DIFFER Report TSVV-5

TSVV-5 KOM

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Previous work





- An option has been added to write Eirene tallies in **HDF5** format.
- The python plotting tool from Jülich TallyViz has been modified to allow reading from this format.
- This output format will be used in the future for interfacing with IMAS.
- However, format is still not self-consistent, as no mesh information is stored.
 - Mesh information will be stored in an IMAS-like format to ease the future conversion process.



Pressure Feedback Loop

- A **new reflection model** has been added in which the thermal reflection coefficient (RECYCT) is adjusted to maintain a constant pressure in a cell at a certain level (user-input).
- **Multiple** loops can be imposed in the same case.
- Necessary to simulate Magnum-PSI pumps behavior





- Related with the inclusion of HDF5 output format, some modernization was performed on the tallies without affecting the core of the program.
- Using the **current effort** in porting and adapting features from Eunomia as well as analyzing issues in Eirene to write a Code Style Guide to standarize the refactorization process.



Comparison with B2.5-Eunomia



- Purely numerical comparison to check if similar results can be achieved by the two codes.
- Also testing of new Eirene functionalities brought from Eunomia.
- Currently, issues with the recycling model at the vessel wall (probably requires an user defined wall model).
- Case presented here with no recycling of H into H₂ at the vessel walls.

Planning for next years



Reference case of Magnum-PSI

- This case will **separate** from the comparison with B2.5-Eunomia and will make use of the additional physics present in Eirene.
- It is a **coupled** case but standalone runs with a fixed plasma background will be presented for Eirene repository.
- Case to compare with **experimental** data from Magnum-PSI.



- Due to its velocity and capability for parallel writing, HDF5 could be used as the default format for large files that need to be wrote in Eirene standalone or, specially, coupled mode.
- This will have a huge impact in **large devices**.
- HDF5 module in Eirene is general enough that multiple parts of the code could take advantage of this.



Refactorization

- Eirene is written with a very old code philosophy, product of the time it was developed and the large number of researchers involved over the years without clear guidelines.
 - The Fortran standard has evolved vastly in recent years to modernize the language
 - This allows to create clearer and more optimal codes.
- Refactorization of Eirene is an **important task** that can provide multiple advantages:
 - Easy to include new developments.
 - Easy to debug.
 - Clearer code.
 - Improved single-thread performance.
- However, this is a delicate task as this has to be done in a way that the main core of Eirene is unaltered to not disturb core functionality.

- Eirene will be coupled with a **Finite Element Wall model** to solve the interaction between neutrals and wall (sputtering, recycling, wall temperature...)
- In principle used for target, but it could be used for **multiple walls**.
- Possible collaboration with with Giuseppe Nallo from Politecnico di Torino (via an ERG) currently working in a similar model (but for fluid B2.5 plasma and neutral species).

Time-dependent simulation

- Specially useful to **validate** against Magnum-PSI data.
- Also to check time-evolving conditions with the Finite Element Wall model.
- Work related with the improvement of time-dependent model in Eirene.



Thank you for your attention

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