

# **MODUL**

## **PEMANFAATAN MULTI TEKNIK DALAM IDENTIFIKASI ABU VULKANIK DENGAN MENGGUNAKAN SATELIT DAN MODEL WRF-CHEM**

**Teknik RGB pada SAT-AID**

**Teknik algoritma satelit**

**Instalasi WRF Ubuntu 14 dan 16 LTS**

**Instalasi WRF-Chem**

**Pengelolaan WRF-Chem**

**Instalasi WRF Ubuntu 18 dan 20 LTS**



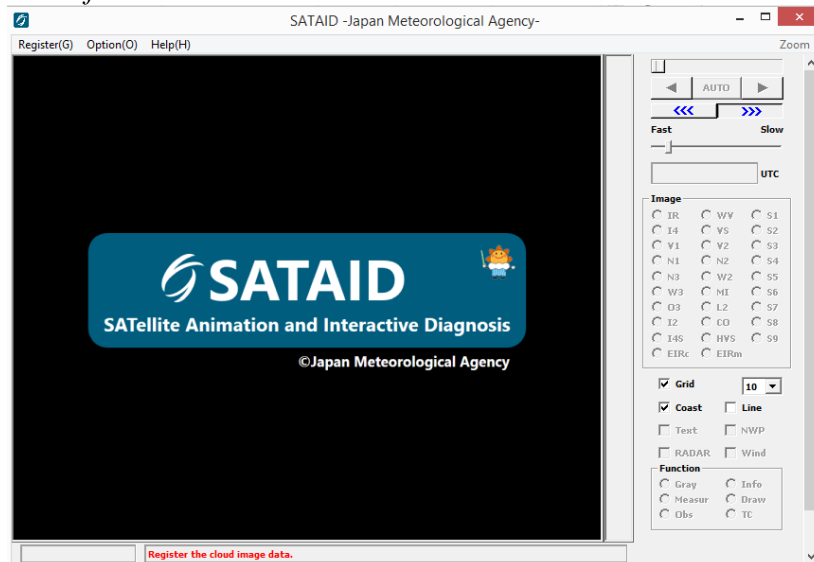
**RICKO DWIKI YUDISTIRA  
11.16.0025**

**PROGRAM DIPLOMA IV METEOROLOGI  
SEKOLAH TINGGI METEOROLOGI KLIMATOLOGI DAN  
GEOFISIKA  
TANGERANG SELATAN**

**2020**

# TEKNIK RGB PADA SATAID

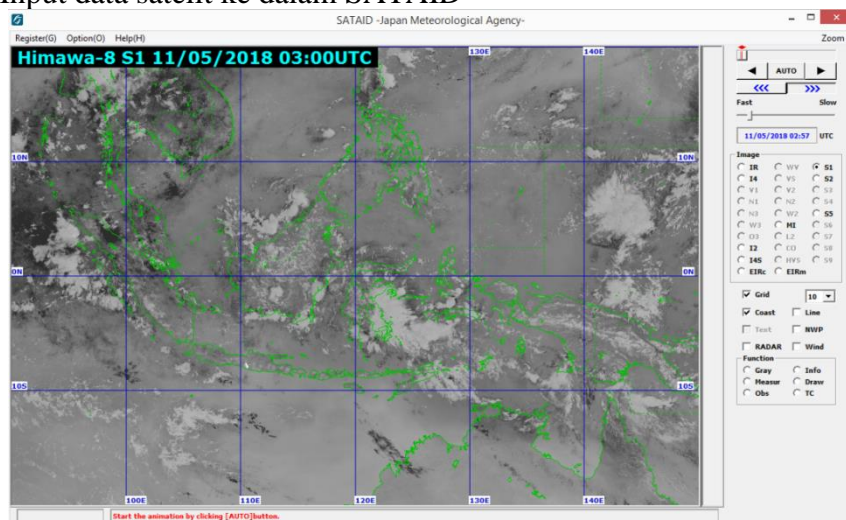
## 1. Buka *software* SATAID



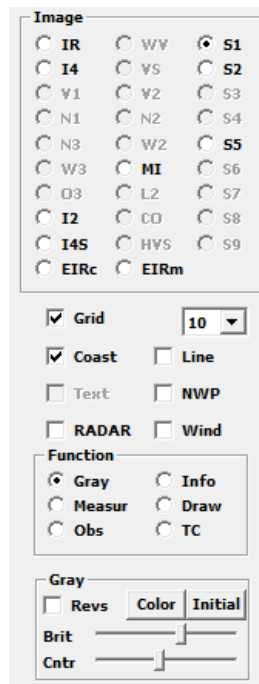
## 2. Persiapkan data satelit dengan format \*.Z dengan kanal B07, B11, B13, dan B15

H08_B07_Indonesia_20180511.Z0300	8/11/2020 1:50 PM	Z0300 File
H08_B11_Indonesia_20180511.Z0300	8/11/2020 1:50 PM	Z0300 File
H08_B13_Indonesia_20180511.Z0300	8/11/2020 1:51 PM	Z0300 File
H08_B15_Indonesia_20180511.Z0300	8/11/2020 1:51 PM	Z0300 File

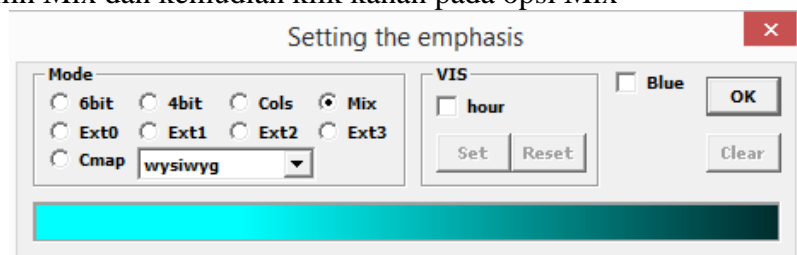
## 3. Input data satelit ke dalam SATAID



