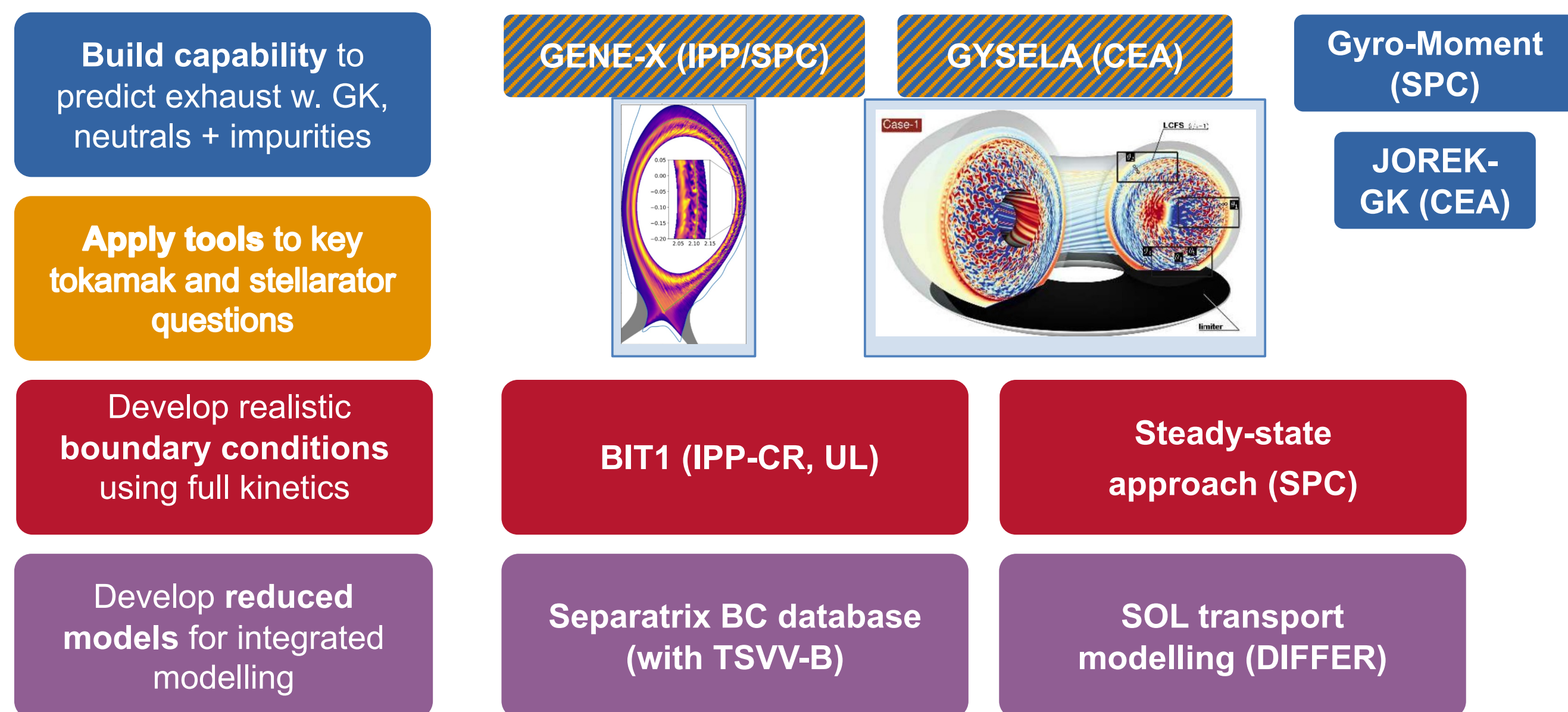


TSVV-C: Plasma Particle/Heat Exhaust — Gyrokinetic Simulations

D. Told¹ and the TSVV-C Team

