Description of leaf water and stem cellulose oxygen isotope ratios simulated with LPX-Bern (July 7, 2016)

Citation of describing paper:
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download: www.biogeosciences.net/13/3869/2016/

General Information:

Format: NetCDF, gridded

Model: Dynamic global vegetation model LPX-Bern Version 1.0 (Land surface Processes and eXchanges, Bern) (Spahni et al., 2013; Stocker et al., 2013)

Resolution: 3.75° x 2.5° lat/lon global

Time: Monthly from Jan 1960 to Dec 2012

Variables:
cellu18: monthly stem cellulose $\delta^{18}O$ (per mil)
lw18: monthly leaf water $\delta^{18}O$ (per mil)
NPP: monthly net primary production (g C m^{-2})
FPC: monthly fractional plant cover

Dimensions: i=longitude, j=latitude, l=time, k=plant functional type

Codes for plant functional types (k):

1 tropical broad-leaved evergreen
2 tropical broad-leaved deciduous (raingreen)
3 temperate needle-leaved evergreen
4 temperate broad-leaved evergreen
5 temperate broad-leaved deciduous (summergreen)
6 boreal needle-leaved evergreen
7 boreal needle-leaved deciduous (summergreen)
8 boreal broad-leaved deciduous (summergreen)
9 temperate herbaceous
10 tropical herbaceous

Forcing:
- Monthly soil water $\delta^{18}O$, water vapor $\delta^{18}O$, and relative humidity: output from a simulation with the coupled atmosphere–land surface model ECHAM5-JSBACH (Haese et al., 2013)

- Monthly gridded meteorological data (temperature, precipitation, cloud cover, and number of wet days (Climatic Research Unit (CRU) TS v.3.21; Harris et al., 2014)
- Annual atmospheric nitrogen deposition (Lamarque et al., 2011)
- Annual atmospheric CO_2 (Etheridge et al., 1998; MacFarling Meure et al., 2006)

Important notes:
- Only use cellulose $\delta^{18}O$ values if monthly NPP is > 1 g C m^{-2} and FPC is > 0.001
- The leaf water $\delta^{18}O$ values in the paper are weighted by NPP (weighting already accounted for in cellulose $\delta^{18}O$ output)
- Please be aware that the data for tropical trees and herbaceous plants have not been evaluated against measurements.

References:

Etheridge, D. M., Steele, L. P., Langenfelds, R. L., Francey, R. J., Barnola, J. M., and Morgan, V. I.: Historical CO2 records from the Law Dome DE08, DE08-2, and DSS ice cores, in: Trends: A Compendium of Data on Global Change. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, US Department of Energy http://cdiac.ornl.gov/trends/co2/lawdome.html, Oak Ridge, Tenn., USA, 1998.

Haese, B., Werner, M., and Lohmann, G.: Stable water isotopes in the coupled atmosphere–land surface model ECHAM5-JSBACH, Geosci. Model Dev., 6, 1463–1480, doi:10.5194/gmd-6-1463-2013, 2013.

Harris, I., Jones, P. D., Osborn, T. J., and Lister, D. H.: Updated high-resolution grids of monthly climatic observations – the CRU TS3.10 Dataset, Int. J. Climatol., 34, 623–642, 2014.

Lamarque, J.-F., Kyle, G. P., Meinshausen, M., Riahi, K., Smith, S. J., van Vuuren, D. P., Conley, A. J., and Vitt, F.: Global and regional evolution of short-lived radiatively-active gases and aerosols in the Representative Concentration Pathways, Climatic Change, 109, 191–212, 2011.

Spahni, R., Joos, F., Stocker, B. D., Steinacher, M., and Yu, Z. C.: Transient simulations of the carbon and nitrogen dynamics in northern peatlands: from the Last Glacial Maximum to the 21st century, Clim. Past, 9, 1287–1308, doi:10.5194/cp-9-1287-2013, 2013.

Stocker, B. D., Roth, R., Joos, F., Spahni, R., Steinacher, M., Zaehle, S., Bouwman, L., Xu, R., and Prentice, I. C.: Multiple greenhouse-gas feedbacks from the land biosphere under future climate change scenarios, Nature Climate Change, 3, 666–672, 2013.