## 4. Selanjutnya tentukan image yang dibutuhkan. Klik opsi S1. Kemudian klik Function Gray dan klik Color

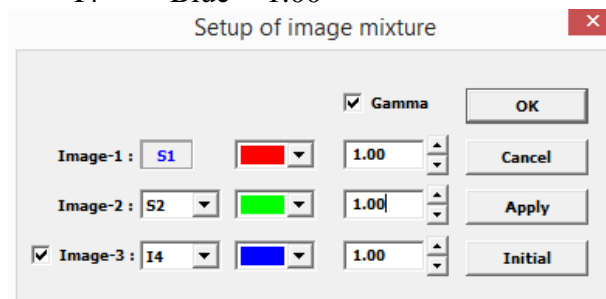


5. Pilih Mix dan kemudian klik kanan pada opsi Mix

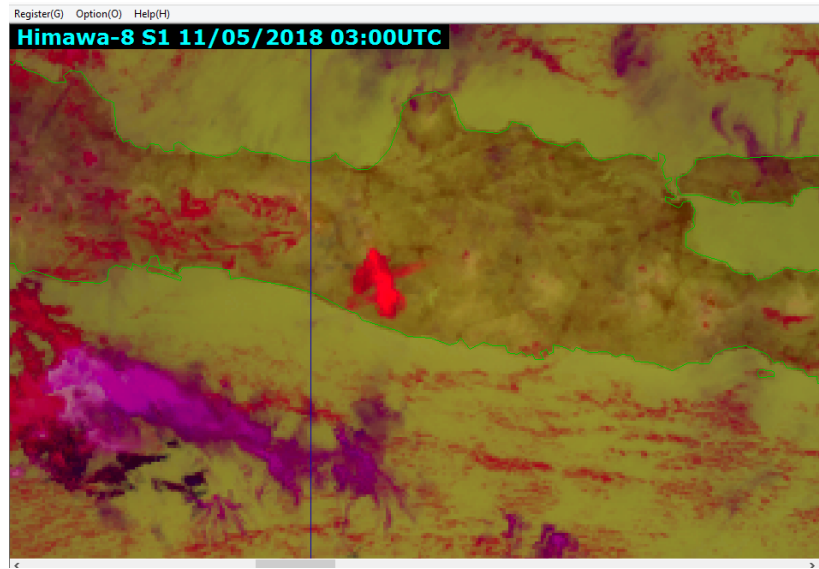


6. Sesuaikan kombinasi warna dan nilai pada masing-masing kanal

Image-1	S1	Red	1.00
Image-2	S2	Green	1.00
Image-3	I4	Blue	1.00







7. Setelah selesai klik Ok, maka hasil akan seperti ini



# TEKNIK ALGORITMA SATELIT

1. Buka *software* Python 3.6
2. Persiapkan data satelit dengan format \*.nc dengan kanal B07, B11, B13, dan B15

 H08_B07_Indonesia_201805110300.nc	8/11/2020 1:52 PM	NC File
 H08_B11_Indonesia_201805110300.nc	8/11/2020 1:52 PM	NC File
 H08_B13_Indonesia_201805110300.nc	8/11/2020 1:53 PM	NC File
 H08_B15_Indonesia_201805110300.nc	8/11/2020 1:53 PM	NC File

3. Buat script seperti berikut :

```
from netCDF4 import Dataset
from mpl_toolkits.basemap import Basemap
from matplotlib import colors
import numpy as np
import matplotlib.pyplot as plt

def algoTVAP(dataB07, dataB13, dataB15, thres):
    res = np.zeros((len(dataB07), len(dataB07[0])), dtype=np.int)
    print (len(dataB07))
    print (len(dataB07[0]))
    for i in range(len(dataB07)):
        for j in range(len(dataB07[0])):
            tes = 60 + (150 * (dataB15[i,j] - dataB13[i,j]) + (4.5 * (dataB07[i,j] -
dataB13[i,j])))
            if (tes > thres):
                res[i,j] = 1
    return res

def split1(dataB13, dataB15):
    res = np.zeros((len(dataB13), len(dataB13[0])), dtype=np.int)
    for i in range(len(dataB13)):
        for j in range(len(dataB13[0])):
            if (dataB13[i,j] < 233):
                if (dataB13[i,j] - dataB15[i,j] < -2):
                    res[i,j] = 1
            else:
```

```

        res[i,j] = 0
    else:
        if (dataB13[i,j] - dataB15[i,j] < 0):
            res[i,j] = 1
        else:
            res[i,j] = 0

    return res

def split2(dataB07, dataB13):
    res = np.zeros((len(dataB13), len(dataB13[0])), dtype=np.int)
    for i in range(len(dataB07)):
        for j in range(len(dataB07[0])):
            if (dataB07[i,j] - dataB13[i,j] > 0):
                res[i,j] = 1
            else:
                res[i,j] = 0

    return res

thresTVAP = 100

rawB07 = 'eH08_B07_Indonesia_201805110300.nc'
rawB13 = 'eH08_B13_Indonesia_201805110300.nc'
rawB15 = 'eH08_B15_Indonesia_201805110300.nc'
dsetB07 = Dataset(rawB07, mode = 'r')
dsetB13 = Dataset(rawB13, mode = 'r')
dsetB15 = Dataset(rawB15, mode = 'r')

lat = dsetB07.variables['latitude']      #grid 0,0 is bottom left and max,max is upper right
lon = dsetB07.variables['longitude']
plotvarB07 = dsetB07.variables['I4'][0]
plotvarB13 = dsetB13.variables['TR'][0]
plotvarB15 = dsetB15.variables['T2'][0]
plt.title('Volcanic Ash ALL')
print (np.shape(plotvarB07))

#####

tvapres = algoTVAP(plotvarB07, plotvarB13, plotvarB15, thresTVAP)
split1res = split1(plotvarB13, plotvarB15)
split2res = split2(plotvarB07, plotvarB13)

```

```

finres = tvapres + split1res + split2res
plotfinres = np.zeros((len(plotvarB07), len(plotvarB07[0])), dtype=np.int)
for i in range(len(plotvarB07)):
    for j in range(len(plotvarB07[0])):
        if (finres[i,j] == 3):
            plotfinres[i,j] = 1
lev = [.99,2]
colva = ['red']
m = Basemap(resolution='i',llcrnrlon=lon[0], llcrnrlat=lat[0], urcrnrlon=lon[-1],urcrnrlat=lat[-1])
x,y = np.meshgrid(np.linspace(lon[0],lon[-1],len(plotvarB07[0,:])), np.linspace(lat[0],lat[-1],len(plotvarB07)))
pltva = m.contourf(x,y,plotfinres,levels=lev,colors=colva,labels='Volcanic Ash')
m.drawcoastlines(linewidth=0.75, color = 'blue')
m.drawcountries(linewidth=0.75, color = 'blue')
plt.show()

```

- a. Untuk teknik Multi Split-windows menggunakan algoritma

```

finres = split1res + split2res
plotfinres = np.zeros((len(plotvarB07), len(plotvarB07[0])), dtype=np.int)
for i in range(len(plotvarB07)):
    for j in range(len(plotvarB07[0])):
        if (finres[i,j] == 2):
            plotfinres[i,j] = 1

```

- b. Untuk teknik Multispectral Infrared menggunakan algoritma

```

finres = tvapres
plotfinres = np.zeros((len(plotvarB07), len(plotvarB07[0])), dtype=np.int)
for i in range(len(plotvarB07)):
    for j in range(len(plotvarB07[0])):
        if (finres[i,j] == 1):
            plotfinres[i,j] = 1

```

- c. Untuk teknik Multispectral Bandwidth menggunakan algoritma

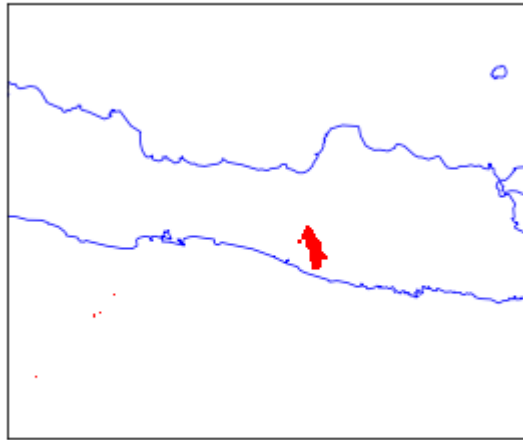
```

finres = tvapres + split1res + split2res
plotfinres = np.zeros((len(plotvarB07), len(plotvarB07[0])), dtype=np.int)
for i in range(len(plotvarB07)):
    for j in range(len(plotvarB07[0])):
        if (finres[i,j] == 3):
            plotfinres[i,j] = 1

```

4. Klik **Run** atau **F5**

Volcanic Ash Dispersion 01.00 UTC (MI)



In [4]:



# Instalasi WRF

## Tahap Persiapan

Untuk menginstall model WRF versi 4.1.2, ada beberapa bahan instalasi yang perlu disiapkan yang dapat didownload dari halaman web berikut :

[http://www2.mmm.ucar.edu/wrf/users/download/get\\_sources.html](http://www2.mmm.ucar.edu/wrf/users/download/get_sources.html)

