Referee 1

In this manuscript, the authors developed an individual tree-based carbon model, FORCCHN2 by using the NSC pools to couple tree growth and phenology. It was tested that the model performed well in reducing uncertainty in predicting forest carbon fluxes. They described the framework in details and provide the source code of the model. The coding system is complete, and both research and development foundations were very solid. Besides, the model is very convenient to be called with other computer tools. I noticed that the results of application of the model in predicting carbon dynamics in the Northern Hemisphere was very ideal. I suggest accept the manuscript for publication after minor revisions. I have the following minor points need to be addressed by the authors.

Response: We sincerely thank the reviewer for your valuable feedback, and we think the reviewer's comments are very important to our work. The responses to the reviewer's concerns have been included in each comment. Our replies are given in the blue text.

1. Section 2, for description of FORCCHN2, you just told phenology, you may mean phenophase, was controlled by heat and chilling. You'd better tell what model was used to decide phenophase by climatic variables. Beside, in phenology, we often say heat and chilling requirements.

Response: We agreed with the comments from the reviewer. Here, we revised the 'phenology' to 'phenophase' in lines 66 and 75. We also added the description of the climatic variables in the calculations of phenophase: 'The spring phenophase is decided by the effective temperature with Thermal Time model (Eqn 39-40), and the autumn phenophase is decided by the effective temperature and photoperiod with Cold Degree-Day model (Eqn 41-42).', in lines 76-79. According to the reviewer's comment, we changed the sentence to: 'The phenophase of spring and autumn in FORCCHN2 is controlled by heat and chilling requirements, respectively.', in lines 75-76.

2. Line 75-76: does phenology here mean spring phenology? As it is difficult for the calculation of chilling requirements for autumn phenology.

Response: In this work, the phenology meant the spring and autumn phenology. We thought the autumn phenology was more difficult to calculate than the spring phenology. We used the effective temperature and photoperiod with the Cold Degree-Day model to calculate the autumn phenology. The corresponding calculation and parametrization of this phenology had been tested in the newest paper, Fang et al. (2022). We had added the reference in this sentence.

Reference for the reviewer

Fang, J., J. A. Lutz,, H. H. Shugart,, Wang L., Liu F., and Yan X. 2022. Continental-scale parameterization and prediction of leaf phenology for the North American forests. Global Ecology and Biogeography, 00:1–13. https://doi.org/10.1111/geb.13533