¹ Max-Planck-Institut für Plasmaphysik, D-85748 Garching, Germany

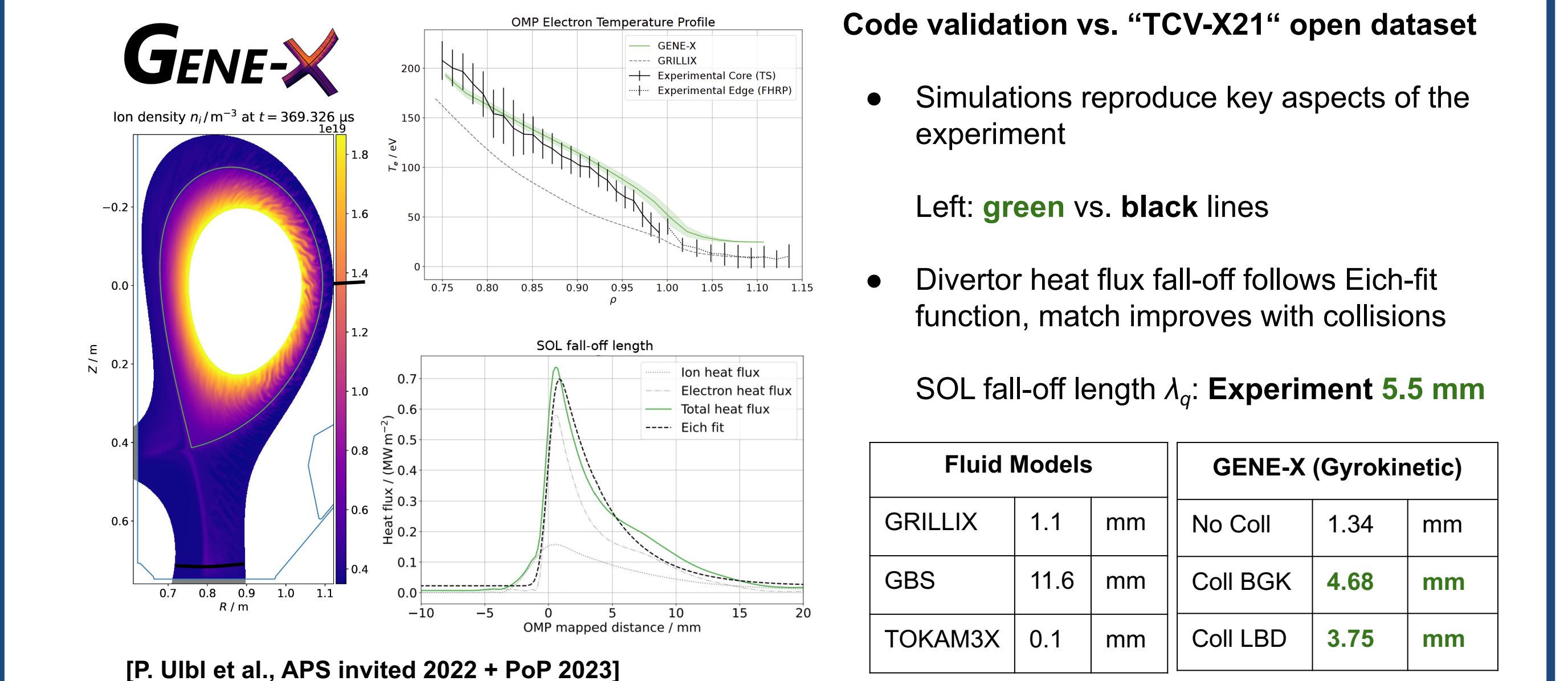
Our Mission: Develop and apply kinetic codes for exhaust