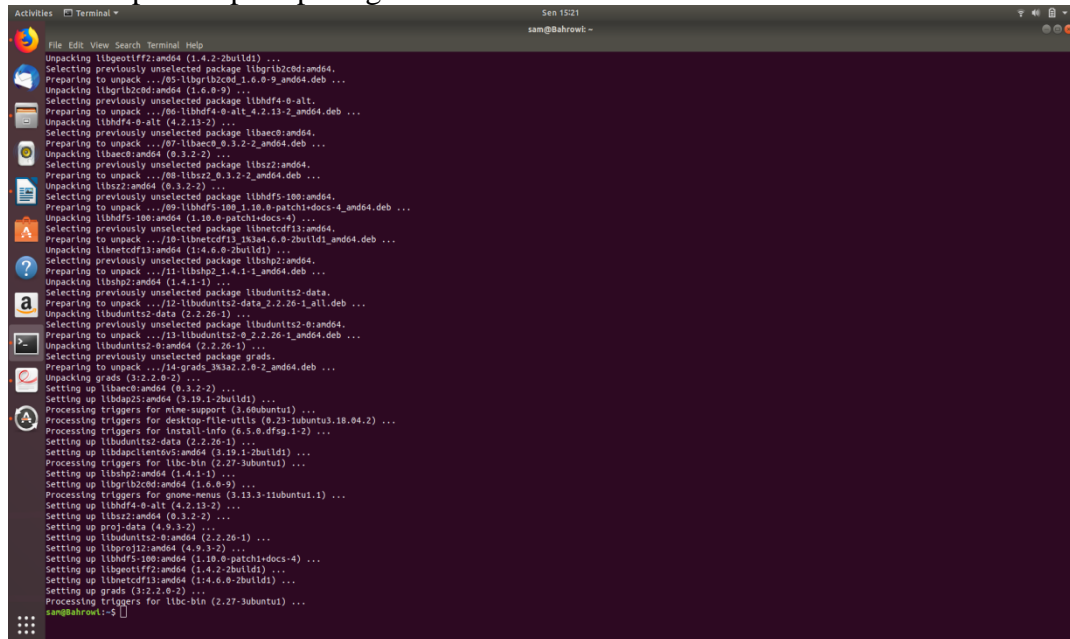
Hal yang perlu dipersiapkan antara lain:

1. WRF-4.1.2
3. WPSV-4.1
4. WRF DomainWizard <https://esrl.noaa.gov/gsd/wrfportal/DomainWizard.html>
5. Prep\_Chem\_Sources [ftp://aftp.fsl.noaa.gov/divisions/taq/global\\_emissions](ftp://aftp.fsl.noaa.gov/divisions/taq/global_emissions))
6. global emissions\_v3 [ftp://aftp.fsl.noaa.gov/divisions/taq/global\\_emissions](ftp://aftp.fsl.noaa.gov/divisions/taq/global_emissions)
7. ARWpost 3.1 [http://www2.mmm.ucar.edu/wrf/users/download/get\\_sources.html](http://www2.mmm.ucar.edu/wrf/users/download/get_sources.html)
8. WPS Geography  
[http://www2.mmm.ucar.edu/wrf/users/download/get\\_sources\\_wps\\_geog.html](http://www2.mmm.ucar.edu/wrf/users/download/get_sources_wps_geog.html)
  - 1) Geog\_complete [http://www2.mmm.ucar.edu/wrf/src/wps\\_files/](http://www2.mmm.ucar.edu/wrf/src/wps_files/)
  - 2) Albedo\_modis,
  - 3) maxsnowalb\_modis,
  - 4) greenfrac\_modis\_5m,
  - 5) modis\_landuse\_20class\_5m\_with\_lakes,
  - 6) topo\_gmted2010\_5m
9. File pendukung, setelah didownload, simpan di folder baru dan berikan nama **LIBRARIES**, yaitu:
  - 1) jasper-1.900.1 <http://www.ece.uvic.ca/~frodo/jasper/>
  - 2) libpng-1.6.37 <http://www.libpng.org/pub/png/libpng.html>
  - 3) mpich-3.0.4 <https://www.mpich.org/downloads/>
  - 4) netcdf-4.1.3 <https://www.unidata.ucar.edu/software/netcdf/>
  - 5) zlib-1.2.11 <http://www.zlib.net/>
  - 6) hdf5-1.10.5 <http://www.hdfgroup.org/ftp/HDF5/current/src/>

Buka terminal (Ctrl+Alt+T), lalu ketikkan (copy+paste) perintah berikut dan jalankan (tekan enter).

```
sudo apt-get install build-essential csh gfortran m4 && which gfortran &&  
which cpp && which gcc && gcc --version && sudo apt install default-jdk  
-y && sudo apt install default-jre -y && sudo apt install grads -y
```

Hasil tampilan seperti pada gambar berikut :

A screenshot of a terminal window titled "Terminal" with the user "sam@bahrowt". The terminal shows the output of the command "sudo apt-get install build-essential csh gfortran m4 && which gfortran && which cpp && which gcc && gcc --version && sudo apt install default-jdk -y && sudo apt install default-jre -y && sudo apt install grads -y". The output lists various packages being unpacked and installed, including libgeotiff, libhdf5, libnetcdf, libudunits2, and grads. The terminal also shows the version of gfortran, cpp, and gcc, and the installation of default-jdk and default-jre. The prompt at the bottom is "sam@bahrowt:~\$".

## Building LIBRARIES

- Buat folder **TESTS** di **/home/sam** dan masuk kefolder TESTS tersebut.(Catatan: dalam tahapan selanjutnya, ganti **/sam** mejadi nama/**user** Ubuntu laptop/PC Anda).

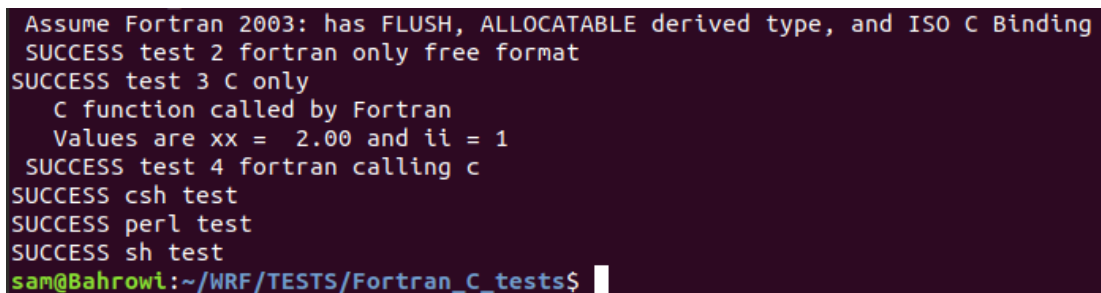
- Buka terminal di **/home/sam/WRF/TESTS**, ketikkan perintah berikut dan kemudian jalankan.

*## untuk Ubuntu 64 bit ##*

wget

```
http://www2.mmm.ucar.edu/wrf/OnLineTutorial/compile_tutorial/tar_files/Fortran_C_tests.tar && tar -xvf Fortran_C_tests.tar  
gfortran TEST_1_fortran_only_fixed.f && ./a.out && gfortran  
TEST_2_fortran_only_free.f90 && ./a.out && gcc TEST_3_c_only.c  
&& ./a.out && gcc -c -m64 TEST_4_fortran+c_c.c && gfortran -c -m64  
TEST_4_fortran+c_f.f90 && gfortran -m64 TEST_4_fortran+c_f.o  
TEST_4_fortran+c_c.o && ./a.out && csh ./TEST_csh.csh  
&& ./TEST_perl.pl && ./TEST_sh.sh
```

Hasil tampilan seperti pada gambar berikut :



```
Assume Fortran 2003: has FLUSH, ALLOCATABLE derived type, and ISO C Binding  
SUCCESS test 2 fortran only free format  
SUCCESS test 3 C only  
  C function called by Fortran  
  Values are xx = 2.00 and ii = 1  
SUCCESS test 4 fortran calling c  
SUCCESS csh test  
SUCCESS perl test  
SUCCESS sh test  
sam@Bahrowi:~/WRF/TESTS/Fortran_C_tests$
```

Buat folder **WRF** di **/home**. Selanjutnya **copy** semua bahan instalasi WRF (6 komponen di atas) yang telah didownload dan paste di folder **/home/sam/WRF** dan kemudian **extract** masing-masing file tersebut. (NB: penamaan folder WRF dapat menyesuaikankeperluan).

