# LPJmL-FIT in Europe. V. 1
## (http://doi.org/10.5880/PIK.2019.022)

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## 1. Licence



## 2. Citation

**When using the data please cite:**

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**The data are supplementary material to:**
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## 3. Data description

LPJmL-FIT is process- and trait-based vegetation model. It is a subversion of the model LPJmL simulating patches of competing individual trees with flexible functional traits and empirically derived relations between these traits. Trait composition, productivity and stability of a forest are a result of environmental and competitive filtering. A detailed description of LPJmL-FIT (basic features and differences to LPJmL) is given by Sakschewski et al. (Sakschewski et al., 2015, https://doi.org/10.1111/gcb.12870). LPJmL-FIT was originally developed for tropical forests and has been adapted to European forests by Thonicke et al. (2020).

The data covers southern and central Europe (29.5°N – 62°N, 11°W – 36°O) on a spatial resolution of 0.5° covering the years 1901-2013. Tree height, leaf and stem traits (specific leaf area, wood density, leaf longevity; aggregated), individual traits of simulated trees, vegetation distribution (foliage projected cover, FPC), vegetation carbon and fire carbon emissions are given on an annual basis. Gross primary productivity is provided monthly. Tree height and leaf and stem traits are biomass weighted.

For evaluation of the dataset R- and MATLAB-scripts are provided.

An overview and description of all variables are found in the file description.

## 4. List of input data

| | |
|---|---|
| air temperature [°C],<br>precipitation [mm/d],<br>short-wave down radiation [W/m²]<br>long-wave net radiation [W/m²] | • WATCH (Weedon, 2011, https://doi.org/10.1175/2011JHM1369.1) from 1901 to 1978<br>• WFDEI-GPCC (Weedon, 2014, https://doi.org/10.1002/2014WR015638) from 1979 - 2013 |
| soil texture | Harmonized World Soil Database (HWSD) version 1.2, (Nachtergaele, F., van Velthuizen, H., Verelst, L., Batjes, N., Dijkshoorn, K., van Engelen, V., Fischer, G., Jones, A., & Montanarella, L., and Petri, M. (2009) Harmonized world soil database, Food and Agriculture Organization of the United Nations. In: (ed. Fao), Rome)<br>Link: http://www.fao.org/fileadmin/templates/nr/documents/HWSD/HWSD_Documentation.pdf |
| atmospheric CO2 concentration | constant at 296 ppm |
| soil depth | constant at 2m |

## 5. File descriptions

Each variable is split up in 20 files. Each file contains simulation data of 50 patches (1 patch = 10m x 10m) with the same climate input.

| Filename | Variable | Description |
|---|---|---|
| firec_europe_1951_*.nc | Fire carbon [gC/m²] | Annual released fire carbon per area and grid cell |
| fpc_europe_1951_*.nc | Foliage projected cover [no unit] | Annual foliage projected cover per grid cell and plant functional type. |
| height_mass_europe_1951_*.nc | Aggregated height distribution [num of bins] | Contains biomass weighted number of trees per height class, cell and year. (100 classes in total) Height classes are provided within the file. |
| longevity_mass_europe_1951_*.nc | Aggregated leaf longevity distribution [num of bins] | Contains biomass weighted number of trees per leaf longevity class, cell and year. (100 classes in total) Leaf longevity classes are provided within the file. |
| mgpp_europe_1951_*.nc | Monthly gross primary productivity [gC/m²] | Mean gross primary productivity per cell,head month and year. |
| sla_mass_europe_1951_*.nc | Aggregated specific leaf area distribution [num of bins] | Contains biomass weighted number of trees per specific leaf area class, cell and year. (100 classes in total) Specific leaf classes are provided within the file. |
| trait_ind_europe_1951_*.nc | Individual trait data | Contains year, cell, specific leaf area, wood density, leaf longevity, plant functional type, biomass and height of trees larger than 5m. |
| vegc_europe_1951_*.nc | Vegetation carbon [gC/m²] | Standing total biomass of vegetation per cell and year. |
| wooddens_mass_europe_1951_*.nc | Aggregated wood density | Contains biomass weighted number of trees per wood density class, cell and |

| | | |
|---|---|---|
| | distribution [num of bins] | year. (100 classes in total) Wood density classes are provided within the file. |

## 6. References


Nachtergaele, F., van Velthuizen, H., Verelst, L., Batjes, N., Dijkshoorn, K., van Engelen, V., Fischer, G., Jones, A., & Montanarella, L., and Petri, M. (2009) Harmonized world soil database, Food and Agriculture Organization of the United Nations. In: (ed. Fao), Rome. URL: http://www.fao.org/fileadmin/templates/nr/documents/HWSD/HWSD_Documentation.pdf

Sakschewski, B., von Bloh, W., Boit, A., Rammig, A., Kattge, J., Poorter, L., … Thonicke, K. (2015). Leaf and stem economics spectra drive diversity of functional plant traits in a dynamic global vegetation model. Global Change Biology, 21(7), 2711–2725. https://doi.org/10.1111/gcb.12870

Weedon, G. P., Balsamo, G., Bellouin, N., Gomes, S., Best, M. J., & Viterbo, P. (2014). The WFDEI meteorological forcing data set: WATCH Forcing Data methodology applied to ERA-Interim reanalysis data. Water Resources Research, 50(9), 7505–7514. https://doi.org10.1002/2014wr015638

Weedon, G. P., Gomes, S., Viterbo, P., Shuttleworth, W. J., Blyth, E., Österle, H., … Best, M. (2011). Creation of the WATCH Forcing Data and Its Use to Assess Global and Regional Reference Crop Evaporation over Land during the Twentieth Century. Journal of Hydrometeorology, 12(5), 823–848. https://doi.org10.1175/2011jhm1369.1