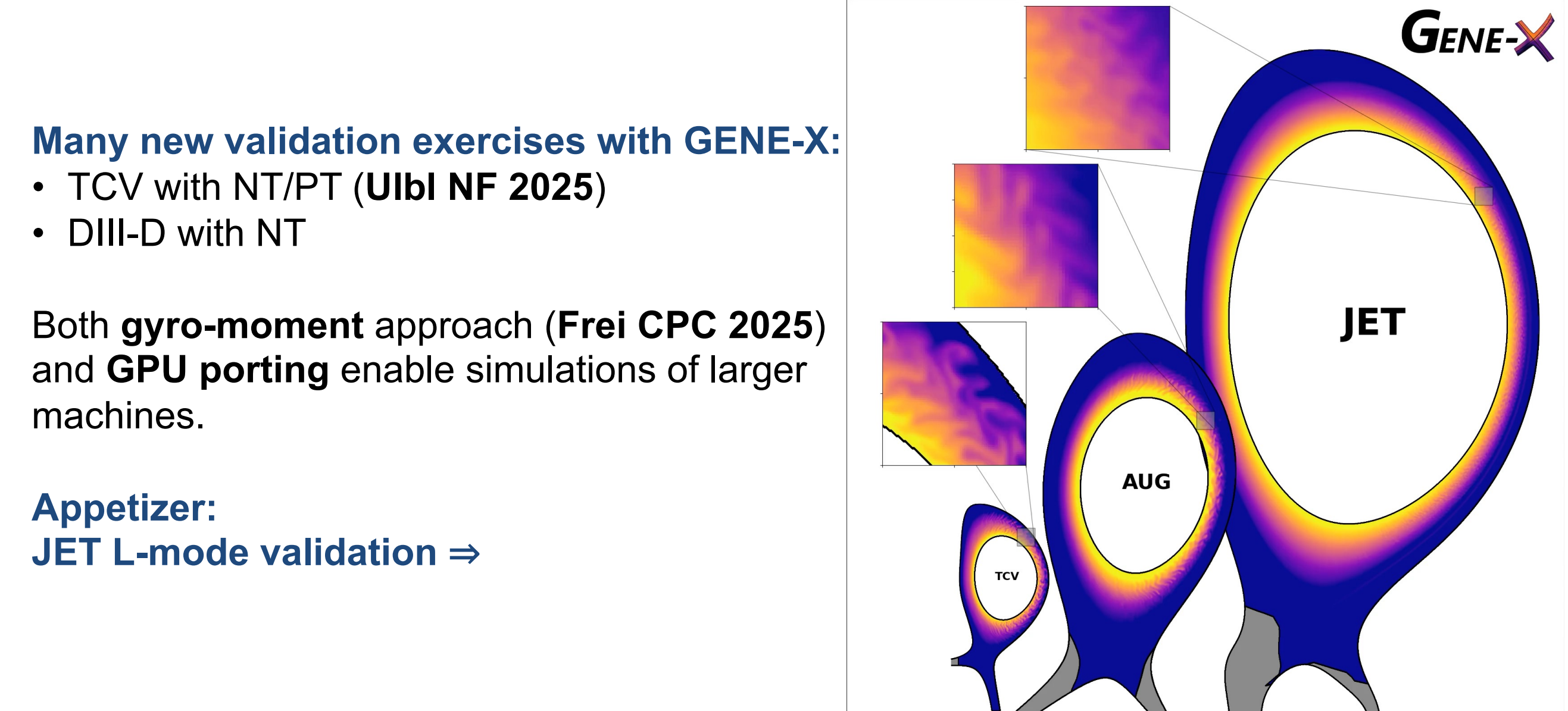
GK Code evolution and status 2021 ➤ 2025

Capability	GENE-X	GYSELA
Full-f nonlinear		
Kinetic electrons		
Electromagnetic (Bperp)		
Electromagnetic (Bpar)		
Collisions		
X-point geometry		
Neutrals		
Sheath boundaries		
Impurities		
Radiation		
Finite Larmor radius eff.		