Buka terminal, ketikan perintah berikut untuk mengekstrak bahan instalasi WRF :

- Masuk ke folder **WRF** `cd home/sam/WRF/`  
  
`tar -xvf WRFV-4.1.2TAR.gz && tar -xvf WPSV-4.1.TAR.gz && tar -xvf  
WRFDomainWizard.zip && tar -xvf ARWpost_V3.tar.gz && tar -xvf  
geog_complete.tar.gz`
- Masuk ke folder **LIBRARIES** `cd home/sam/WRF/LIBRARIES`  
  
`tar -xvf netcdf-4.1.3.tar.gz && tar -xvf mpich-3.0.4.tar.gz && tar -xvf zlib-  
1.2.11.tar.gz && tar -xvf libpng-1.6.37.tar.gz && tar -xvf jasper-  
1.900.1.tar.gz`
- Masuk ke folder **LIBRARIES**  
  
`cd/home/sam/WRF/LIBRARIES`

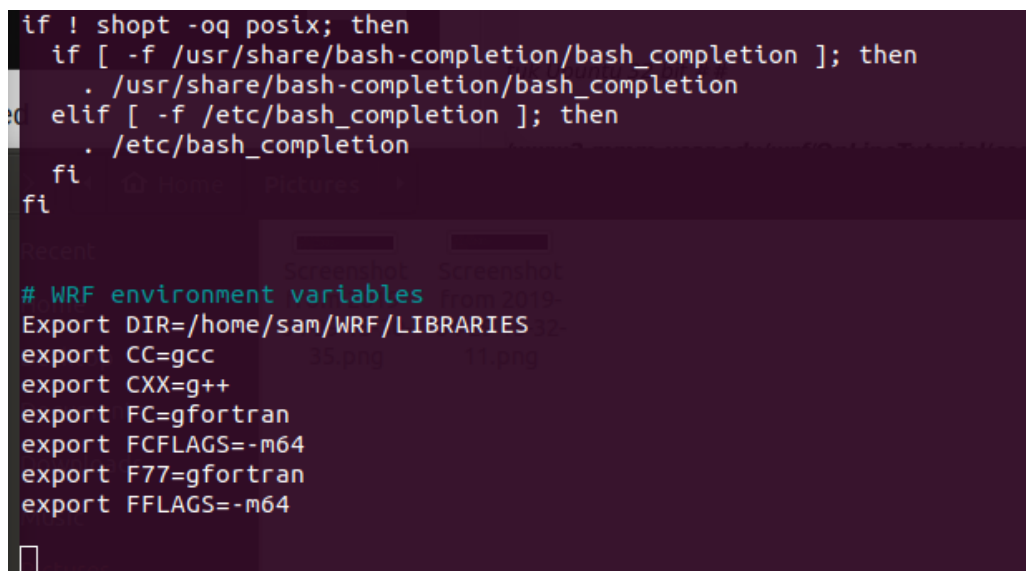
Buka terminal, ketikkan perintah berikut dan jalankan.

```
sudo nano ~/.bashrc
```

Kemudian tambahkan script ini pada baris terakhir.

```
## untuk Ubuntu 64 bit ##  
  
# WRF environment variables  
export DIR=/home/sam/WRF/LIBRARIES  
export CC=gcc  
export CXX=g++  
export FC=gfortran  
export FCFLAGS=-m64  
export F77=gfortran  
export FFLAGS=-m64
```

Tampilan seperti pada gambar berikut :



```
if ! shopt -oq posix; then  
  if [ -f /usr/share/bash-completion/bash_completion ]; then  
    . /usr/share/bash-completion/bash_completion  
  elif [ -f /etc/bash_completion ]; then  
    . /etc/bash_completion  
  fi  
fi  
  
# WRF environment variables  
Export DIR=/home/sam/WRF/LIBRARIES  
export CC=gcc  
export CXX=g++  
export FC=gfortran  
export FCFLAGS=-m64  
export F77=gfortran  
export FFLAGS=-m64  
  
█
```

Selanjutnya **keluar** dan **save** (Ctrl+X > Y > Enter). Lalu ketikkan dan jalankan perintah berikut.

```
source ~/.bashrc
```

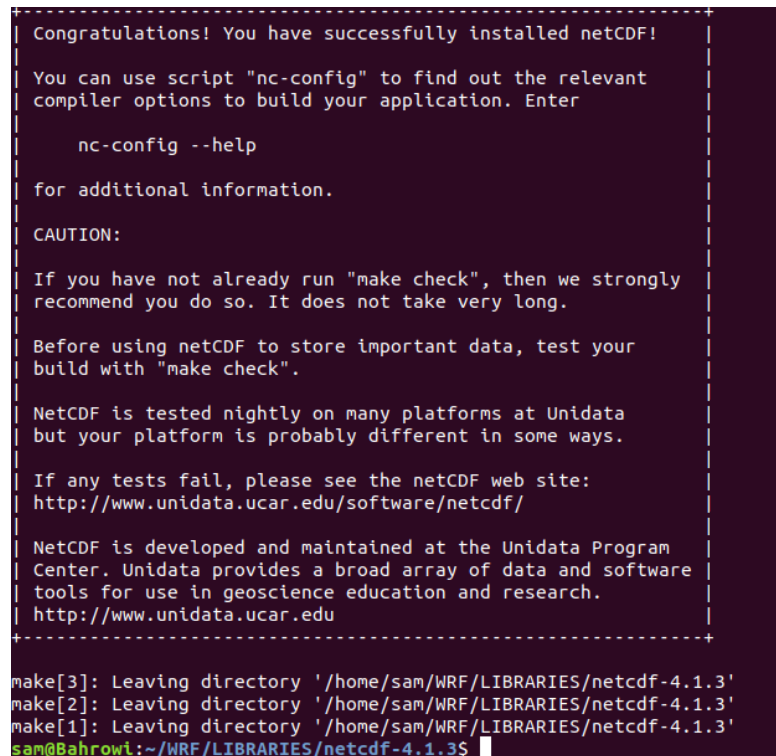
- Masuk ke folder **netcdf**

```
cd /home/sam/WRF/LIBRARIES/netcdf* .
```

Buka terminal, ketikkan perintah berikut dan jalankan.

```
./configure --prefix=$DIR/netcdf --disable-dap --disable-netcdf-4 --disable-shared && make && make install
```

Hasil tampilan seperti pada gambar berikut :



```
-----
| Congratulations! You have successfully installed netCDF!
| You can use script "nc-config" to find out the relevant
| compiler options to build your application. Enter
|
|     nc-config --help
|
| for additional information.
|
| CAUTION:
|
| If you have not already run "make check", then we strongly
| recommend you do so. It does not take very long.
|
| Before using netCDF to store important data, test your
| build with "make check".
|
| NetCDF is tested nightly on many platforms at Unidata
| but your platform is probably different in some ways.
|
| If any tests fail, please see the netCDF web site:
| http://www.unidata.ucar.edu/software/netcdf/
|
| NetCDF is developed and maintained at the Unidata Program
| Center. Unidata provides a broad array of data and software
| tools for use in geoscience education and research.
| http://www.unidata.ucar.edu
|
|-----
make[3]: Leaving directory '/home/sam/WRF/LIBRARIES/netcdf-4.1.3'
make[2]: Leaving directory '/home/sam/WRF/LIBRARIES/netcdf-4.1.3'
make[1]: Leaving directory '/home/sam/WRF/LIBRARIES/netcdf-4.1.3'
sam@Bahrowi:~/WRF/LIBRARIES/netcdf-4.1.3$
```

ketikkan perintah berikut dan jalankan

```
sudo nano ~/.bashrc
```

Kemudian tambahkan script ini pada baris terakhir.

```
export PATH=$DIR/netcdf/bin:$PATH  
export NETCDF=$DIR/netcdf
```

Tampilan seperti pada gambar berikut :

```
# WRF environment variables
export DIR=/home/sam/WRF/LIBRARIES
export CC=gcc
export CXX=g++
export FC=gfortran
export FCFLAGS=-m64
export F77=gfortran
export FFLAGS=-m64
export PATH=$DIR/netcdf/bin:$PATH
export NETCDF=$DIR/netcdf
```

Selanjutnya **keluar** dan **save** (Ctrl+X > Y > Enter). Lalu ketikkan dan jalankan perintah berikut.

