EMC3-Eirene simulations are compared with different local diagnostics on W7-X, as a complement to our recent work on “understanding detachment of the W7-X island divertor” [Y. Feng et al., submitted to Nucl. Fusion, 2021]. The main goals are to:

- estimate cross-field transport coefficients
- identify the application limitations of the current EMC3-Eirene model
- verify the consistency of different diagnostics
- isolate geometric and physical effects that need to be prioritized in further developing the EMC3-Eirene code and improving diagnostic coverage.

**Experiment - #20180814.25**

Time windows selected for comparison

**Setup of three simulation series**

<table>
<thead>
<tr>
<th>Two configurations</th>
<th>Two sets of heat conductivities</th>
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<tbody>
<tr>
<td>SDC</td>
<td></td>
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<tr>
<td>M-SDC</td>
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**Comparison results**

**EMC3 vs IR-cameras** along the target probe array

- Most of the comparisons are made along the target probe array.
- Error fields + beta-effects
- All cross-field transport coefficients are spatially constant.

**EMC vs target Langmuir probes**

- Agree within the uncertainties in modeling and measurement

**EMC3 vs Thomson scattering outside the divertor region**

- Agree in form, peak location and dynamics; but not in absolute numbers
- Reasonable match within modeling and measurement uncertainties

**EMC3 vs Hα-camera (during detachment)**

**CONCLUSION**

First comparison results between EMC3-Eirene and various local diagnostics have shown reasonable agreement in many aspects, but there are exceptions:

- At detachment the IR-cameras show diverse heat flux profiles, indicating error-field and drift effects inaccessible to the 3D code.
- There are significant differences in absolute Hα-emission flux between the Hα-cameras and the EMC3-Eirene code, or more precisely, between the photon flux captured by the Hα-cameras and that expected from the target probes.
- At detachment, qualitative discrepancies in n_e on the inboard side are found between EMC3-Eirene and TS, which need to be clarified with improved diagnostic capabilities.

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