NCSX Flexibility: Profiles

Design Point Flexibility/Robustness

Can a single coil set cope with a range of plasma profiles ?
- Is QA possible with a range of pressure/density shapes ?
- Bootstrap acceptable with wide range of density profiles ?

Assemble a database of density, temperatures, pressures.
- Stellarators: W7-AS, ATF, CHS, LHD
- Similar size tokamaks: PBX-M, DIII-D (ASDEX-U?)
- Make standard profiles available through subroutine calls.

Others: assess the impact of new profiles.
- Resulting equilibria can match physics targets?

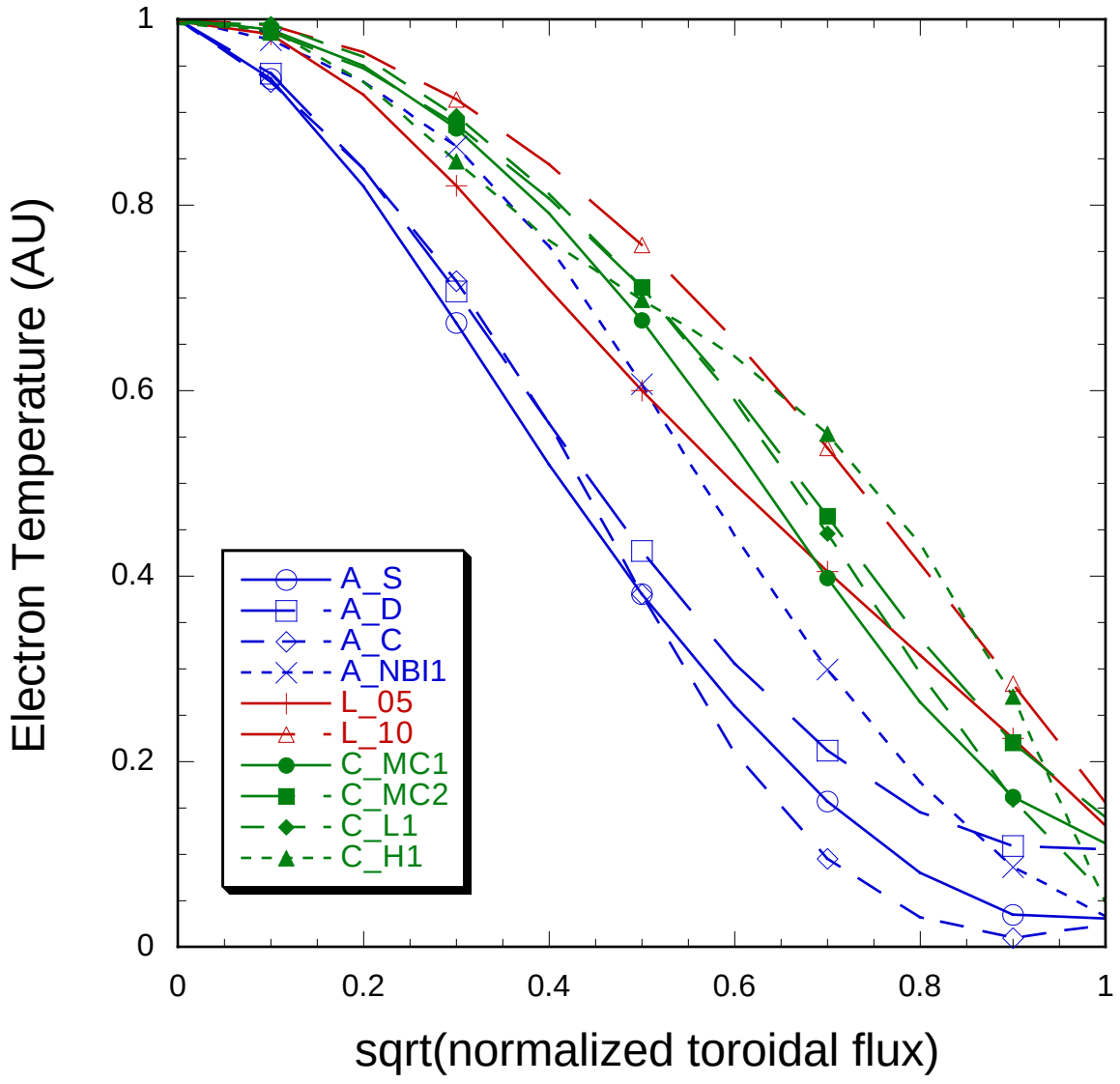
Develop Self-Consistent Startup Scenario

TRANSP simulation of startup (far from design point!).
- 1D diffusion, 2-D geometry, fixed plasma boundary.
- Compare with later WHIST 3D simulation.
- Prescribe temperatures based on DIII-D & PBX-M.
- Calculate current diffusion for different I_p ramp rates.
- Estimate bootstrap later in startup.

