Systematic error in pebble's modelling

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ABSTRACT

Due to the impossibility of MCNP to model the geometry of a random distributed system, such as a pebble fuel element, a lot of effort has been made to show the accuracy of lattice-based models. For pebble bed reactors the approximation is used in both distributions of kernels inside the pebbles, and pebbles inside the core. These approximations are usually based in a volume-weighted philosophy, but do not take into account boundary effects due to the intersection of finite bodies with the limiting surface. This fact introduces a systematic bias in the amount of fissile material included in the model of the core, and therefore in all the kcode output variables, from keff to neutron fluxes.

In this work it will be shown the behaviour of this systematic error as a function of the geometry modelled, as well as a method to calculate the proper geometric parameter for the lattice approximation.