Precursor drift in Molten Salt Reactors

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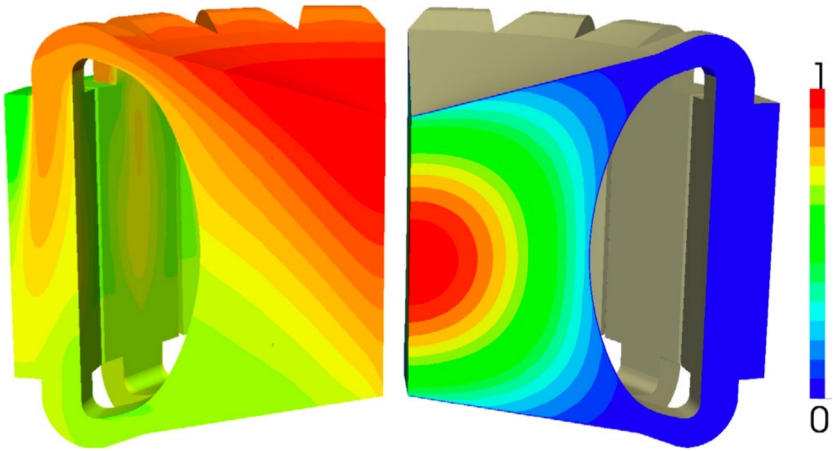
- Previous work
- SERPENT extension
- Visualisation of results

Previous work

Describes there ways to account for precursor drift in MSRs:

- Analytical (MATLAB);
- Monte-Carlo (SERPENT);
- Deterministic (OpenFOAM).



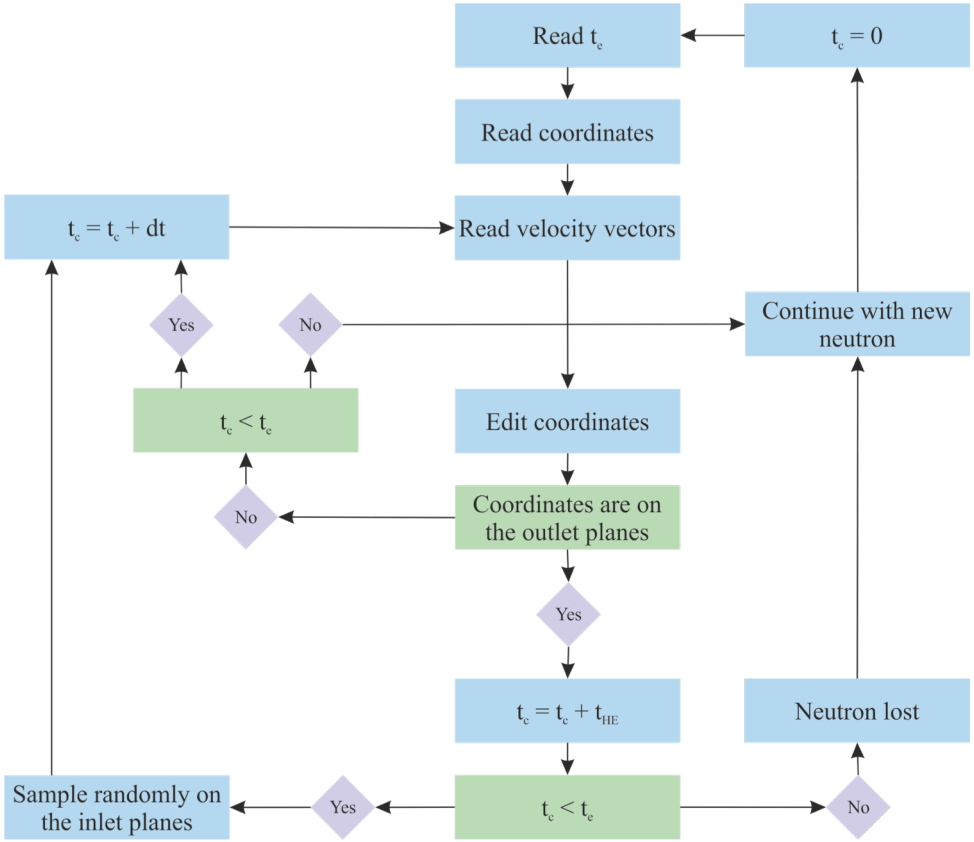
Spatial distribution of the delayed (left) and prompt (right) neutron sources at nominal flow rate (arbitrary unit; OpenFOAM; optimized geometry, 3D case study; nominal flow rate)

