Editorial office comments  
­(1) Please mention Listing 1 in the main text.

*Response: Listing 1 is now referenced in the main text.*

Reviewer #1 comments

I have reviewed the manuscript listed above. This manuscript describes a new capability to generate multigroup cross sections from a widely available, generalized geometry, continuous ­energy Monte Carlo code. The paper is well ­written and is of interest to the readers of Nuclear Technology. Therefore, I recommend it be accepted with the minor comments listed below.

(1) The OpenMOC code is introduced above Eq. (2), but no reference is given. I believe that it should have reference [5] attached to it. The authors may also want to consider making the sentence with OpenMOC a new paragraph. The transition from OpenMC to OpenMOC is confusing to the readers because the names are so similar. OpenMOC is eventually described, but not until much later in the paper.

*Response: The reference for the OpenMOC code is given when it is first referenced in the second paragraph of Section I on the first page. A reference to the Section VI.C which summarizes the OpenMOC code’s capabilities is now given when OpenMOC is mentioned above Eq. (2).*

(2) There is a dangling "s" at the end of the paragraph including Eq. (2).

*Response: The dangling “s” has been removed.*

(3) The definition of a delayed fission source is confusing. First, it does not explicitly use the common term "Beta\_i". This could be resolved by simply adding a sentence that the delayed fission source is commonly known as "beta\_i\*total fission source". Second, there is no index over the delayed energy groups (typically 6). Are there actually 6 different delayed fission sources, or just one? Third, how are the isotope­-dependent delayed neutron yields accounted for?

*Response: As recommended, a sentence (and the new Eq. (27)) point out the more common definition of the delayed neutron fraction in terms of the delayed neutron source, and how it can be easily derived from Eq. (26). The reviewer makes a good point about the delayed group index having been omitted – the new delayed group index is properly included in the revised manuscript. In addition, the revision notes that the number of delayed groups typically ranges from 1 to 6 or 8 (both ranges are supported by OpenMC). Finally, the revision includes a note on how isotope-dependent delayed neutron fractions are calculated with isotope-dependent fission sources.*

(4) In section III.G, the "nu-­fission" cross section has an energy to energy transfer dependence. Is this the general form of the data in the ACE libraries? I think some readers may expect to see a single fission cross section and a "chi" term, especially since the multigroup cross sections are intended to be used in deterministic codes. I suggest that the authors add a note mentioning this, or perhaps combining sections III.G and III.H?

*Response: The reviewer makes a good point that the group-to-group nu-fission production matrix (Eq. (22)) is not typically not required nor used by multi-group codes, which more commonly use the fission spectrum “chi” is instead (however, the authors are aware of at least one code which optionally usse the group-to-group fission production matrix in place of “chi”). This fact is now noted at the end of Section III.G and the beginning of Section III.H. The two sections have been kept separate since the group-to-group fission matrix in III.G is not used as an intermediate step in computing the “chi” term in III.H. Although the fission matrix is not commonly used in multi-group codes, it is straightforward to compute from Monte Carlo tallies as is done by OpenMC, and it can be an instructive quantity to analyze in an educational setting.*

(5) In section IV.B.1, it mentions that the number of tallies are reduced from 10^2 ­ 10^3, but it doesn't say what they are reduced to. Is it on the order of 10's of tally's? I understand that reducing the number of tallies will speed up the calculation, but from Figure 1.b, it still seems like you need to store the same amount of information whether it is one single tally or multiple tallies. Could you add some details on how you are able to "slice" a tally without still needing the same information from multiple smaller tallies?

*Response: The number of tallies is typically reduce to 1 – 100 as is now noted in the text (i.e., tally merging reduces the number of tallies by 1-2 orders of magnitude). The reviewer is correct in noting that the same amount of information is stored in memory irregardless of whether the tallies are represented by a single tally object or multiple tally objects – this fact is now made explicit in the text. However, the text also now makes note of the fact that tally merging is useful to reduce the number of tallies which must be “searched” or “queried” to find those which must be scored to on each interaction.*

(6) In the paragraph before section V.C, "comma" is misspelled. In addition, I think the last "OpenMC" should actually be "OpenMOC".

