HESFIRE model

Readme file: general documentation of the model and support to run it.
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Model description

The description of the HESfire model and its parameterization procedure are detailed in the following publication:

Le Page, Y., Morton, D., Bond-Lamberty, B., Pereira, J. M. C. and Hurtt, G.: HESFIRE: an explicit fire model for projections in the coupled Human–Earth System, Biogeosciences Discussions, 11(7), 10779–10826, 2014.

This paper is currently in discussion.

Running the model

1. Software requirements

You will need a python installation (tested on Python 2.7) with the numpy, scipy and xlrd modules.

2. Input data

An example of input data is provided with the model over the Amazon basin to illustrate the format they should have. There are 3 types of data:

- Static: their value doesn't change in time within a single run: GDP, landuse and landcover
- Monthly: monthly precipitation as a fuel proxy, and monthly observation-derived burned areas for the optimization algorithm.
- Daily: night-time and day-time data (one file each) for soil moisture, relative humidity, temperature, lightning strikes and wind.

All these data are formatted in 2-D matrices, with grid-cells as rows and time slices as columns. The first 2 rows are used to store time information, while the first 4 columns are used to store geographical coordinates. The rest is the data:

				Time A	Time A	Time A
				Time B	Time B	Time B
Latitude index	Longitude index	Latitude	Longitude	*1.2*	*3.2*	*1.6*
Latitude index	Longitude index	Latitude	Longitude	*2.1*	*6.8*	*9.01*
Latitude index	Longitude index	Latitude	Longitude	*0.1*	*2.3*	*2.2*

IMPORTANT: The model does not check whether your different files contain the same grid-cells in the same order. All your input files should have the same number of rows in the same order.

For all 3 types of files, Time A is the year. Time B is irrelevant in the case of static data, but indicates the month for monthly data, and is again irrelevant for daily data.

Latitude and longitude are in degrees. They are important in the model to calculate the size of the grid cells (changes with latitude).

Latitude index and longitude index are irrelevant to the model, I use them for mapping purposes.

The first 4 cells of the first 2 rows are irrelevant to the model.

3. User inputs

The file HESFIRE_params.xls contains key variables and can be edited to run HESFIRE with different variables values. Variables are described in the file.

The code is commented and efforts will be made to improve user-friendliness.

Here is what average fire activity is when running HESFIRE with the Amazon basin input files provided and with the parameterization described in the Biogeosciences paper.

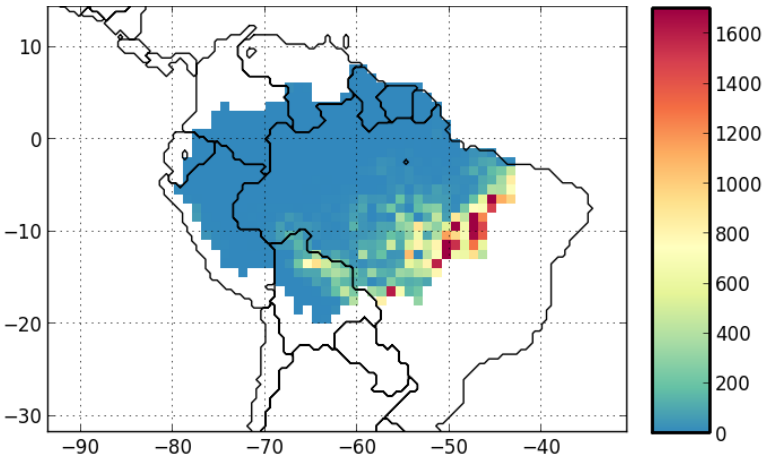

Figure 1. Average annual burned area (km², 2001-2003) in the Amazon basin as modeled in HESFIRE.