M. Aufiero *et al.*, "Calculating the effective delayed neutron fraction in the Molten Salt Fast Reactor: Analytical , deterministic and Monte Carlo approaches," *Ann. Nucl. Energy*, vol. 65, pp. 78–90, 2014.

SERPENT extension

Similar to that created by Aufiero M., but also:

- allows to to exclude heat exchangers from SERPENT model.



Negri O., Abram T., "Influence of Fuel Flow Rate Variation on Molten Salt Reactor Performance," in PHYSOR 2020: Transition to a Scalable Nuclear Future, 2020.

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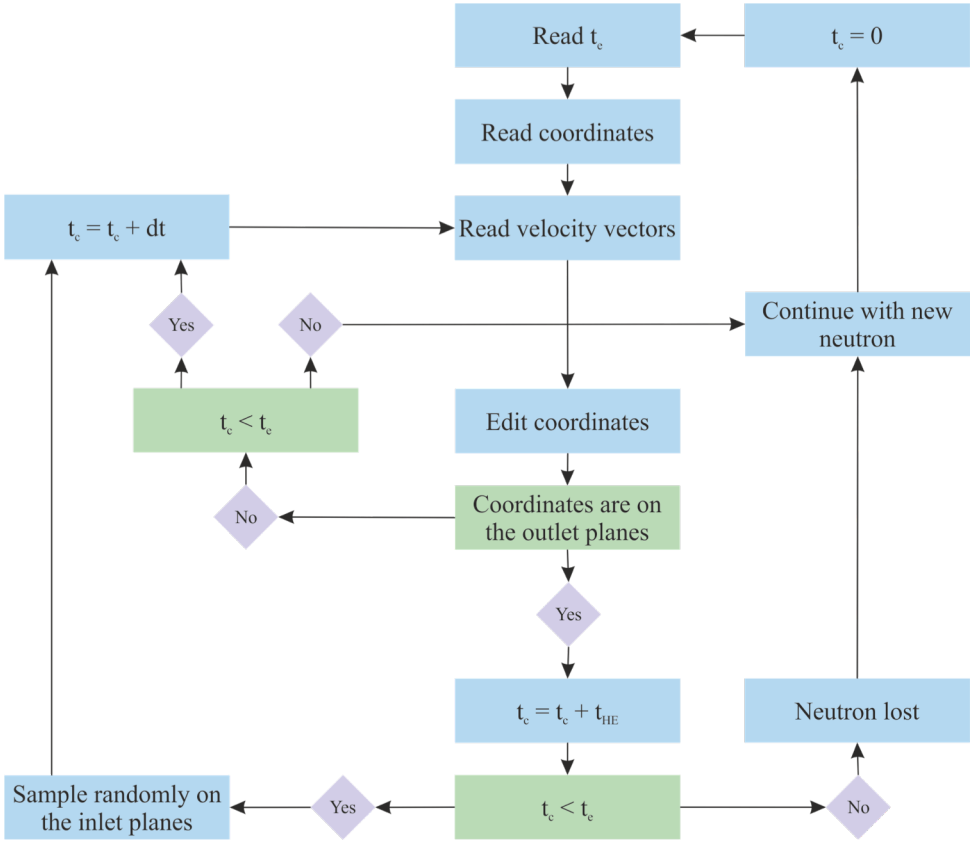

