

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

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I would like to thank the anonymous referee #1 very much for the very useful comments about the manuscript. Hereby I would like to reply the referee for the comments. The references at the end of this response are also added to the manuscript. For avoiding the repetition of some long names in the comments, I would like to some acronym as

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follow;

Acronyms:

Reply to General Comment: RGC

Reply to Specific Comment: RSC

Reply to Technical Comment: RTC

General Comments:

RGC-1: GBIF data includes data for observations of occurrence of *Alnus* spp. not only by field observations but also by citizen scientist and surveys from research expeditions (see GBIF, 2013). It also includes more than 450 million of records of 1.4 million of species from over 15000 datasets and 600 publishers by end of 2013. That makes the GBIF data base a valuable dataset for using the data records in presenting the global or regional distribution of plant or animal species. Also, as it is mentioned in P822 line 6, I used 308 data records for the construction of ADM where for the validation of the ADM, I used 237178 data records for the alder distribution (see P825 line 18). Therefore, I used trustfully the GBIF data base for validation of the ADM in this study.

RGC-2: The classification of the biome and vegetation groups of the World was done by Josef Schmithüsen by concerning among the others the interactions between the plants species and plant functional types (Schmithüsen, 1967; Schmithüsen, 1976). It was published that the global data set of Schmithüsen for biome and vegetation groups treats the plant-plant interaction. When the alder distribution which is based on the prediction by climate variables, was stressed by the vegetation, the distribution was quite good effected by the adding the plant-plant interaction (see Supplement FS-3). Please consider, that the correlation between the observed and predicted data in Fig. 3 was done by considering the distribution records in half degree grid cells which has more than 100 data records in 20 countries. That can be the reason why the referee thought that there is slightly effect on the alder distribution by adding the vegetation

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group as stress factor. By considering the Fig 3. and Fig. S3 in supplementary, I believe that it is necessary to add the vegetation groups as an additional stress factor.

RGC-3: For the prediction of alder distribution in 2300, I used the climate data of the extension of RCP scenarios from CCSM data model. Meinshausen et al. (2011) published the methodology of the extension of the RCP scenarios for climate change research (Meinshausen, 2011). According to the methodology of the paper, it is to see that the CO₂ concentration in the atmosphere. To clarify the misunderstanding of this topic, the reference paper is also added to the manuscript.

Specific Comments:

RSC-1: The abstract is modified for adding necessary information about the results.

RSC-2: The FAO-UNESCO Soil Map of the World data base includes 129 type of soil unit. It is also added in the manuscript.

RSC-3: The potential vegetation data was used from Schmithüsen vegetation data base. The required information is added in the manuscript.

RSC-4: It should be RCP instead of SRES. It is corrected in the manuscript.

RSC-5: The lifespan of alders ranges between 40-100 years (Claessens et al., 2010; Harrington et al., 1994). I assume that a change in 30 years annual average of climate conditions (i.e. temperature and precipitation) can change the suitable climate conditions in the distribution area and force the migration of alder species. Unfortunately, there is no pro or contra data about this assumption in the academic literature databases. Therefore the 30 years period was used for the prediction of alder distribution and migration. This is a weak point of the model, and may be changed in the future by long term observation studies.

RSC-6: The following sentences are added in the manuscript. "Gleysols are wetland soils and categorized in FAO-UNESCO soil database as a hydromorphic soil group which are influenced by groundwater for a long period to develop a characteristics

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gleyic pattern, and are mainly covered by swamp vegetation (FAO-UNESCO, 1974)."

RSC-7: The following sentences are added in the manuscript. "An increase in CO₂ in the atmosphere can also influence the plant distribution by e.g. CO₂ fertilization, CO₂ partial pressure, water use efficiency (Johnson et al., 1993; Collatz et al., 1998). In this study, I did not consider this type of effect from CO₂ on the alder distribution."

RSC-8: The sentence in the P840 line 6-7 is changed as follow: "The model shows that combine effect of the all three parameters (i.e. climate, soil, vegetation) is the predictor for the identification of regions which are potential habitats for the alders."

Technical Correction:

RTC-1: The using of climate parameter from Leemans Cramer was due to bias correction of the dataset. The dataset contains long term monthly averages data for the 0.5 degree longitude/latitude resolution on global level which is generated from large dataset by using the methodology of partial thin-plate splining algorithm. That was the main reason why this data set was used in this study.

RTC-2: The word "after" is changed to "according to the study from"

RTC-3: The title of the subsection is changed to "Distribution data for alders"

RTC-4: For the Tann "°C" and for the Pann "mm" was added

RTC-5: The following sentences are added to the manuscript: "where P is the number of the simulated grid cells with potential alder distribution in related locations and O is the number of the observed grid cells with alder distribution"

RTC-6: The sentence in P826 line 19 shows an assumption, therefore it is usable at that point.

RTC-7: One of the two "the" is removed from the sentence in P831 line 26.

RTC-8: The bold lines in Table 2 are the main groups of the related sub group for soil

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types according to FAO-UNESCO Soil Map of the World. The bold lines in Table 3 are the name of the vegetation groups according to Esser et al. (2011) which includes the biome type from Schmithüsen (1974) vegetation data base. This information is also added to the manuscript.

RTC-9: The year 2100 in caption of the figure 7 is changed to 2300.

References:

Claessens, H., Oosterbaan, A., Savill, P., Rondeux, J. (2010): A review of the characteristics of black alder (*Alnus glutinosa* (L.) Gaertn.) and their implications for silvicultural practices. *Forestry*, 83 (2), 163–175, 2010. DOI: 10.1093/forestry/cpp038

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