

## ***Interactive comment on “Nitrogen impacts on vascular plants in Britain: an analysis of two national observation networks” by P. A. Henrys et al.***

**Anonymous Referee #2**

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The manuscript submitted by Reis et al. aimed to investigate the effect of nitrogen deposition on plant composition for some of the most important habitats in the UK, by looking at the changes in individual species. This is a very interesting and original approach, which adds relevant information, related to the qualitative impact of nitrogen deposition on the different habitats in the UK, i.e., which species is more sensitive to atmospheric N input. The authors took into account data from two national observation networks over the UK, providing the opportunity to investigate the effect of N deposition on plant species at the national scale. The authors used a generalized additive model, which includes ecological variables other than N deposition, in order to account for the effect of other covariates. However, looking at the interaction effect (i.e., N deposition X

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single ecological variables) would have been even interesting (see specific comments below). Finally, due to the relevance and originality of the study, I expected the authors to discuss in more details results obtained from their large scale investigation, with particular reference to the ecological (and perhaps economic) implication of the changes in the species distribution observed, in the context of the climate change. Does change in the species occurrence have an effect in the soil biogeochemical cycle, plant productivity, ecosystem functionality, competition with other species and/or survival or the rare endemic species (not included in the study, but the effect of N deposition could be more detrimental for the rare species than the common ones)? How the loss or the abundance of species might affect the management and/or conservation of the different habitats considered? I believe that discussion and conclusion of this important paper deserve to be improved, by accounting also for the above mentioned aspects.

Specific comments:

Title: Why only nitrogen and not nitrogen deposition? If you leave only Nitrogen it could lead to misleading (e.g., N fertilization).

Abstract: Results and their implication should be better presented.

2. Methods-Paragraph 2.1. It would be useful to describe in more details the habitats included in the studies, with particular reference to their spatial distribution. Indeed, in addition to the table 1 a map could be add in order to provide a view of how the different habitats are distributed across the UK.

2. Methods- Paragraph 2.2. In the second line the authors mention “N deposition”, but it is not clear whether they consider “total N deposition”, i.e., wet+dry N deposition or “total inorganic N deposition”. Please provide more specific information here.

2. Methods- Paragraph 2.2. In the lines 3-4 the authors specify the variables included in the model. I am very surprised that they included only total annual rainfall and not the summer rainfall. Giving that precipitation during summer might be critical in some

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areas of the Country (i.e., South-East of England), including it might be relevant.

2. Methods- Paragraph 2.2- Discussion. What is missing there (and I believe would be interesting to see) is the interaction effect between Ndeposition and the other variables included on the individual species occurrence. The interaction effect between Ndeposition and other variable was poorly mentioned also in the discussion. For instance, the authors included also Sdeposition in the model. Hence, it would be interesting to understand whether the changes in the occurrence of individual species is affected by the interaction SdepXdep, giving that Sdep has decreased over the last years. Another example could be the interaction between precipitation (in particular summer precipitation) and N deposition. In the case of the lowland acid grassland species, the negative relationship between species occupancy and Ndeposition observed for nine species (Fig. 2a; paragraph 4.1.1, pg 7453-7454) could have been affected also by a reduction in summer precipitation, giving that these species are typical of dry acid grassland in the South and East of England (as the authors stated at pg.7454, lines 4-5). Other important aspects (not even mentioned) are the agricultural practice and/or grazing, which could be relevant for some of the habitats considered, i.e., the grassland.

#### Table and figures

Caption to figures 2-7. It would be good to specify in the caption that only species with significant P-values are shown. Figures with different lines (e.g., Fig. 2a,2b, 3a) can be more readable, if different colours are used.

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