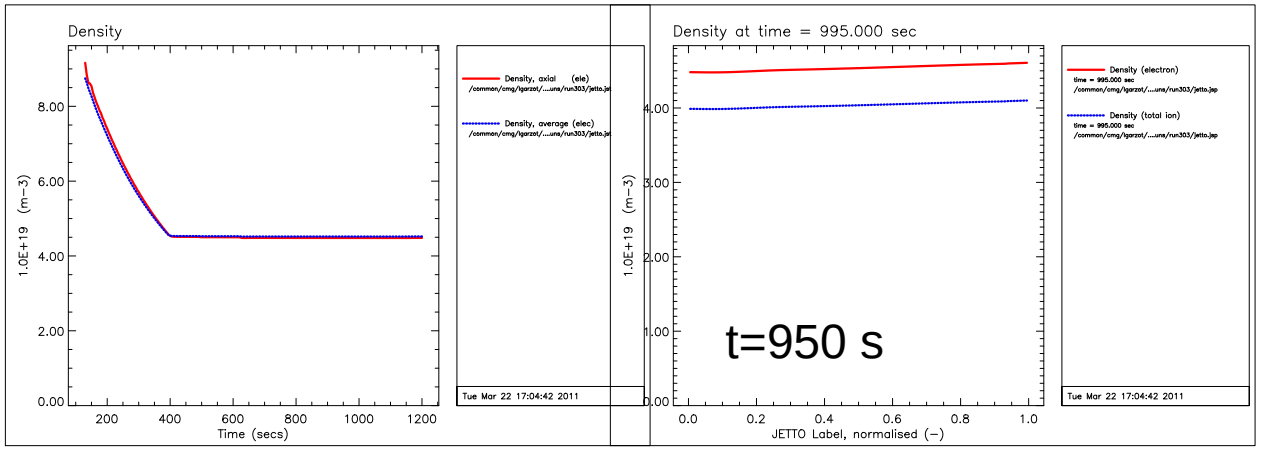

77922
JET Data Display
8.0
7.0
6.0
5.0
4.0
3.0
10^{19} m-3
4.0
3.5
3.0
10^{19} m-3
47
48
49
50
51
52
53
secs
77922 HRTX/NE0
Seq=134 (0)
77922 JST/NEAX
Seq=430 (0) Uid=JETGAR
77922 JST/NEAX
Seq=437 (0) Uid=JETGAR
77922 JST/NEAX
Seq=438 (0) Uid=JETGAR
77922 HRTX/NEVL
Seq=134 (0)
77922 JST/NEAV
Seq=430 (0) Uid=JETGAR
77922 JST/NEAV
Seq=437 (0) Uid=JETGAR
77922 JST/NEAV
Seq=438 (0) Uid=JETGAR

Situation for ITER

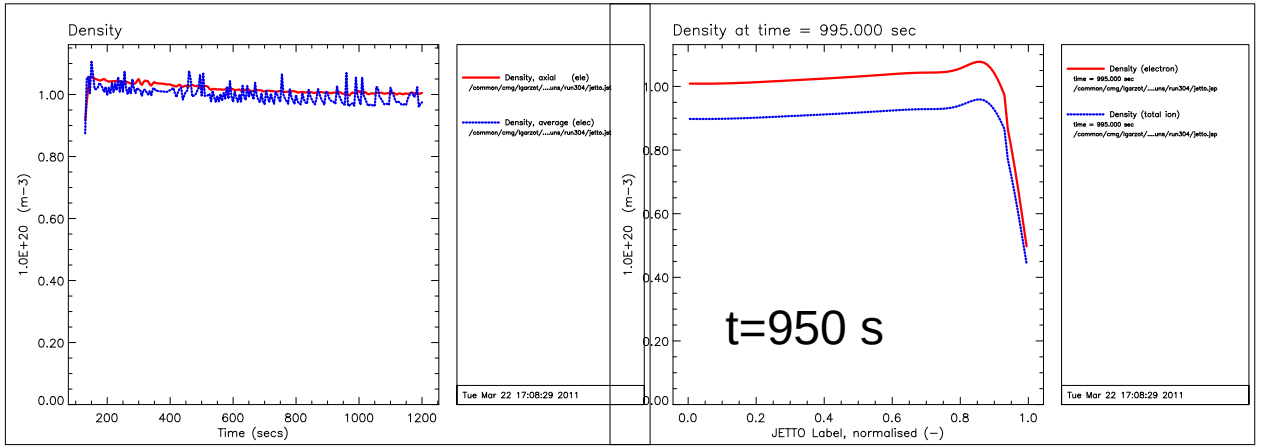
- Fully predictive simulation from 130 s (start of H-mode) to 1200 s with Bohm/gyro-Bohm.
  - Case 1: R=1, no fuelling. Core density decreases due to D-T burning. Edge gradient and particle outflux vanish. Flat density profile is reached. (Still under investigation).
  - Case 2: R=0, pellet fuelling with feedback on the density at the top of the barrier. Ok.
- Equivalent cases with GLF23 give problems.
  - Case 1: still running.
  - Case 2: with continuous pellets crashes.

Examples





R=1, no density feedback



R=0, density feedback, pellet injection

What to do next

- Improve Bohm/gyro-Bohm simulations. Start using them. How?
- Try and solve problems with GLF23.
- Decide what to do if GLF23 doesn't work.
- ...