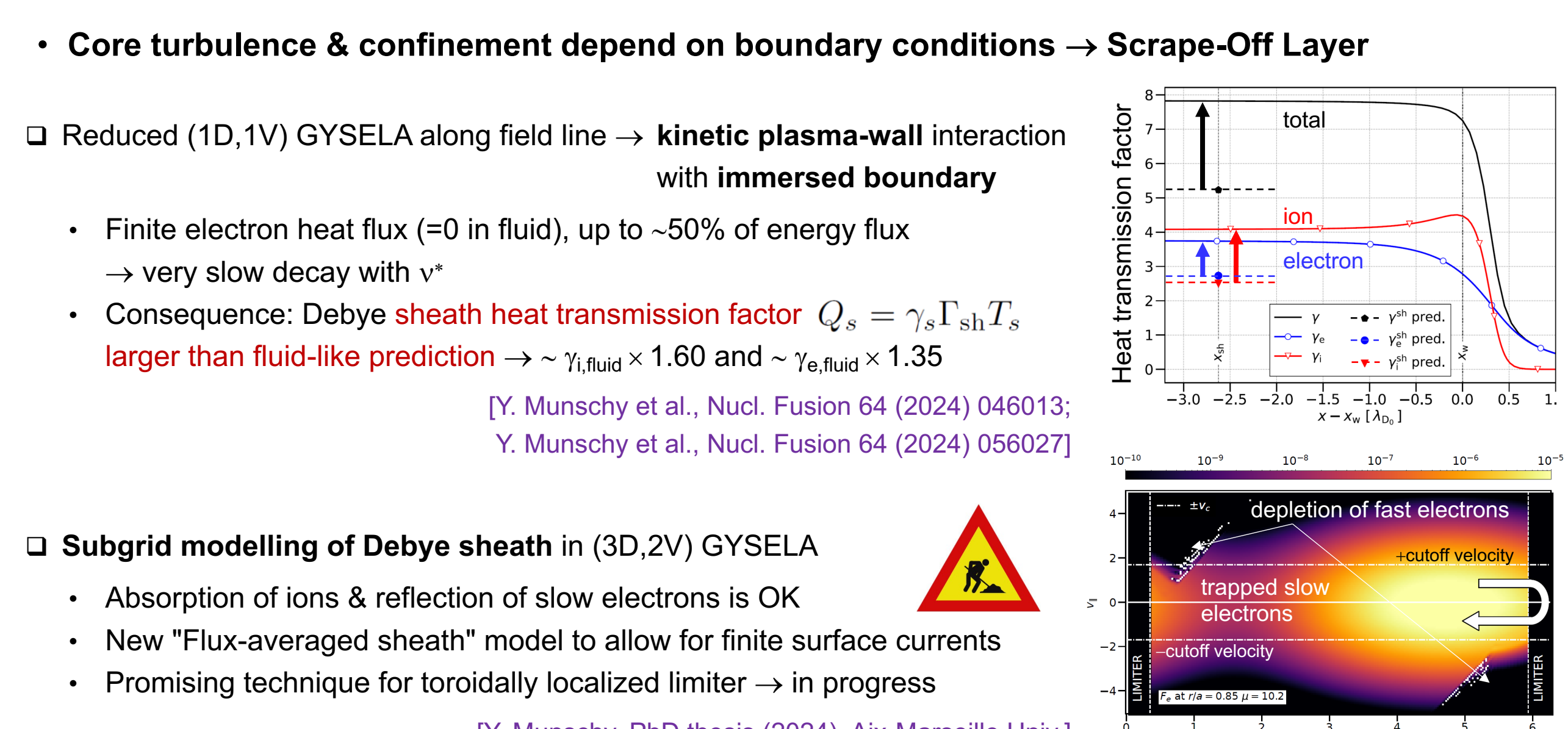
Successful validation of GENE-X in TCV