**source ~/.bashrc**

- Masuk ke folder **mpich**

**cd /home/sam/WRF/LIBRARIES/mpich\* .**

Buka terminal, ketikkan perintah berikut dan jalankan.

**./configure --prefix=\$DIR/mpich && make && make install**

Hasil tampilan seperti pada gambar berikut :

```
make[3]: Leaving directory '/home/sam/WRF/LIBRARIES/mpich-3.0.4'
make[2]: Leaving directory '/home/sam/WRF/LIBRARIES/mpich-3.0.4'
Making install in examples
make[2]: Entering directory '/home/sam/WRF/LIBRARIES/mpich-3.0.4/examples'
make[3]: Entering directory '/home/sam/WRF/LIBRARIES/mpich-3.0.4/examples'
make[3]: Nothing to be done for 'install-exec-am'.
make[3]: Nothing to be done for 'install-data-am'.
make[3]: Leaving directory '/home/sam/WRF/LIBRARIES/mpich-3.0.4/examples'
make[2]: Leaving directory '/home/sam/WRF/LIBRARIES/mpich-3.0.4/examples'
make[1]: Leaving directory '/home/sam/WRF/LIBRARIES/mpich-3.0.4'
sam@Bahrowl:~/WRF/LIBRARIES/mpich-3.0.4$ sudo nano ~/.bashrc
```

ketikkan perintah berikut dan jalankan

**sudo nano ~/.bashrc**

Kemudian tambahkan script ini pada baris terakhir.

**export PATH=\$DIR/mpich/bin:\$PATH**

Tampilan seperti pada gambar berikut :

```
# WRF environment variables
export DIR=/home/sam/WRF/LIBRARIES
export CC=gcc
export CXX=g++
export FC=gfortran
export FCFLAGS=-m64
export F77=gfortran
export FFLAGS=-m64
export PATH=$DIR/netcdf/bin:$PATH
export NETCDF=$DIR/netcdf
export PATH=$DIR/mpich/bin:$PATH
```

Selanjutnya **keluar** dan **save**(Ctrl+X > Y > Enter). Lalu ketikkan dan jalankan perintah berikut.

```
source ~/.bashrc
```

- Masuk ke folder **LIBRARIES**  
**cd/home/sam/WRF/LIBRARIES**

Buka terminal, ketikkan perintah berikut dan jalankan.

```
sudo nano ~/.bashrc
```

Kemudian tambahkan script ini pada baris terakhir.

```
export LDFLAGS=-L$DIR/grib2/lib  
export CPPFLAGS=-I$DIR/grib2/include
```

Tampilan seperti pada gambar berikut :

```
# WRF environment variables
export DIR=/home/sam/WRF/LIBRARIES
export CC=gcc
export CXX=g++
export FC=gfortran
export FCFLAGS=-m64
export F77=gfortran
export FFLAGS=-m64
export PATH=$DIR/netcdf/bin:$PATH
export NETCDF=$DIR/netcdf
export PATH=$DIR/mpich/bin:$PATH
export LDFLAGS=-L$DIR/grib2/lib
export CPPFLAGS=-I$DIR/grib2/include
```

Selanjutnya **keluar** dan **save**(Ctrl+X > Y > Enter). Lalu ketikkan dan jalankan perintah berikut.

**source ~/.bashrc**

- Masuk ke folder **zlib**

**cd /home/sam/WRF/LIBRARIES/zlib\* .**

Buka terminal, ketikkan perintah berikut dan jalankan.

**./configure --prefix=\$DIR/grib2 && make && make install**

Hasil tampilan seperti pada gambar berikut :

```
gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -o examplesh example.o -L. libz.so.1.2.7
gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -o minigzipsh minigzip.o -L. libz.so.1.2.7
gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -I. -D_FILE_OFFSET_BITS=64 -c -o example64.o test/example.c
gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -o example64 example64.o -L. libz.a
gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -I. -D_FILE_OFFSET_BITS=64 -c -o minigzip64.o test/minigzip.c
gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -o minigzip64 minigzip64.o -L. libz.a
cp libz.a /home/sam/WRF/LIBRARIES/grib2/lib
chmod 644 /home/sam/WRF/LIBRARIES/grib2/lib/libz.a
cp libz.so.1.2.7 /home/sam/WRF/LIBRARIES/grib2/lib
chmod 755 /home/sam/WRF/LIBRARIES/grib2/lib/libz.so.1.2.7
cp zlib.3 /home/sam/WRF/LIBRARIES/grib2/share/man/man3
chmod 644 /home/sam/WRF/LIBRARIES/grib2/share/man/man3/zlib.3
cp zlib.pc /home/sam/WRF/LIBRARIES/grib2/lib/pkgconfig
chmod 644 /home/sam/WRF/LIBRARIES/grib2/lib/pkgconfig/zlib.pc
cp zlib.h zconf.h /home/sam/WRF/LIBRARIES/grib2/include
chmod 644 /home/sam/WRF/LIBRARIES/grib2/include/zlib.h /home/sam/WRF/LIBRARIES/grib2/include/zconf.h
sam@Bahrowl:~/WRF/LIBRARIES/zlib-1.2.7$
```

- Masuk ke folder **libpng**

**cd /home/sam/WRF/LIBRARIES/libpng\* .**

Buka terminal, ketikkan perintah berikut dan jalankan.

**./configure --prefix=\$DIR/grib2 && make && make install**



Hasil tampilan seperti pada gambar berikut :

```
make install-data-hook
make[2]: Entering directory '/home/sam/WRF/LIBRARIES/libpng-1.2.50'
cd /home/sam/WRF/LIBRARIES/grib2/include; rm -f png.h pngconf.h
cd /home/sam/WRF/LIBRARIES/grib2/include; ln -s libpng12/png.h png.h
cd /home/sam/WRF/LIBRARIES/grib2/include; ln -s libpng12/pngconf.h pngconf.h
cd /home/sam/WRF/LIBRARIES/grib2/lib/pkgconfig; rm -f libpng.pc
cd /home/sam/WRF/LIBRARIES/grib2/lib/pkgconfig; ln -s libpng12.pc libpng.pc
make[2]: Leaving directory '/home/sam/WRF/LIBRARIES/libpng-1.2.50'
make[1]: Leaving directory '/home/sam/WRF/LIBRARIES/libpng-1.2.50'
sam@Bahrowt:~/WRF/LIBRARIES/libpng-1.2.50$
```

- Masuk ke folder **jasper**

**cd /home/sam/WRF/LIBRARIES/jasper\* .**

Buka terminal, ketikkan perintah berikut dan jalankan.

