Overview of simulation cases within TSVV 5

N. Horsten

KU LEUVEN

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Aalto University
School of Science

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Overview

- JET (Aalto University & N. Horsten): computationally cheap and well-diagnosed L-mode cases for validation:
  - Photon transport (R. Chandra)
  - Sub-divertor studies (T. Kiviniemi, A. Vesa)
  - CRM (N. Horsten?)
- AUG (Aalto University & W. Dekeyser): computationally cheap:
  - Example case for SOLPS-ITER extended grid version (paper in preparation)
  - Sub-divertor studies (A. Vesa)
- ITER (KU Leuven)
  - Standard vs. extended grids (W. Dekeyser)

Overview (continued)

- DEMO (W. Van Uytven): most expensive simulations
  - Numerical error studies (W. Van Uytven)
- Magnum-PSI (DIFFER): excellent for validation of CRMs
- JT-60SA (Aalto University & KU Leuven)
  - Simulations will be done in 2025

Summary of JET work

- N. Horsten: hypotheses for simulation-experiment discrepancies
  - Reabsorption of Lyman emission ➔ include photon tranpsort (R. Chandra)
  - Underestimate of recombination via molecular channels (cf. K. Verhaegh)
    ➔ CRM (ModCR, H2-colrad)

- T. Kiviniemi: effect of sub-divertor structure on neutral pressure
  - Effect of secondary louvres
  - Next steps:
    - BGK vs. BGKES approximation (still working in EIRENE?) vs. $R(v)$, where $R(v)$ are velocity-dependent relaxation rates ➔ worth the effort given other uncertainties?
    - Isotope studies: e.g., D-T seggregation
    - Recirculation flows from LFS to HFS and vice versa
    - Coupling to plasma? ➔ initiated by N. Horsten

Summary of ITER work (W. Dekeyser)

- Standard vs. extended grids
- Extension of fluid neutral models for neutral-neutral collisions ➔ adaptations after mathematical derivations from E. Andoni
- Comparison between simulations with kinetic and fluid neutrals ➔ comparison with atom only kinetic simulations ongoing

Summary of DEMO work (W. Van Uytven)

- Numerical error analysis of Kristel Ghoos [K. Ghoos et al., JCP **322** (2016)] for computationally expensive simulations, including neutral-neutral collisions and impurities
- Discretization error sufficiently small for the commonly used grid resolution [W. Van Uytven et al., CPP (2024)]
- Neutral-neutral collisions don’t change conclusions of Kristel’s work
- Significant bias when using a low number of particles for impurity strata, especially for large time steps

Data storage

- JET SOLPS-ITER simulations PSI paper N. Horsten: Replication Data for: Validation of SOLPS-ITER and EDGE2D-EIRENE simulations for H, D, and T JET ITER-like wall low-confinement mode plasmas - KU Leuven RDR
  - ➔ extracted minimum number of files to continue SOLPS-ITER simulations (~300 MB in total)
  - ➔ ready to be transferred to SimDB, when in operation
  - ➔ IMASification possible, if needed

- EDGE2D-EIRENE simulations catalogued at JDC ➔ see catalog IDs in paper

- Similar approach can be followed for the other cases