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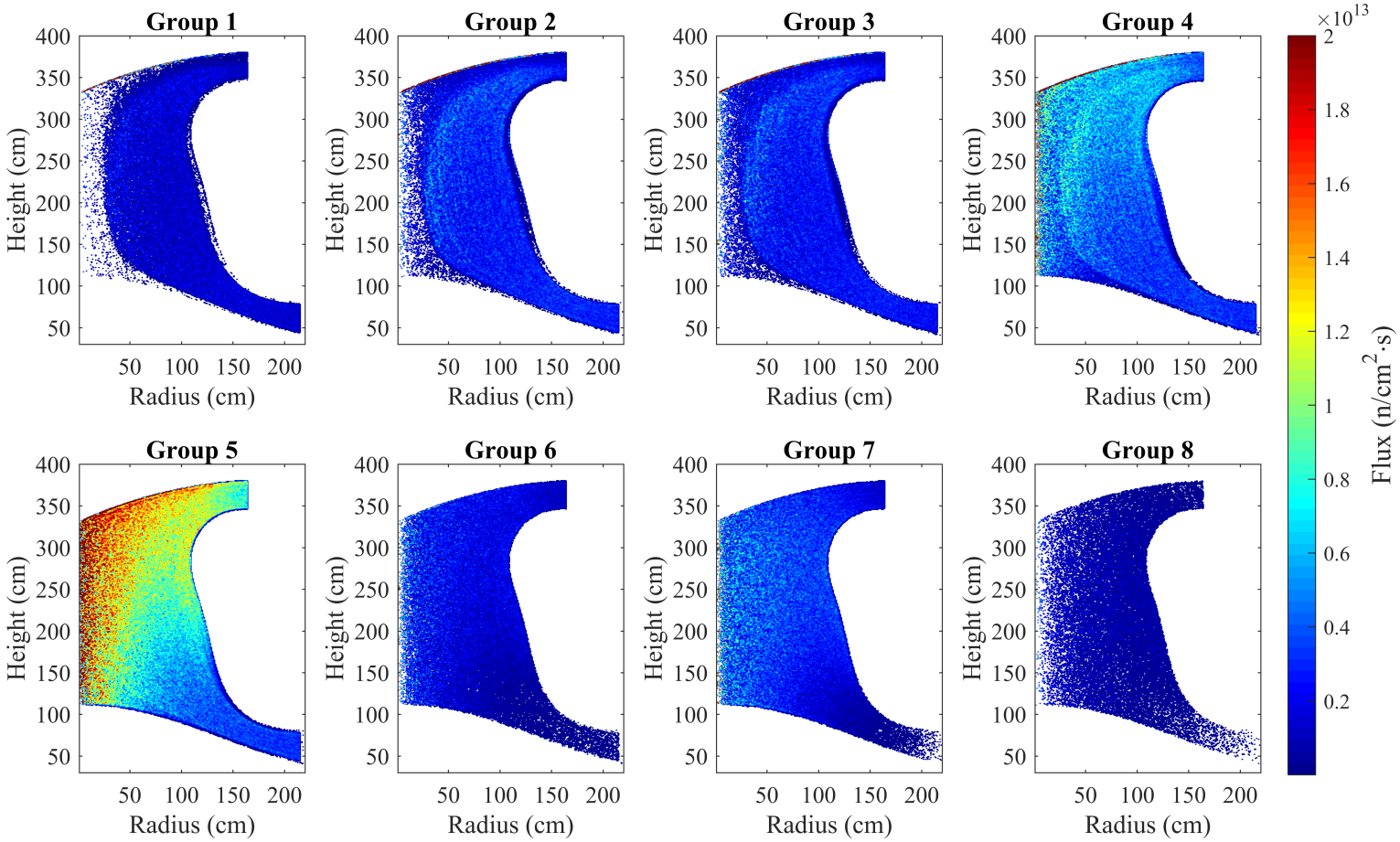
Comparison between performance times of the original and extended SERPENT (600 cycles, 50000 neutron population)

SERPENT version	Time (h)	β_{eff} (pcm)
Original	26	336
Extended	38	157

Visualisation of results



Delayed neutron flux by groups

O. Negri, "Modelling Of Neutronics And Thermal-Hydraulics Of Molten Salt Reactors," 2020.