



# ***Interactive comment on “LPJmL-Med – Modelling the dynamics of the land-sea nutrient transfer over the Mediterranean region–version 1: Model description and evaluation” by Mohamed Ayache et al.***

## **Anonymous Referee #2**

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The paper modeled the dynamics of water discharge, nitrate and phosphorus export to the Mediterranean Sea with the LPJmL model. The authors integrated a number of formulas in quantifying processes of N and P losses into rivers, in-river retention, and export. These processes include remineralization, adsorption, nitrification, denitrification and phytoplankton dynamics, etc. Indeed, these formulas in quantify the processes are not new, but the model runs on daily time scale. The key question is modeling N and P input into rivers from terrestrial sources with effective validation, which would

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make the model robust. That is particularly difficult and challenging. Up to now, less study or modeling can be validated in this area.

From technical point of view, I have following questions regarding N and P input into rivers, in-river and in-reservoir retentions. Figure 1, regarding the conceptual diagram of nitrate and phosphate losses to rivers, diffuse sources include soil source, urban land source, rural land source. In addition, aquacultures feed also should be considered. This paper only modeled the soil diffuse source, without quantifying other diffuse sources such as urban land source, rural land source and aquacultures feed. For soil diffuse source, I concern the impact of cropping system change on N and P budgets, this is particularly important from long-term agricultural activities. I am particularly interested in in-river and in-reservoir retention of N and P. For in-reservoir retention, the temporal pattern in construction of artificial dam-reservoirs can significantly influence reservoir's retention/removal of N and P. A group of newly-built reservoirs in upriver can influence downriver "aged" reservoir's retention of N and P, particularly for P, because the inputs of N and P to these "aged" reservoirs have been changed due to the newly-built reservoirs in the same river networks. For in-river retention, N and P retention by different river orders should be considered at the river network scale, because rivers with different orders have different hydraulic loads which can control N and P retention. Finally, the model runs on daily time scale, authors should showed the daily-temporal changes in nitrate and phosphate concentrations for those rivers flowing into the Mediterranean Sea.

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