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Interactive comment on “Process based model sheds light on climate signal of mediterranean tree rings” by R. Touchan et al.

R. Touchan et al.

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Received and published: 31 December 2011

Dear Dr. Tom Levanic,

We are grateful that you found our manuscript represents a novel approach to interpretation of the climate-tree growth relationship. We believe your comments and suggestions will improve and enhance our manuscript. Concerning your questions:

1. Please explain if the model was tested against the real cambium growth for that particular tree-species, and do we need to make some preliminary cambium dynamics studies in order to use the model on species that are not in the model's database?

In the paper we used an estimation of integral tree-ring growth rate. But in the VS-model there is a special block which allows to simulate cambial activity based on cell

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measurements (Vaganov et al., 2006). So we need to parameterize (to estimate 15 optimal cambium parameters) that particular part of VS-model based on seasonal cell sizes. In the model tree ring growth is considered as an increase of cell number in one cell line based on cell divisions of the cambial zone. Tree-ring cells will grow and divide if their size reaches a critical size. The rate of cell growth depends on cell position in the cambial zone, the phase of cell cycle and forcing by external factors. We can simulate cambium activity by the model but to verify this simulation we would need to know the real cambium dynamics from direct measurements. Cambium dynamics studies would certainly improve the confidence in application of the model to particular species.

2. Can we expect similar good results in the environments where relationship between climate and tree-growth is not that high; or by taking into account all parameters of the VS model – can we actually expect better results in the environments where climate – growth relationship is not that pronounced?

In the model, integral growth rate depends on 3 principal external factors: solar irradiation, daily air temperature and soil moisture. Therefore, tree-ring growth is completely specified by the climatic forcing. The VS-model uses a non-linear relationship between tree growth and climate. In some specific cases (where the linear climate – growth correlation was not so high) we have obtained good simulation results by the VS-model (Shishov et al., 2007; Ivanovsky, Shishov, 2010).

3. It would be good to mention that VS model can be used for broadleaved trees as well.

Yes, we will add a sentence about this issue if we are allowed to make modifications to the text. We are trying to adopt this model for broadleaved species taking into account the different anatomical structure of the tree rings.

Regarding your editorial suggestions, we will make the required changes if we are allowed.

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Best wishes,

Interactive comment on Biogeosciences Discuss., 8, 11089, 2011.

BGD

8, C5126–C5128, 2011

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C5128

