

JOREK development and application to ITER and DEMO: status and plans

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JOREK development

- Implement a model for the RE beam “companion plasma” in JOREK (task C7)
 - Team: Cédric, Eric, JOREK developers external to this project, e.g. Vinodh Bnadaru
 - Milestone in 2023

- Implement a PIC RE model in JOREK (task C10)
 - Team: Konsta, Cristian, Eero
 - Milestone in 2025
 - Note: many kinetic developments in JOREK planned within TSVV 8

JOREK application to ITER and DEMO (1/3)

- RE generation in ITER MMI-triggered disruptions
 - External to this project but clearly connected: Vinodh Bandaru to work on revisiting the GO study from Oskar et al.
 - Will allow assessing impact of VDE and MHD instabilities on RE beam formation
 - Will q_a go below 2, possibly leading to RE deconfinement, before a substantial RE beam is formed?
 - No 3D simulation of the TQ planned
 - Within this project, we aim to simulate the TQ self-consistently and investigate RE generation: “RE generation during the TQ simulated with JOREK” (task A1)
 - Milestone on Cristian for 2025
 - Use JOREK/NIMROD/M3D-C1 ITER TQ simulations done/planned within collaborations/contracts with IO as a basis

JOREK application to ITER and DEMO (2/3)

- Further investigate the use of pure D2 SPI for fast dilution before the TQ in ITER (task A2)
 - Extend work from [Nardon NF 2020]
 - Milestone on Eric for 2021
 - A number of things can/should be studied, to be prioritized and organized (in particular with colleagues external to the project):
 - Other target plasmas
 - Multiple pre-TQ D2 SPI from several toroidal locations
 - Effect of background impurities
 - Effect of pre-existing islands
 - Ongoing study for an ASDEX Upgrade case by F. Wieschollek - To be followed by ITER study(?)
 - Compatibility with other ITER DMS objectives
 - Simulate 2nd (impurity-containing) SPI
 - We also promised to check hot tail suppression with DREAM in this scenario
 - JOREK simulations ongoing towards validation on JET (M. Kong) and KSTAR (S. Lee)
 - INDEX 1.5D simulations by A. Matsuyama also planned within QST-IO collaboration

JOREK application to ITER and DEMO (3/3)

- Use JOREK to seek benign RE beam termination scenarios in ITER, possibly involving a pure D2 SPI onto the RE beam (D6)
 - First JOREK simulations of RE beam termination in ITER planned by Vinodh Bandaru (external to this project)
 - 2 milestones on E. Nardon within this project:
 - Simulations of “natural” RE beam termination (2023)
 - Simulations of RE beam termination after an SPI into the beam (2024)
 - All this should go hand-in-hand with development of model for the companion plasma and validation on JET (C. Reux)
- Final note: we have not explicitly promised any DEMO studies with JOREK