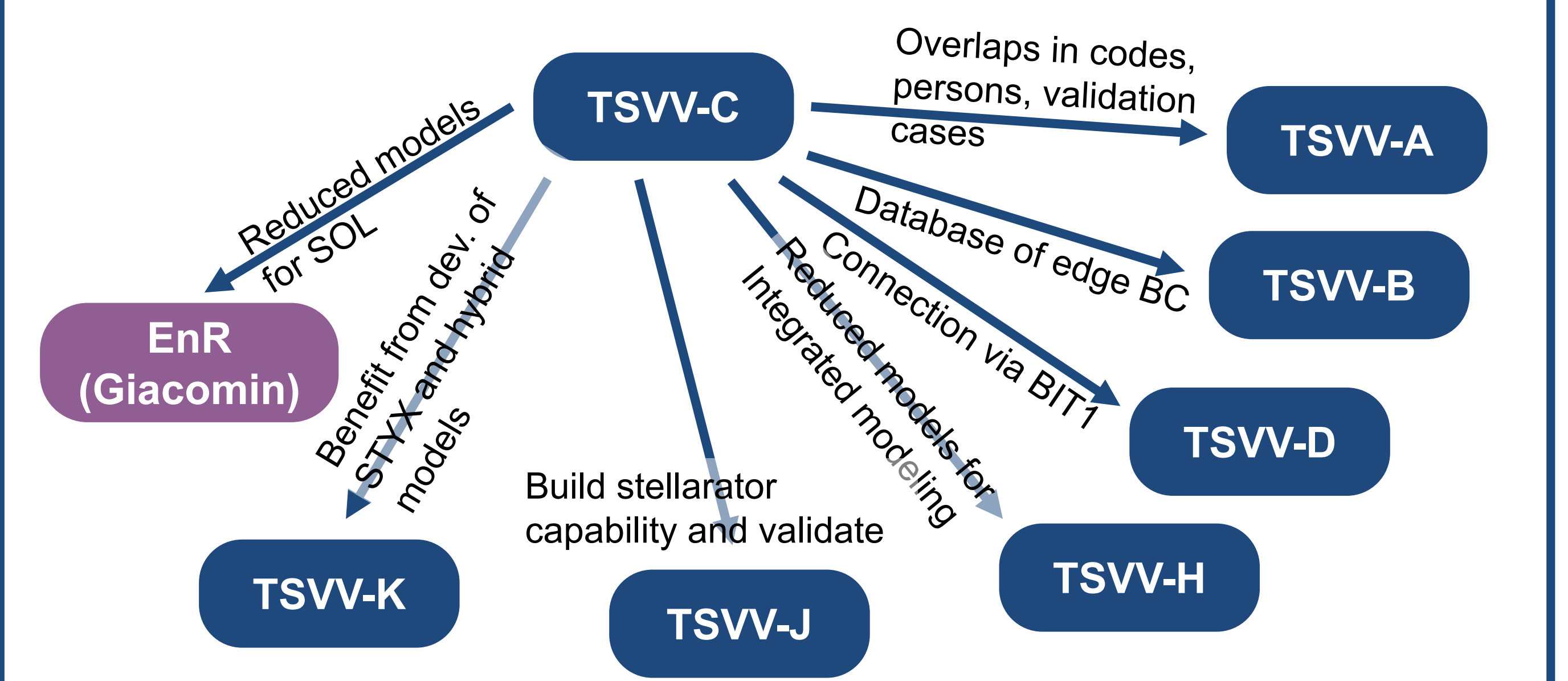
GENE-X validation is scaling to larger devices



