Author's response of the paper ID100

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I appreciate for your review. We agree with your important comments and have incorporated the suggestion throughout the paper. Our response is written in blue.

Reviewer 1: The paper is well written and reads nicely. It summarizes the capabilities of the ARKADIA code system. A few comments below:

section 2.1: Fig. 1FIG. 1 is double
I am sorry for this double expression. "FIG. 1" comes from a field code function of the MS word. We have corrected it.

Please indicate whether the ARKADIA analysis shown in Fig 3 is also compared to experimental data from EBR-II (and if so, consider showing it) or whether the simulations solely targets demonstration of the code capabilities.
Fig. 3 is a demonstrative numerical result by ARKADIA-Design. To clarify it, we have added "demonstrative" in the first paragraph of the section 3.1.3. As you mentioned, comparison to experimental data for validation is an important task in the future.

Is the SPECTRA code described in this paper the same code as mentioned in the paper of Stempniewicz et al. (2018) in Nuclear Engineering & Design 339 which was also used for SFR safety assessment?
I am sorry for that this name causes confusion. The SPECTRA code written in our paper is originally developed by Japan Atomic Energy Agency. To distinguish it from the code by Stempniewicz et al., we have already described the full name, "Severe-accident PhEnomenological Computational tool for TRansient Assessment". To prevent misunderstanding, we have added "which is originally developed by JAEA" after the full name of the code.

The CFD analysis mentioned as part of the SPECTRA analysis is not what we usually call CFD looking at the mesh presented in Fig 6. It looks more like a 3D system code model like e.g. available in RELAP3D or SAM. Please comment on this or change the name.

In addition I am curious how turbulence transport is modeled in the 'CFD' part.

The CFD module in the SPECTRA code can use a detailed three-dimensional mesh. However, speaking about this demonstrative analysis of this hypothetical LORL event, we used the simplified in-vessel configuration and coarse mesh for the in-vessel part. We have described this point in the first paragraph of the section 3.2.3. The purpose of this code is to evaluate the whole plant behavior by using the fast computable models. Considering this purpose, turbulence transport model is not considered.

Reviewer 2: Interesting paper presenting ARKADIA (Advanced Reactor Knowledge- and AI-aided Design Integration Approach through the whole plant lifecycle), a platform providing solutions for the design, safety measures, maintenance and decommissioning of advanced nuclear reactors. The paper should be accepted, after the following minor comments have been addressed:

· Page 1, abstract: add "the" before development in first sentence.

· Page 1, abstract: delete "the" in "decommissioning of advanced nuclear reactors".

· Page 1, abstract: "with as first target sodium-cooled fast reactors".

· Page 1, last paragraph: remove "the" before "three interconnected systems"

· Page 2, 2nd paragraph: remove "the" in "…appearing in the advanced reactors.."

· Page 2, 2nd paragraph: add "the" in "..analysis code is the base model…"

· Page 2, in 2.1: delete the double reference to Fig 1.

· Page 2, last paragraph: Could you elaborate on the mentioned database tags. Where they come from and how are they selected? They seem rather fundamental is making sure the correct information is retrieved from the knowledge base.

· Page 3, in 3.1.1: delete "using" in "…simulation approach using by the coupled.."

· Page 4, in 3.1.3: Please elaborate on the sequential two-way coupling that is used. How is this coupling performed? Are iterative schemes used, or under-relaxation factors. Or is input from the one code just used as boundary condition or source term in the next code?

· Page 5, in 3.2.1: "method" should be "methods"

· Page 8: "at different four times" □ "at four different times"

· Page 8: remove "the" in "..amount of the leaked debris.."

· Page 10: Heading should be "conclusions", not "cocnlusions".

Thank you for your detailed comments. We have reflected all of the comment concerning English expression. The responses for other comments are written below.

· Page 2, last paragraph: Could you elaborate on the mentioned database tags. Where they come from and how are they selected? They seem rather fundamental is making sure the correct information is retrieved from the knowledge base.

The method to determine database tags for a knowledge data is being examined. We can say that the database tags will be determined based on the hierarchy method at this time. We have mentioned this point in the second paragraph of the section 2.1.

· Page 4, in 3.1.3: Please elaborate on the sequential two-way coupling that is used. How is this coupling performed? Are iterative schemes used, or under-relaxation factors. Or is input from the one code just used as boundary condition or source term in the next code?

As you mentioned, code-to-code coupled analysis was realized by transferring the boundary conditions. This method is expressed in Fig. 3a. However, the explanation in the body text was not enough to understand. We have added this explanation in the first paragraph of the section 3.1.3.

Reviewer 3: Thanks for this paper! Please find a few corrections, comments and requests for clarification below :

p2: "user's requirement" -> "user requirements"
We have corrected this expression.

p5 §3.2.1: SPECTRA is also the name of a system thermal-hydraulics code developed at NRG (Netherlands) for the analysis of LWRs and fast reactors. It seems the SPECTRA code described in this paper is completely different?
I apologize that this name causes confusion. As mentioned before, we have added the explanation to prevent misunderstanding.

p8: "different four times" -> "four different times"
We have corrected this expression.

p9 fig7 : I think this mesh is maybe a bit too coarse to be qualified as "CFD"...
Maybe "3D thermal-hydraulics analysis" would be a better choice?
We agree with your important comments. However, we used the simplified in-vessel configuration and coarse mesh for this overall functional test coupling in- and ex-vessel phenomena. We have corrected some sentences to understand the purpose of this test analysis.

p8 : could you provide an estimate of the gain in calculation time provided by SPECTRA compared to a calculation made with "reference" tools, for instance SIMMER for the primary circuit and CONTAIN-LMR for the containment?
We have not estimated a calculation time compared to the existing codes. This point is very important as a future work. This is not a direct answer, but we have added the explanation concerning the calculation speed and stability in the last paragraph in page 8.