**./configure --prefix=\$DIR/grib2 && make && make install**

Hasil tampilan seperti pada gambar berikut :

```
make[1]: Entering directory '/home/sam/WRF/LIBRARIES/jasper-1.900.1'
make[2]: Entering directory '/home/sam/WRF/LIBRARIES/jasper-1.900.1'
make[2]: Nothing to be done for 'install-exec-am'.
make[2]: Nothing to be done for 'install-data-am'.
make[2]: Leaving directory '/home/sam/WRF/LIBRARIES/jasper-1.900.1'
make[1]: Leaving directory '/home/sam/WRF/LIBRARIES/jasper-1.900.1'
sam@Bahrowt:~/WRF/LIBRARIES/jasper-1.900.1$
```

- Masuk ke folder **hdf5\***.

**cd /home/sam/WRF/LIBRARIES/hdf5\* .**

Buka terminal, ketikkan perintah berikut dan jalankan.

**sudo nano ~/.bashrc**

Kemudian tambahkan script ini pada baris terakhir.

**export LD\_LIBRARY\_PATH=\$DIR/hdf5-1.10.5/lib**

**export HDF5=\$DIR/hdf5-1.10.5**

Tampilan seperti pada gambar berikut :

```
export NETCDF=$DIR/netcdf
export PATH=$DIR/mpich/bin:$PATH
export HDF5=$DIR/hdf5-1.10.5
export LD_LIBRARY_PATH=$DIR/hdf5-1.10.5/lib
```

Selanjutnya **keluar** dan **save**(Ctrl+X > Y > Enter). Lalu ketikkan dan jalankan perintah berikut.

**source ~/.bashrc && ./configure --enable-fortran && make && make install**

Hasil tampilan seperti pada gambar berikut :

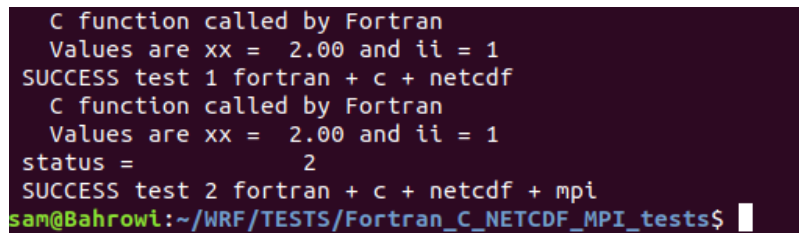
```
make[3]: Leaving directory '/home/cko/WRF/LIBRARIES/hdf5-1.10.5/hl/fortran/examples'
make[2]: Leaving directory '/home/cko/WRF/LIBRARIES/hdf5-1.10.5/hl/fortran'
make[1]: Leaving directory '/home/cko/WRF/LIBRARIES/hdf5-1.10.5/hl'
```

- Untuk mengecek keberhasilan instalasi LIBRARIES, masuk ke folder **TESTS** dan buka terminal, kemudian ketikkan perintah berikut dan jalankan.

**wget**

**[http://www2.mmm.ucar.edu/wrf/OnLineTutorial/compile\\_tutorial/tar\\_files/Fortran\\_C\\_NETCDF\\_MPI\\_tests.tar](http://www2.mmm.ucar.edu/wrf/OnLineTutorial/compile_tutorial/tar_files/Fortran_C_NETCDF_MPI_tests.tar) && tar -xvf Fortran\_C\_NETCDF\_MPI\_tests.tar && cp \${NETCDF}/include/netcdf.inc . && gfortran -c 01\_fortran+c+netcdf.f.f && gcc -c 01\_fortran+c+netcdf\_c.c && gfortran 01\_fortran+c+netcdf\_f.o 01\_fortran+c+netcdf\_c.o -L\${NETCDF}/lib -lnetcdff -lnetcdf && ./a.out && cp \${NETCDF}/include/netcdf.inc . && mpif90 -c 02\_fortran+c+netcdf+mpi.f.f && mpicc -c 02\_fortran+c+netcdf+mpi\_c.c && mpif90 02\_fortran+c+netcdf+mpi\_f.o 02\_fortran+c+netcdf+mpi\_c.o -L\${NETCDF}/lib -lnetcdff -lnetcdf && mpirun ./a.out**

Hasil tampilan seperti pada gambar berikut :



```
C function called by Fortran
Values are xx = 2.00 and ii = 1
SUCCESS test 1 fortran + c + netcdf
C function called by Fortran
Values are xx = 2.00 and ii = 1
status = 2
SUCCESS test 2 fortran + c + netcdf + mpi
sam@Bahrowi:~/WRF/TESTS/Fortran_C_NETCDF_MPI_tests$
```

## Building WRFV3

Ubah nama folder **WRF-4.1.2** menjadi **WRFV3**

- Masuk ke folder **WRFV3**  
**cd/home/sam/WRF/WRFV3**

Buka terminal, ketikkan perintah berikut dan jalankan.

```
sudo nano ~/.bashrc
```

Kemudian tambahkan script ini pada baris terakhir.

```
export WRF_EM_CORE=1  
export WRF_CHEM=1  
export WRFIO_NCD_LARGE_FILE_SUPPORT=1
```

Selanjutnya **keluar** dan **save**(Ctrl+X > Y > Enter). Lalu ketikkan dan jalankan perintah berikut.

```
source ~/.bashrc
```

Buka terminal, ketikkan perintah berikut dan jalankan.

```
./configure
```

Akan muncul pilihan dalam bentuk barisan seperti berikut.

```

Please select from among the following Linux x86_64 options:

 1. (serial)  2. (smpar)  3. (dmpar)  4. (dm+sm)  PGI (pgf90/gcc)
 5. (serial)  6. (smpar)  7. (dmpar)  8. (dm+sm)  PGI (pgf90/pgcc): SGI MPT
 9. (serial) 10. (smpar) 11. (dmpar) 12. (dm+sm)  PGI (pgf90/gcc): PGI accelerator
13. (serial) 14. (smpar) 15. (dmpar) 16. (dm+sm)  INTEL (ifort/icc)
17. (dm+sm)  INTEL (ifort/icc): Xeon Phi (MIC architecture)
18. (serial) 19. (smpar) 20. (dmpar) 21. (dm+sm)  INTEL (ifort/icc): Xeon (SNB with AVX mods)
22. (serial) 23. (smpar) 24. (dmpar) 25. (dm+sm)  INTEL (ifort/icc): SGI MPT
26. (serial) 27. (smpar) 28. (dmpar) 29. (dm+sm)  INTEL (ifort/icc): IBM POE
30. (serial) 31. (dmpar)  PATHSCALE (pathf90/pathcc)
32. (serial) 33. (smpar) 34. (dmpar) 35. (dm+sm)  GNU (gfortran/gcc)
36. (serial) 37. (smpar) 38. (dmpar) 39. (dm+sm)  IBM (xlf90_r/cc_r)
40. (serial) 41. (smpar) 42. (dmpar) 43. (dm+sm)  PGI (ftn/gcc): Cray XC CLE
44. (serial) 45. (smpar) 46. (dmpar) 47. (dm+sm)  CRAY CCE (ftn $(NOOMP)/cc): Cray XE and XC
48. (serial) 49. (smpar) 50. (dmpar) 51. (dm+sm)  INTEL (ftn/icc): Cray XC
52. (serial) 53. (smpar) 54. (dmpar) 55. (dm+sm)  PGI (pgf90/pgcc)
56. (serial) 57. (smpar) 58. (dmpar) 59. (dm+sm)  PGI (pgf90/gcc): -f90=pgf90
60. (serial) 61. (smpar) 62. (dmpar) 63. (dm+sm)  PGI (pgf90/pgcc): -f90=pgf90
64. (serial) 65. (smpar) 66. (dmpar) 67. (dm+sm)  INTEL (ifort/icc): HSW/BDW
68. (serial) 69. (smpar) 70. (dmpar) 71. (dm+sm)  INTEL (ifort/icc): KNL MIC
72. (serial) 73. (smpar) 74. (dmpar) 75. (dm+sm)  FUJITSU (frtpr/fccpx): FX10/FX100 SPARC64 IXfx/XLfx

Enter selection [1-75] : 34

```

Pilih nomor yang **dmpar** dalam barisan **GNU (gfortran/gcc)** > biasanya nomor **34**.  
Kemudian akan muncul pilihan **basic**, isikan nomor **1**.

