Hestia Fossil Fuel Carbon Dioxide ($FFCO_2$) Data Product - Los Angeles Basin, Version 2.5, WRF grid

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Contacts:

Jianming Liang (jliang41@asu.edu)
Kevin Gurney (kevin.gurney@asu.edu)
Arizona State University

PREAMBLE

ACKNOWLEDGEMENT POLICY

The Hestia data product represents many years of development by many people with support from the Purdue Showalter Trust and the National Institute for Standards and Technology. If you use the Hestia data product in your research we recommend that you contact Dr. Kevin Gurney to assure that the data product is being used in a way consistent with its strengths and weaknesses. In some instances we consider it appropriate to include the Hestia team in publications resulting from use of the Hestia data product. At a minimum, we kindly request that you cite the database and peer-reviewed paper establishing the data product (citations below) and acknowledgement the funding agencies that have supported the Hestia development. The following is the correct acknowledgement: "The Hestia data product was made possible through support from Purdue University Showalter Trust and the National Institute of Standards and Technology grant 70NANB14H321".

CITATION

Please cite both the dataset DOI (TBD) and the peer-reviewed publication (TBD).

FAIR USE DISCLAIMER

The Hestia data product is an attempt to estimate fossil fuel CO_2 ($FFCO_2$) emissions at very fine time and space scales. It should be considered a "climatology" of emissions rather than the "weather" of emissions. By that, we mean that the estimates represent "typical" emissions at a specific time and place (average conditions). Hence, we do not consider it appropriate to use in comparison to short-term "campaign" style atmospheric measurements (e.g. 5 days of continuous monitoring at a specific location) without consideration of the mismatch between the measurement and the Hestia estimation approach.

SECTORAL COMPOSITION

The Hestia-LA Basin version 2.5 $FFCO_2$ emissions represent emissions due to the combustion of fossil fuel and cement production in the the five counties of the LA Basin (Los Angeles, Orange, San Bernardino, Riverside, Ventura). The emissions are generated using a bottom-up/engineering approach and are tied to results generated by the Vulcan Project, an effort to quantify $FFCO_2$ emissions for the entire United States landscape. The native spatial resolution of the Hestia $FFCO_2$ emissions data product is a combination of points, lines, and polygons dictated primarily by the underlying data sources and the Vulcan $FFCO_2$ emissions output. The $FFCO_2$ emissions are placed into a regularized continuous gridded landscape for ease of analysis and incorporation into atmospheric transport modeling efforts. The data sources used in Hestia lend themselves to categorization by economic sector (Table 1).

***Table 1**. Sector categories in the Hestia V2.5 $FFCO_2$ emissions data product and the abbreviations used in the filename scheme.*

Economic sector	Abbreviation
electricity production	elec_prod
onroad	onroad
commercial	commercial
residential	residential
industrial	industrial
nonroad	nonroad
railroad	railroad
cement	cement
airport	airport
total	total

OUTPUT FILE NAMES AND FILE STRUCTURE

The Hestia version 2.5 $FFCO_2$ emissions are generated using two time-resolutions: annual and hourly for the 5 year timespan of 2010 to 2014, inclusive. The 0.1° x 0.1° gridded $FFCO_2$ emissions are stored in double-precision (8-bit) binary files (ending with ".bin") and represent the emissions resulting from integration of all point, line, and polygon elements within a gridcell (using area or length proportions for line and polygon elements that straddle gridcells). Each of the hourly emissions files contain 8760 (for the years other than 2012) or 8784 (for the year 2012) grid arrays, each of which has 17181 double-precision values and was arranged in the same order as the grid cell sequence in shapefile "Socab_Domain.shp". All the gridded $FFCO_2$ emissions are in units of kilograms of carbon (kgC)/gridcell and the hourly emissions are in local time.

The gridded output files follow a naming convention that indicates time, time resolution, and sectoral information. The files start with the prefix “WRF.VY” followed by a sector designation (Table 1), then either “annual” or “hourly” to designate the time resolution. Lastly, the calendar year of the data is listed in numeric format. The files are binary files and all are gzipped to simplify network transfer. For example, “WRF.VY.nonroad.hourly.2012.bin.gz” refers to the nonroad sector with hourly time resolution, for the year 2012.

CHECKSUMS

To ensure correct interpretation and processing of the Vulcan version 3.0 results, Table 2 provides totals for individual year/sector/time resolution combination files.

***Table 2.** Total $FFCO_2$ emissions in each of the year/sector/time resolution files in the Hestia-LA V2.5 fileset. (MtC = million metric tonnes of carbon)*

Filenames for year 2010	Total (MtC)
WRF.VY.airport.annual.2010.bin	0.56
WRF.VY.airport.hourly.2010.bin	0.56
WRF.VY.cement.annual.2010.bin	0.07
WRF.VY.cement.hourly.2010.bin	0.07
WRF.VY.cmv.annual.2010.bin	0.33
WRF.VY.cmv.hourly.2010.bin	0.33
WRF.VY.com.annual.2010.bin	1.94
WRF.VY.com.hourly.2010.bin	1.94
WRF.VY.elecprod.annual.2010.bin	4.42
WRF.VY.elecprod.hourly.2010.bin	4.42
WRF.VY.ind.annual.2010.bin	8.17
WRF.VY.ind.hourly.2010.bin	8.17

WRF.VY.nonroad.annual.2010.bin	1.25
WRF.VY.nonroad.hourly.2010.bin	1.25
WRF.VY.onroad.annual.2010.bin	18.16
WRF.VY.onroad.hourly.2010.bin	18.16
WRF.VY.railroad.annual.2010.bin	0.01
WRF.VY.railroad.hourly.2010.bin	0.01
WRF.VY.res.annual.2010.bin	3.02
WRF.VY.res.hourly.2010.bin	3.02
WRF.VY.total.annual.2010.bin	37.93
WRF.VY.total.hourly.2010.bin	37.93