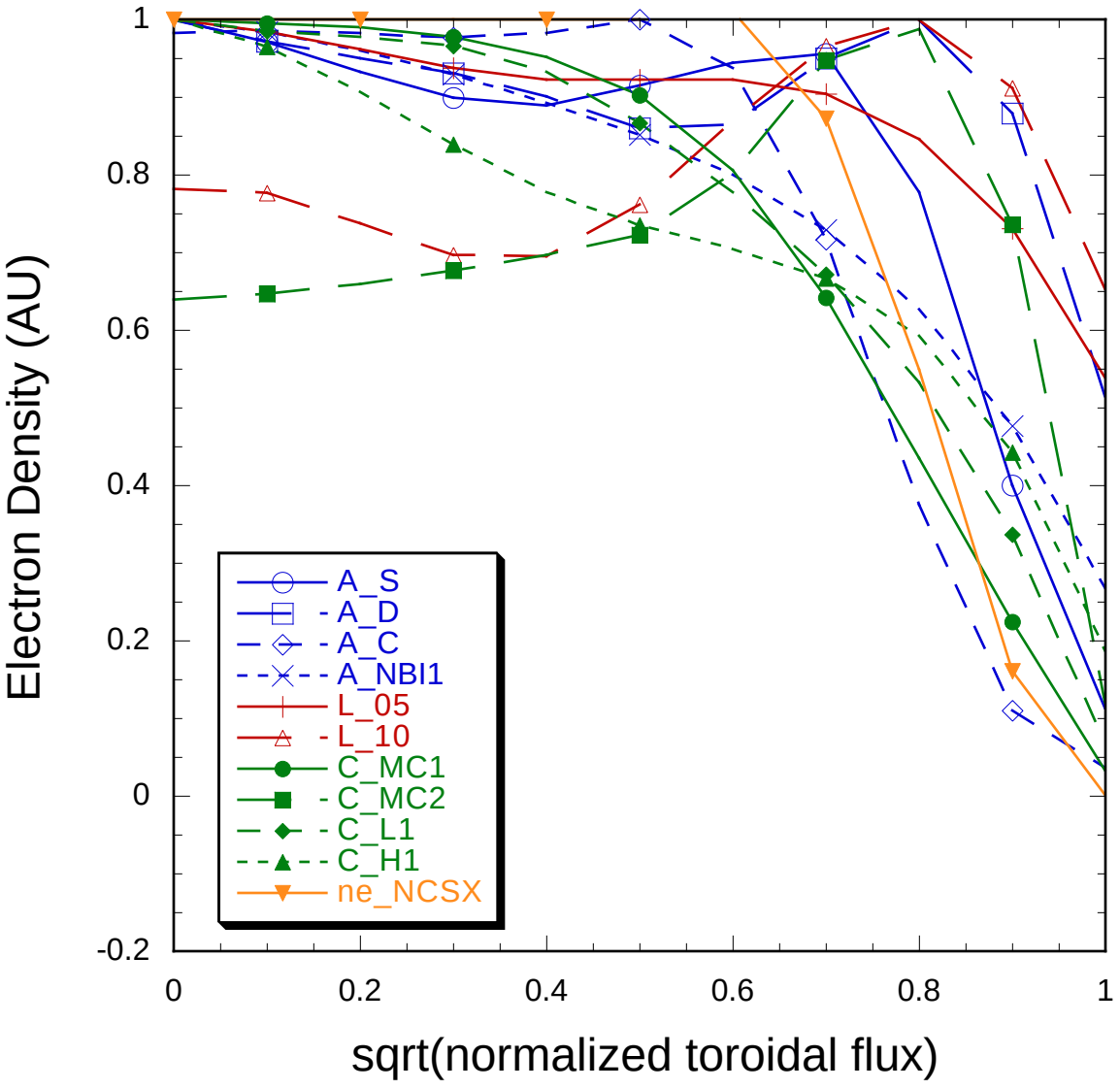
How early can the neutral beams inject? (orbit losses)
- When can the low β transform confine the beam ions.
- What is the current relaxation time scale in the core?

Others: can some coil set meet physics targets at all times?
- Are trim coils needed?
- How early can quasi-axisymmetry be achieved?