Hasil tampilan seperti pada gambar berikut :

```

Settings listed above are written to configure.wrf.
If you wish to change settings, please edit that file.
If you wish to change the default options, edit the file:
    arch/configure_new.defaults
NetCDF users note:
  This installation of NetCDF supports large file support.  To DISABLE large file
  support in NetCDF, set the environment variable WRFIO_NCD_NO_LARGE_FILE_SUPPORT
  to 1 and run configure again. Set to any other value to avoid this message.

Testing for NetCDF, C and Fortran compiler

This installation of NetCDF is 64-bit
      C compiler is 64-bit
      Fortran compiler is 64-bit
      It will build in 64-bit

sam@Bahrowi:~/WRF/WRFV3$

```

Kemudian cek compile WRF dengan mengetikkan perintah berikut

**sudo nano configure.wrf**

Kemudian cek apakah tertampil hal berikut.

**em\_real (3d real case)**

**em\_quarter\_ss (3d ideal case)**  
**em\_b\_wave (3d ideal case)**  
**em\_les (3d ideal case)**  
**em\_heldsuarez (3d ideal case)**  
**em\_tropical\_cyclone (3d ideal case)**  
**em\_hill2d\_x (2d ideal case)**  
**em\_squall2d\_x (2d ideal case)**  
**em\_squall2d\_y (2d ideal case)**  
**em\_grav2d\_x (2d ideal case)**  
**em\_seabreeze2d\_x (2d ideal case)**  
**em\_scm\_xy (1d ideal case)**

Kemudian keluar (Ctrl+X > Y >Enter).

Ketikkan perintah berikut dan jalankan.

```
./compile em_real >& compile.log &
tail -f compile.log && ls -las main/ *.exe
```

Hasil tampilan seperti pada gambar berikut :

```
=====
build started:   Sen Apr 29 16:22:54 WIB 2019
build completed: Sen Apr 29 16:32:37 WIB 2019

--->              Executables successfully built              <---

-rwxr-xr-x 1 sam sam 40362280 Apr 29 16:32 main/ndown.exe
-rwxr-xr-x 1 sam sam 40239304 Apr 29 16:32 main/real.exe
-rwxr-xr-x 1 sam sam 39817776 Apr 29 16:32 main/tc.exe
-rwxr-xr-x 1 sam sam 43773128 Apr 29 16:31 main/wrf.exe
=====
```

Kemudian cek di folder **/home/sam/WRF/WRFV3/run**, pastikan terinstall: **ndown.exe, real.exe, tc.exe, dan wrf.exe**

Ketikkan perintah berikut dan jalankan.

```
./compile emi_conv>& compile.log &  
tail -f compile.log && ls -las main/ *.exe
```

Kemudian cek di folder **/home/sam/WRF/WRFV3/Chem**, pastikan terinstall:  
**convert\_emiss.exe**

## Building WPS

- Masuk ke folder **WPS**  
**cd/home/sam/WRF/WPS**

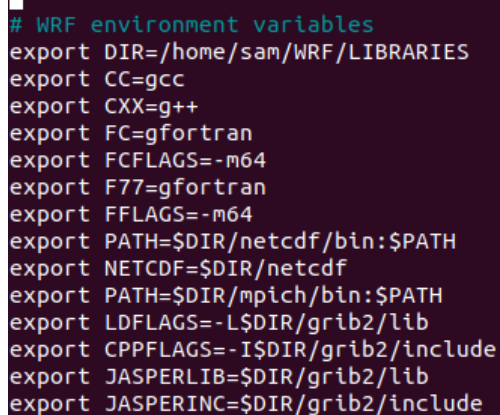
Buka terminal, ketikkan perintah berikut dan jalankan.

```
./clean && sudo nano ~/.bashrc
```

Kemudian tambahkan script ini pada baris terakhir.

```
export JASPERLIB=$DIR/grib2/lib  
export JASPERINC=$DIR/grib2/include
```

Tampilan seperti pada gambar berikut :



```
# WRF environment variables  
export DIR=/home/sam/WRF/LIBRARIES  
export CC=gcc  
export CXX=g++  
export FC=gfortran  
export FCFLAGS=-m64  
export F77=gfortran  
export FFLAGS=-m64  
export PATH=$DIR/netcdf/bin:$PATH  
export NETCDF=$DIR/netcdf  
export PATH=$DIR/mpich/bin:$PATH  
export LDFLAGS=-L$DIR/grib2/lib  
export CPPFLAGS=-I$DIR/grib2/include  
export JASPERLIB=$DIR/grib2/lib  
export JASPERINC=$DIR/grib2/include
```

Selanjutnya **keluar** dan **save** (Ctrl+X > Y > Enter). Lalu ketikkan dan jalankan perintah berikut.

```
source ~/.bashrc && ./configure --prefix=/home/trp96145/WRF/WPS
```

Akan muncul pilhan dalam bentuk barisan seperti berikut.

```
Will use NETCDF in dir: /home/sam/WRF/LIBRARIES/netcdf
Found Jasper environment variables for GRIB2 support...
$JASPERLIB = /home/sam/WRF/LIBRARIES/grib2/lib
$JASPERINC = /home/sam/WRF/LIBRARIES/grib2/include
-----
Please select from among the following supported platforms.

1. Linux x86_64, gfortran (serial)
2. Linux x86_64, gfortran (serial_NO_GRIB2)
3. Linux x86_64, gfortran (dmpar)
4. Linux x86_64, gfortran (dmpar_NO_GRIB2)
5. Linux x86_64, PGI compiler (serial)
6. Linux x86_64, PGI compiler (serial_NO_GRIB2)
7. Linux x86_64, PGI compiler (dmpar)
8. Linux x86_64, PGI compiler (dmpar_NO_GRIB2)
9. Linux x86_64, PGI compiler, SGI MPT (serial)
10. Linux x86_64, PGI compiler, SGI MPT (serial_NO_GRIB2)
11. Linux x86_64, PGI compiler, SGI MPT (dmpar)
12. Linux x86_64, PGI compiler, SGI MPT (dmpar_NO_GRIB2)
13. Linux x86_64, IA64 and Opteron (serial)
14. Linux x86_64, IA64 and Opteron (serial_NO_GRIB2)
15. Linux x86_64, IA64 and Opteron (dmpar)
16. Linux x86_64, IA64 and Opteron (dmpar_NO_GRIB2)
17. Linux x86_64, Intel compiler (serial)
18. Linux x86_64, Intel compiler (serial_NO_GRIB2)
19. Linux x86_64, Intel compiler (dmpar)
20. Linux x86_64, Intel compiler (dmpar_NO_GRIB2)
21. Linux x86_64, Intel compiler, SGI MPT (serial)
22. Linux x86_64, Intel compiler, SGI MPT (serial_NO_GRIB2)
23. Linux x86_64, Intel compiler, SGI MPT (dmpar)
24. Linux x86_64, Intel compiler, SGI MPT (dmpar_NO_GRIB2)
25. Linux x86_64, Intel compiler, IBM POE (serial)
26. Linux x86_64, Intel compiler, IBM POE (serial_NO_GRIB2)
27. Linux x86_64, Intel compiler, IBM POE (dmpar)
28. Linux x86_64, Intel compiler, IBM POE (dmpar_NO_GRIB2)
29. Linux x86_64 g95 compiler (serial)
30. Linux x86_64 g95 compiler (serial_NO_GRIB2)
31. Linux x86_64 g95 compiler (dmpar)
32. Linux x86_64 g95 compiler (dmpar_NO_GRIB2)
33. Cray XE/XC CLE/Linux x86_64, Cray compiler (serial)
34. Cray XE/XC CLE/Linux x86_64, Cray compiler (serial_NO_GRIB2)
35. Cray XE/XC CLE/Linux x86_64, Cray compiler (dmpar)
36. Cray XE/XC CLE/Linux x86_64, Cray compiler (dmpar_NO_GRIB2)
37. Cray XC CLE/Linux x86_64, Intel compiler (serial)
38. Cray XC CLE/Linux x86_64, Intel compiler (serial_NO_GRIB2)
39. Cray XC CLE/Linux x86_64, Intel compiler (dmpar)
40. Cray XC CLE/Linux x86_64, Intel compiler (dmpar_NO_GRIB2)

Enter selection [1-40] : 3
```

