README for FINNv2.5 - June 2024

Christine Wiedinmyer, University of Colorado, Christine.Wiedinmyer@colorado.edu
Louisa Emmons, NSF NCAR, emmons@ucar.edu

FINN website: https://www2.acom.ucar.edu/modeling/finn-fire-inventory-ncar
FINN data archive: https://rda.ucar.edu/datasets/ds312-9/
FINN2 publication: Wiedinmyer et al., 2023, https://doi.org/10.5194/gmd-16-3873-2023

The Fire INventory from NCAR v2.5 (FINNv2.5) provides daily global fire emissions at high spatial resolution. The FINN model uses satellite detection of active fires (thermal anomalies) and underlying land cover to determine the emission estimates. Full details on the emissions calculations and results are in a peer-review publication: Wiedinmyer et al., GMD, 2023 [https://doi.org/10.5194/gmd-16-3873-2023].

FINNv2.5 emission estimates of key gases and aerosols are provided on the NSF NCAR Research Data Archive (ds312.9). The speciation of the total Volatile Organic Compound (VOC) emissions for three common chemical mechanisms (MOZART-T1, SAPRC99 and GEOS-Chem) are included in the files (see Wiedinmyer et al. 2023 for details).

FINNv2.5 emission estimates are based on two uses of satellite observations, downloaded from the NASA Fire Information for Resource Management System (FIRMS, https://firms.modaps.eosdis.nasa.gov/download/):
   1) MODIS (Moderate Resolution Imaging Spectroradiometer) fire detections only, which are available for 2002 - present; and
   2) Both MODIS and VIIRS (Visible Infrared Imaging Radiometer Suite) active fires, which are available for 2012-present.

For both MODIS and MODIS+VIIRS emissions estimates, there are two resolutions of output:
   ● Emissions for **each fire** at daily resolution, in annual files (monthly files for 2022 & 2023) with VOC speciation for 3 mechanisms (gzipped *.txt files) - labeled '**eachfire modis**' and '**eachfire modisviirs**' on the RDA site
   ● **Gridded** emissions at 0.1 x 0.1 degree in files for each year for each chemical compound (NetCDF4) - labeled '**modis**' and '**modisviirs**' on the RDA site

Emissions for 2022 and 2023 have recently been created. These are based on archive-quality fire detections from MODIS C6.1 through January 2023 and from Suomi-VIIRS through August 2022. For dates after these, Near-Real-Time fire detections are used (MODIS Feb-Dec 2023 and VIIRS Sept 2022-Dec 2023).

Near-Real-Time FINNv2.5 emissions (daily text files only) are available for 2024 at:
https://www.acom.ucar.edu/acresp/MODELING/finn_emis_txt/
See the FINN website for more information (https://www2.acom.ucar.edu/modeling/finn-fire-inventory-ncar)

Check for updates at: https://www2.acom.ucar.edu/modeling/finn-fire-inventory-ncar

Each active fire detection is assigned a POLYID. Each POLYID is assigned to a FIREID. If multiple fire points are located together as part of a big fire, they are assigned to the same FIREID.

The categories for GENVEG are:
1 = grasslands and savanna
2 = woody savanna/shrublands
3 = tropical forest
4 = temperate forest
5 = boreal forest
6 = temperate evergreen forest 9 = croplands
0 = no vegetation

Emissions corresponding to 3 different chemical mechanisms are available:
- MOZART-T1 speciation (version 2.0)
- SAPRC99 speciation (version 1.0)
- GEOS-CHEM speciation (version 1.0)
  *** NOTE: The output for all contains different fields than FINNv1 ****

The first line in each text file includes the headers of each field.

All files contain:
DAY   Julian Day (day of year)
POLYID   ID associated with each fire point
FIREID   FIRE ID for which each POLYID is assigned
GENVEG   Generic Vegetation type where fire occurred (See list above)
LATI   Latitude (decimal degrees)
LONGI   Longitude (decimal degrees)
AREA   Area burned (m^2) for fire point
              (NOTE: for larger fires, sum area for each FIREID to get total area burned)
BMASS   Biomass burned per area burned (kg/m^2)

All **gas**-phase species emissions are provided as **mole(species)/day**.

All **aerosol** emissions (OC, BC, PM25, PM10) are provided as **kg(species)/day**.

For MOZART speciation, NMOC is in kg-NMOC/day.

A fortran program for gridding the text files is available at: https://www.acom.ucar.edu/Data/fire/