Filenames for year 2011	**Total (MtC)**
WRF.VY.airport.annual.2011.bin	0.56
WRF.VY.airport.hourly.2011.bin	0.56
WRF.VY.cement.annual.2011.bin	0.07
WRF.VY.cement.hourly.2011.bin	0.07
WRF.VY.cmv.annual.2011.bin	0.32
WRF.VY.cmv.hourly.2011.bin	0.32
WRF.VY.com.annual.2011.bin	1.9
WRF.VY.com.hourly.2011.bin	1.9
WRF.VY.elecprod.annual.2011.bin	4.23
WRF.VY.elecprod.hourly.2011.bin	4.23
WRF.VY.ind.annual.2011.bin	8.89
WRF.VY.ind.hourly.2011.bin	8.89
WRF.VY.nonroad.annual.2011.bin	1.23
WRF.VY.nonroad.hourly.2011.bin	1.23
WRF.VY.onroad.annual.2011.bin	17.64
WRF.VY.onroad.hourly.2011.bin	17.64
WRF.VY.railroad.annual.2011.bin	0.01
WRF.VY.railroad.hourly.2011.bin	0.01
WRF.VY.res.annual.2011.bin	3.12
WRF.VY.res.hourly.2011.bin	3.12
WRF.VY.total.annual.2011.bin	37.95
WRF.VY.total.hourly.2011.bin	37.95

Filenames for year 2012	**Total (MtC)**
WRF.VY.airport.annual.2012.bin	0.55
WRF.VY.airport.hourly.2012.bin	0.55
WRF.VY.cement.annual.2012.bin	0.07
WRF.VY.cement.hourly.2012.bin	0.07
WRF.VY.cmv.annual.2012.bin	0.31
WRF.VY.cmv.hourly.2012.bin	0.31
WRF.VY.com.annual.2012.bin	1.93
WRF.VY.com.hourly.2012.bin	1.93
WRF.VY.elecprod.annual.2012.bin	5.22
WRF.VY.elecprod.hourly.2012.bin	5.22
WRF.VY.ind.annual.2012.bin	8.53
WRF.VY.ind.hourly.2012.bin	8.53
WRF.VY.nonroad.annual.2012.bin	1.18
WRF.VY.nonroad.hourly.2012.bin	1.18
WRF.VY.onroad.annual.2012.bin	17.42
WRF.VY.onroad.hourly.2012.bin	17.42
WRF.VY.railroad.annual.2012.bin	0.01
WRF.VY.railroad.hourly.2012.bin	0.01
WRF.VY.res.annual.2012.bin	2.89
WRF.VY.res.hourly.2012.bin	2.89
WRF.VY.total.annual.2012.bin	38.12
WRF.VY.total.hourly.2012.bin	38.12

Filenames for year 2013	Total (MtC)
WRF.VY.airport.annual.2013.bin	0.58
WRF.VY.airport.hourly.2013.bin	0.58
WRF.VY.cement.annual.2013.bin	0.07
WRF.VY.cement.hourly.2013.bin	0.07
WRF.VY.cmv.annual.2013.bin	0.31
WRF.VY.cmv.hourly.2013.bin	0.31
WRF.VY.com.annual.2013.bin	1.94
WRF.VY.com.hourly.2013.bin	1.94
WRF.VY.elecprod.annual.2013.bin	4.81
WRF.VY.elecprod.hourly.2013.bin	4.81
WRF.VY.ind.annual.2013.bin	9.15
WRF.VY.ind.hourly.2013.bin	9.15
WRF.VY.nonroad.annual.2013.bin	1.19
WRF.VY.nonroad.hourly.2013.bin	1.19
WRF.VY.onroad.annual.2013.bin	17.63
WRF.VY.onroad.hourly.2013.bin	17.63
WRF.VY.railroad.annual.2013.bin	0.01
WRF.VY.railroad.hourly.2013.bin	0.01
WRF.VY.res.annual.2013.bin	2.94
WRF.VY.res.hourly.2013.bin	2.94
WRF.VY.total.annual.2013.bin	38.62
WRF.VY.total.hourly.2013.bin	38.62

Filenames for year 2014	Total (MtC)
WRF.VY.airport.annual.2014.bin	0.61
WRF.VY.airport.hourly.2014.bin	0.61
WRF.VY.cement.annual.2014.bin	0.07
WRF.VY.cement.hourly.2014.bin	0.07
WRF.VY.cmv.annual.2014.bin	0.31
WRF.VY.cmv.hourly.2014.bin	0.31
WRF.VY.com.annual.2014.bin	1.82
WRF.VY.com.hourly.2014.bin	1.82
WRF.VY.elecprod.annual.2014.bin	5.03
WRF.VY.elecprod.hourly.2014.bin	5.03
WRF.VY.ind.annual.2014.bin	8.92
WRF.VY.ind.hourly.2014.bin	8.92
WRF.VY.nonroad.annual.2014.bin	1.20
WRF.VY.nonroad.hourly.2014.bin	1.20
WRF.VY.onroad.annual.2014.bin	17.81
WRF.VY.onroad.hourly.2014.bin	17.81
WRF.VY.railroad.annual.2014.bin	0.01
WRF.VY.railroad.hourly.2014.bin	0.01
WRF.VY.res.annual.2014.bin	2.42
WRF.VY.res.hourly.2014.bin	2.42
WRF.VY.total.annual.2014.bin	38.20
WRF.VY.total.hourly.2014.bin	38.20