

Accepted Manuscript

Estimating regional effects of climate change and altered land use on biosphere carbon fluxes using distributed time delay neural networks with Bayesian regularized learning

Andres Schmidt, Whitney Creason, Beverly E. Law



PII: S0893-6080(18)30224-7
DOI: <https://doi.org/10.1016/j.neunet.2018.08.004>
Reference: NN 4008

To appear in: *Neural Networks*

Received date: 6 April 2018
Revised date: 18 June 2018
Accepted date: 2 August 2018

Please cite this article as: Schmidt, A., Creason, W., Law, B.E., Estimating regional effects of climate change and altered land use on biosphere carbon fluxes using distributed time delay neural networks with Bayesian regularized learning. *Neural Networks* (2018), <https://doi.org/10.1016/j.neunet.2018.08.004>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1 **Estimating Regional Effects of Climate Change and altered Land Use on Biosphere**
2 **Carbon Fluxes using Distributed Time Delay Neural Networks with Bayesian**
3 **Regularized Learning**

4
5 Andres Schmidt^{1,2}, Whitney Creason², and Beverly E. Law²

6 ¹ RWTH Aachen University, Department of Geography, 52062 Aachen, Germany

7 ² Oregon State University, Department of Forest Ecosystems and Society, Corvallis, OR 97331, USA

8 Correspondence to: andres.schmidt@geo.rwth-aachen.de

9

10 **Abstract**

11 The ability to accurately predict changes of the carbon and energy balance on a regional scale is of
12 great importance for assessing the effect of land use changes on carbon sequestration under future
13 climate conditions. Here, a suite of land cover-specific Distributed Time Delay Neural Networks
14 with a parameter adoption algorithm optimized through Bayesian regularization was used to model
15 the statewide atmospheric exchange of CO₂, water vapor, and energy in Oregon with its strong
16 spatial gradients of climate and land cover. The network models were trained with eddy covariance
17 data from 9 atmospheric flux towers. Compared to results derived with more common regression
18 networks utilizing non-delayed input vectors, the performance of the DTDNN models was
19 significantly improved with an average increase of the coefficients of determination of 64%.

20 The optimized models were applied in combination with downscaled climate projections of the
21 CMIP5 project to calculate future changes in the cycle of carbon, associated with a prescribed
22 conversion of conventional grass-crops to hybrid poplar plantations for biofuel production in
23 Oregon. The results show that under future RCP8.5 climate conditions the total statewide NEP
24 increases by 0.87 TgC per decade until 2050 without any land use changes. With all non-forage
25 grass completely converted to hybrid poplar the NEP averages 32.9 TgC in 2046-2050, an increase
26 of 9%. Through comparisons with the results of a Bayesian inversion study, the results presented
27 demonstrate that DTDNN models are a specifically well-suited approach to use the available data
28 from flux networks to assess changes in biosphere-atmosphere exchange triggered by massive land
29 use conversion superimposed on a changing climate.

Download English Version:

<https://daneshyari.com/en/article/10127110>

Download Persian Version:

<https://daneshyari.com/article/10127110>

[Daneshyari.com](https://daneshyari.com)