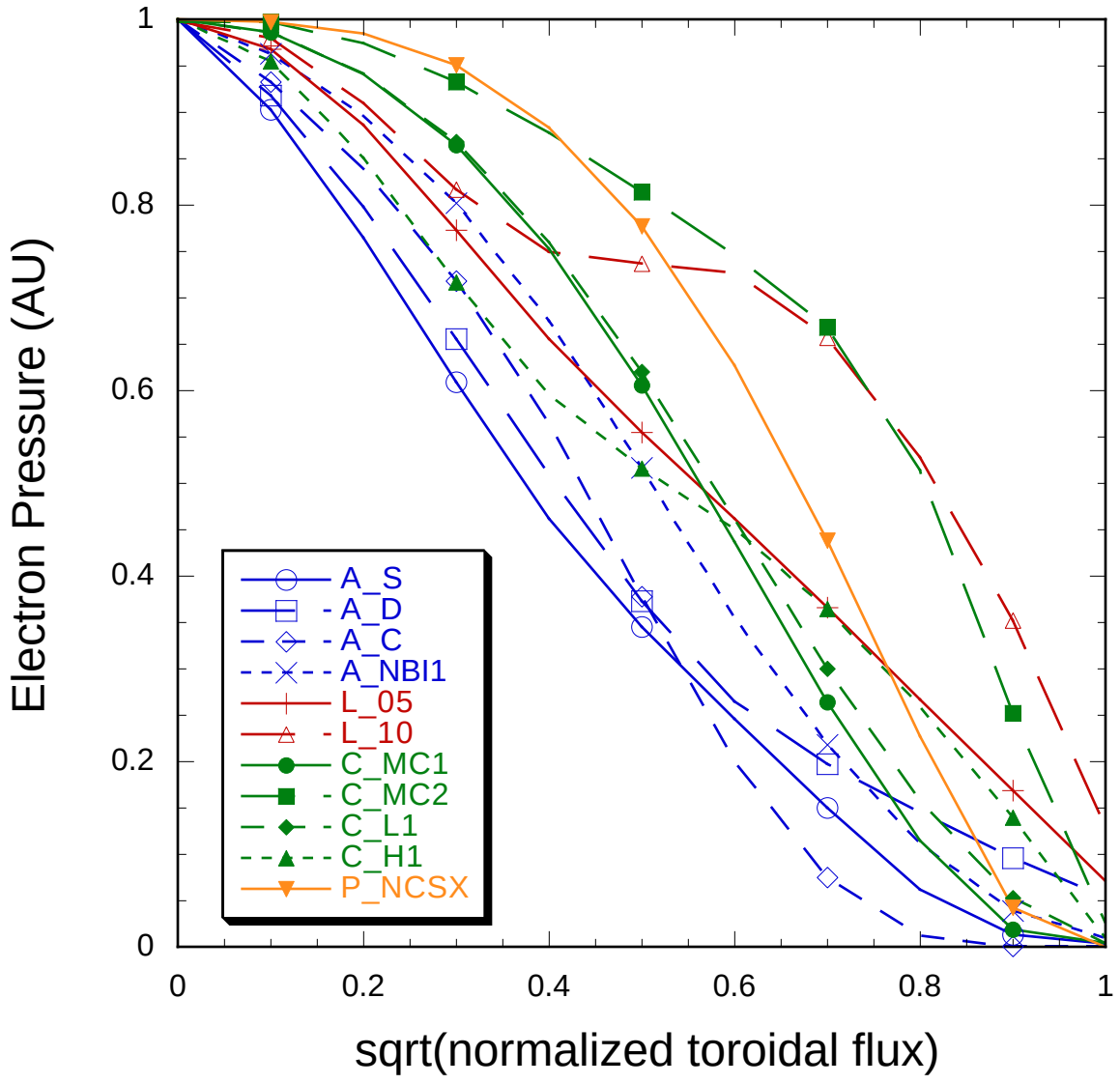
Measured electron temperature profile shapes
•Similar to tokamak temperature profiles.



Measured electron density profile shapes
•Broader than tokamak density profiles.



Measured electron pressure profile shapes
•Broader than tokamak pressure profiles.



Schedule

January 17: Standard profile subroutines available.
Add to data file occasionally (no re-compiles).

Others: begin stability analysis for plausible range of profiles.

January 24: Begin TRANSP startup simulations.
Examine heating profile, adjust T_e profile?

?? Stability analysis feedback: critical profile characteristics?
Look for dangerous profiles in experimental database.
Learn how dangerous profiles can be avoided?