

Interactive comment on “How can effect the synergy of climate change, soil units and vegetation groups the potential global distribution of plants up to 2300: a modelling study for prediction of potential global distribution and migration of the N₂ fixing species *Alnus* spp.” by A. Sakalli

Anonymous Referee #1

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_____ General comments This study develops empirical models for explaining the global geographical distribution of alder species. Each model employ one of the annual-mean-climate, soil type, and a potential vegetation map as the explanatory variable. When these three models are combined (denoted as the "All method" in the manuscript), it has the highest performance for explaining the geographical distribution

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of the alder species. Author then applied the "All method" for predicted climatic conditions at years of 2100 and 2300, and tried to state the potential changes in the geographical distribution of alder species. As authors mentioned, such study would have an important implications for vegetation sciences, because alder is N₂ fixing species, which may ease up nitrogen-limitation for plant productivity under increasing trend of atmospheric CO₂ concentration. Also, such topic would be suitable for the Biogeosciences. However, I cannot encourage this manuscript for further consideration for publication due to critical flaws in its method.

Major concern 1: Validation method For constructing the model, author employed seven data bases concerning global distribution of alder species (2nd paragraph of P821). For validating the model, authors employed another data base (GBIF) for global distribution of alder species (2nd paragraph of P825). Although the GBIF was not referred when author constructed the model, this cannot be an independent validation, because all of the involving data-sets are plant distribution information constructed from field observations.

Major concern 2: The sub-model "Veg" Author stressed the importance of inter-relationships among plant species for determining their geographical distributions. However, no potential-vegetation-map at large geographic scales treats such factors, they simply constructed from a set of climatic envelopes. Therefore, author employed additional climatic envelopes for developing the "Veg" model in this study. The "Veg" model is apparently more successful for explaining to the global distribution of alder species, when it was compared with the "Clim" model (Fig 3). This indicates that nearly no improvement was attained by the newly developed climate envelopes in this study.

Major concern 3: The predicted climate at the year of 2300 In the IPCC's 4th assessment report, 200 years simulations were appended after the year of 2100 with no further development of atmospheric CO₂ concentration. The aim of these simulations is not for prediction, but for assessing the inertia effect of the change of atmospheric radiation-forcing on the climate. However, author utilize the climatic condition at the

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end of this appended 200 years simply as the climatic condition of the year of 2300 without any excuse.

_____ Specific comments (1) Abstract Brief summarizing for conclusion of this study must be needed.

(2) P823, 1st paragraph The logic in this paragraph is not easy to follow for me. Also, please explain how many "soil units" are available in this data-set.

(3) P823, 1st paragraph Authors has to explain the source of the potential vegetation data with references.

(4) P824, Line 17 But, authors states that they employed SRES scenarios in other parts of the manuscript.

(5) P825, Line 10 Authors should state why 30-years period is sufficient for alder species to migrate adjacent simulation grids. Because alder is a typical species group with pioneer life history?

(6) P827, Line24 Authors should briefly explain physical properties of the "Gleysols".

(7) Discussion Changes in atmospheric CO₂ concentration also affect plants distribution by changing the fertilization-effects and water-use-efficiency. Authors should state that he did not consider such effects in his analysis.

(8) P840, Lines 6~7 "The models show that climate is the main predictor for the identification of regions which are potential habitats for the alder" But, according to the figure 3, the "clim" model has the lowest coefficient of determination (r^2) among all models.

_____ Technical corrections (1) P820, Lines17~20 Please explain why such an old data-set was employed.

(2) P820, Line24 (also P835, Line 9) Being a non-native English speaker, I am not very sure, but "after" in this context sounds strange.

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- (3) P821, Line8 What's data? The title should be more specific.
- (4) P822, Line15 Units for Tann and Pann would be provided.
- (5) P826, Line 8 What specific numbers Pi and Oi have?
- (6) P 826, Line 19 Being a non-native English speaker, I am not very sure, but "assume" in this context sounds strange.
- (7) P831, Line 26 "the" is duplicated.
- (8) Table 2 and 3 Please explain differences between bold-font lines and regular-fonts lines.
- (9) Caption for the figure 7 According to the main text, this graph is the simulated-state at the year of the 2300, right?

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