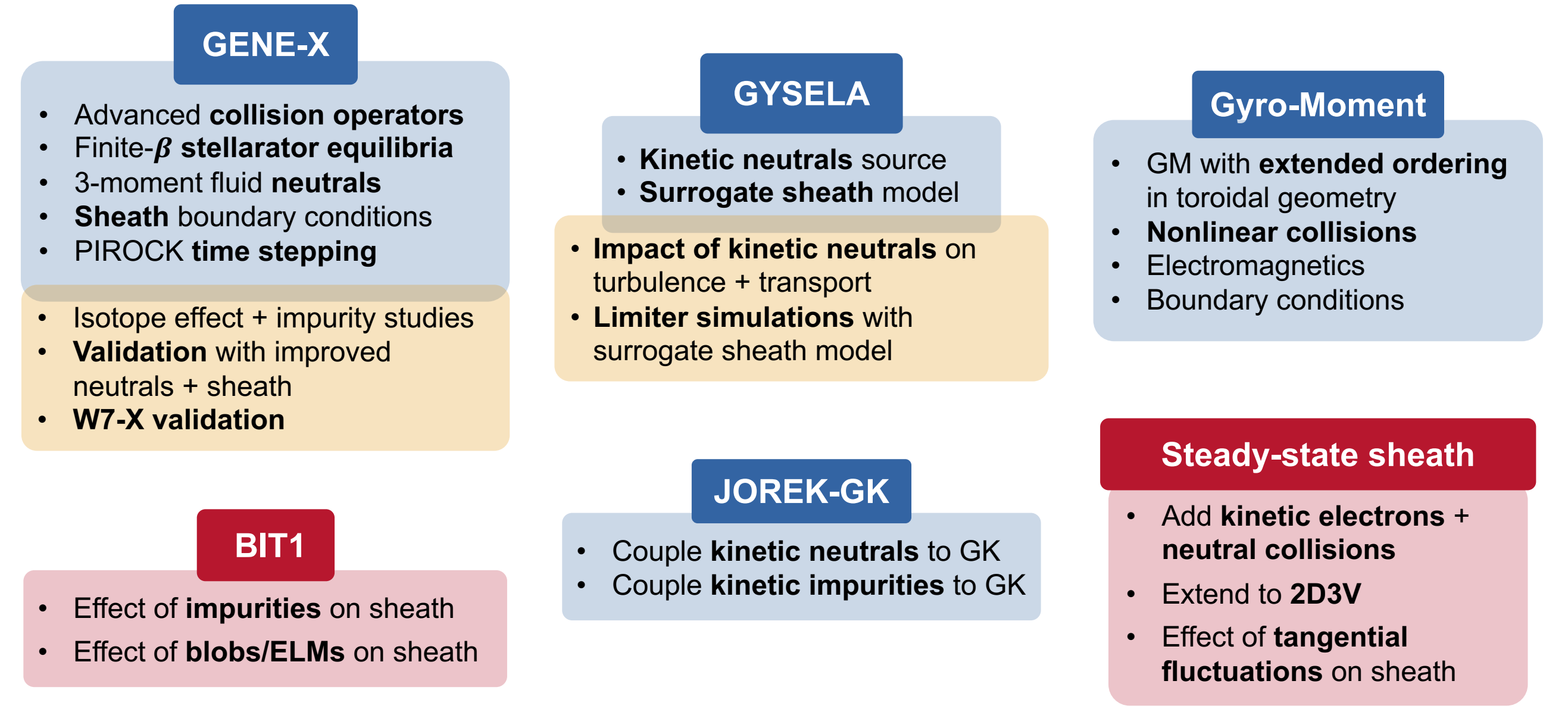
GYSELA – towards self-consistent plasma-wall model



Links to other TSVVs and EnR projects



Work plan 2026/27: Build capability, apply to key problems



Expected outcomes end-2027: tools + validation

- Validated GENE-X physics packages** for reactor-relevant edge/SOL studies (collisions, neutrals/impurities, sheath BCs), demonstrated in targeted validation/use cases.
- GENE-X stellarator readiness:** equilibrium interface delivered and W7-X validation studies initiated/advanced.
- GYSELA boundary/neutral advances:** surrogate sheath model demonstrated; kinetic neutral source terms implemented and compared against fluid reductions.
- Kinetic sheath advances:** 1D3V steady-state code with neutral collisions plus first 2D steady-state; effects of transient events on sheath physics studied with BIT1.
- Deliverables for integrated modelling and reduced models:** BC database populated and shared; reduced-model/transport comparison workflow + cross-code post-processing tool delivered.

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- Scan to contact TSVV-C!
- CEA EPFL IPP UNIVERZA V LJUBLJANI DIFFER



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