*Response: The word “comma-separated” is now properly spelled. The last “OpenMC” is correct as-is since this refers to OpenMC’s multi-group calculation mode (which is a stochastic multi-group solver, but stands in contrast to OpenMC’s more commonly known and used continuous energy mode).*

Reviewer #2 comments

The paper is very well written and in general clear enough. The part on the programming is a bit cumbersome and I understand that much efforts have been done in managing the important set of data. A explanation in the underline reasons that lead to this kind of programming is necessary in my view.

*Response: It is not clear to us what this request is specifically asking for. We have provided a high-level overview of the software engineering design – along with the computational constraints which guided our design choices – in Sections IV and V. These “cumbersome” sections are intended to provide enough detail for either:*

1. *OpenMC users to understand how to efficiently use the MGXS generation module and/or make contributions to our open source codebase*
2. *Developers of other Monte Carlo codes to readily reproduce our methods to incorporate MGXS generation into their own codes, while potentially improving upon our software design with their own implementation*

From the physical point of view, there are a number of hypothèses that need to be clarified. In particular, the use of the scalar flux for energy collapsing and spatial averaging is a strong hypothesis that might lead to significant bias.

*Response: The MGXS generation module uses the angular flux varying in space and energy for energy collapsing and spatial averaging rather than the scalar flux, as is noted in Sections III.A and III.B, and Eqns. (3) – (5) in Sections III.A and III.B on symbolic notation, which is used in all subsequent equations in Section III (namely, Eqns. (6) – (28)).*

*It is possible that the reviewer is pointing out the fact that all of our notation indicates that the multi-group constants are integrated across the entire angular domain, which is indeed an underlying approximation (and one which is made by many common MGXS generation methods in use today). If this is the case, wish to note that we neglected to highlight the fact that our MGXS module is actually capable of generating angular-dependent MGXS, since this capability is the sole topic of a separate forthcoming paper.*

I strongly recommend to give guidance to the user so that they do not fail into strong problems.  
Your method generates xs for use in transport theory (MOC) in 70, 8 or 2 groups. As you see in your tests, only 70 groups is leading to results with reduced discrepancies.

*Response: It is fully expected that one would obtain results more consistent with a Monte Carlo reference solution with a finer energy discretization with more energy groups. The results we present in the paper were simply meant to illustrate the effectiveness of the MGXS generation module and are not intended to provide comprehensive guidance on the efficacy of different energy group structures for solving high-fidelity neutron transport problems.*

Now if you want to generate smeared xs for the entire assembly, your method will not work. You should in that condition create xs directly for the entire assembly with your equation (6) but not for the individual régions. see paper M&C2013: Generation of SFR Few­Group Constants Using the Monte Carlo Code Serpent from Emil Fridman and Co. In this paper, the transport effects within the assembly are taken into account by the method itself and the remaining transport effects (core­ control rods and core­blanket interfaces) are not precisely described but could be done with your method.

*Response: As is noted in the abstract, Section I, and throughout the paper, our method and implementation are not intended to generate smeared MGXS for an entire assembly. Our multi-group constants are intended for use by fine-mesh transport rather than coarse-mesh diffusion codes, which brings its own set of unique (though not mutually exclusive) challenges with respect to few-group diffusion.*

Also, your fission rates discrepancies in the colorset benchmark are most probably due to hydrogen anisotropy of water reflector. This can be catched only with P1 transport effect if you use proper weighting by the angular flux. see paper at PHYSOR2014 on Neutron Leakage Treatment in Reactor Physics. Consequences on SFR Characteristics Prediction from G. Rimpault et al.

*Response: The case study presented in the paper uses OpenMC’s “iso-in-lab” feature for isotropic-in-lab scattering, as is noted in the second paragraph of Section VI.B. The “iso-in-lab” feature eliminates hydrogen anisotropy of the water reflector, and the need for a P1 transport correction. Therefore, the discrepancies in the colorset benchmark are necessarily due to other approximations. Three of the authors have two additional papers currently in peer review which diagnose the fission rate discrepancies and present new techniques to address them.*

Well, I would appreciate if you could add some kind of more exhaustive list of references with perspectives to improve your method.

*Response: The paper references all known prior work which is directly applicable to the content presented.*