Kemudian pilih nomor yang **dmpar** dalam barisan **gfortran**>biasanya nomor **3**.

Kemudian cek compile WPS dengan mengetikkan perintah berikut dan jalankan.

**sudo nano configure.wps**

Kemudian cek pastikan terdapat **WRF\_DIR** = **../WRFV3**

Tampilan seperti pada gambar berikut :

```
# Listing of options that are usually independent of machine type.
# When necessary, these are over-ridden by each architecture.

ARFLAGS          =

PERL              =      perl

RANLIB            =      echo

WRF_DIR           =      ../WRFV3

WRF_INCLUDE       =      -I$(WRF_DIR)/external/io_netcdf \
                        -I$(WRF_DIR)/external/io_grib_share \
                        -I$(WRF_DIR)/external/io_grib1 \
                        -I$(WRF_DIR)/external/io_int \
                        -I$(WRF_DIR)/inc \
                        -I$(NETCDF)/include
```

Selanjutnya **keluar** dan **save**(Ctrl+X > Y > Enter). Lalu ketikkan dan jalankan perintah berikut.

```
./compile >& compile.log &  
tail -f compile.log && ls -ls *.exe
```

Kemudian cek di folder **/home/sam/WRF/WPS** ,pastikan terinstall: **geogrid.exe, netgrid.exe, dan ungrib.exe** .

Buka terminal,ketikkan perintah berikut dan jalankan.

```
ln -sf ungrib/Variable_Tables/Vtables.GFS
```



## Building WPS\_GEOG

Ubah nama file **geog** menjadi **WPS\_GEOG** secara manual, atau dapat melalui menjalankan perintah berikut pada terminal.

```
mv geog WPS_GEOG
```

Extract setiap file **WPS Geography** yang ada di nomor 8.

Pindahkan folder yang telah di ekstrak ke dalam **WPS\_GEOG**

- Masuk ke folder **WPS**  
**cd /home/sam/WRF/WPS**

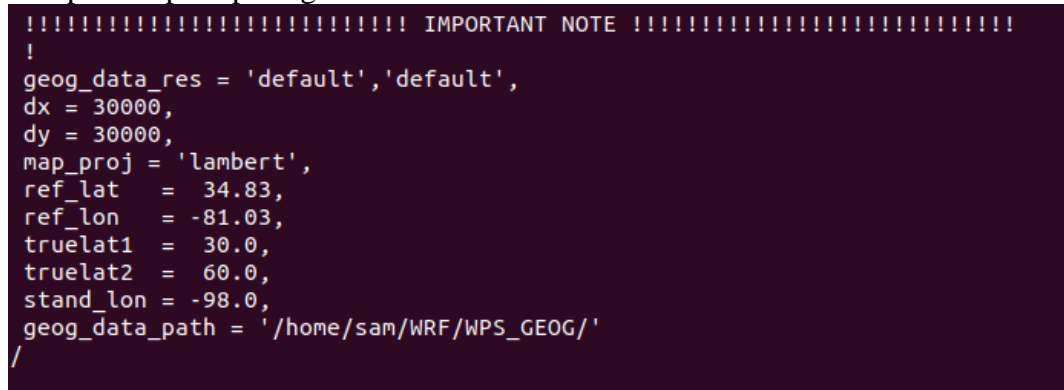
kemudian ketikkan perintah berikut dan jalankan.

```
nano namelist.wps
```

Pada baris berikut, sesuaikan isinya menjadi:

```
geog_data_path = '/home/sam/WRF/WPS_GEOG/'
```

Tampilan seperti pada gambar berikut :



```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! IMPORTANT NOTE !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!
geog_data_res = 'default','default',
dx = 30000,
dy = 30000,
map_proj = 'lambert',
ref_lat = 34.83,
ref_lon = -81.03,
truelat1 = 30.0,
truelat2 = 60.0,
stand_lon = -98.0,
geog_data_path = '/home/sam/WRF/WPS_GEOG/'
/
```

Selanjutnya **keluar** dan **save**(Ctrl+X > Y > Enter).

## Building Post Processing

- Masuk ke folder **ARWpost**  
**cd/home/sam/WRF/ARWpost**

Buka terminal,ketikkan perintah berikut dan jalankan.

**ls -las && ./configure**

Akan muncul pilhan dalam bentuk barisan seperti berikut.

```
Please select from among the following supported platforms.

1.  PC Linux i486 i586 i686 x86_64, PGI compiler
2.  PC Linux i486 i586 i686 x86_64, Intel compiler
3.  PC Linux i486 i586 i686 x86_64, gfortran compiler

Enter selection [1-3] : 3
```

Pilih nomor yang **gfortran compiler** > biasanya nomor **3**.

- Masuk ke folder **src**  
**cd /home/sam/WRF/ARWpost/src**

Buka terminal,ketikkan perintah berikut dan jalankan.

**nano Makefile**

Pada baris berikut, sesuaikan isinya menjadi:

**-L\$(NETCDF)/lib -lnetcdf -lnetcdff -I\$(NETCDF)/include -lnetcdf**

Tampilan seperti pada gambar berikut :

```
@echo " "
@echo " "

all: ARWpost.exe

ARWpost.exe: $(OBJS)
$(FC) $(FFLAGS) $(LDFLAGS) -o $@ $(OBJS) \
-L$(NETCDF)/lib -lnetcdf -lnetcdff -I$(NETCDF)/include -lnetcdf

module_model_basics.o:
constants_module.o:
```

Selanjutnya **keluar** dan **save**(Ctrl+X > Y > Enter).

- Masuk ke folder **ARWpost**  
**cd/home/sam/WRF/ARWpost**

Buka terminal, ketikkan perintah berikut dan jalankan.

**nano configure.arwp**

Padabaris berikut, sesuaikan isinyamenjadi:

**FFLAGS = -ffree-form -cpp -O -fno-second-underscore -fconvert=big-endian  
-frecord-marker=4**

**F77FLAGAS = -ffixed-form -cpp -O -fno-second-underscore -fconvert=big-  
endian**

**CFLAGS = -fPIC -m64**

**CPP = /lib/cpp -P -traditional**

Tampilan seperti pada gambar berikut :

```
#### Architecture specific settings ####
# Settings for PC Linux i486 i586 i686 x86_64, gfortran compiler
#
FC = gfortran
FFLAGS = -ffree-form -O -fno-second-underscore -fconvert=big-endian -frecord-marker=4
F77FLAGS = -ffixed-form -O -fno-second-underscore -fconvert=big-endian
FNGFLAGS = $(FFLAGS)
LDFLAGS =
CC = gcc
CFLAGS = -fPIC -m64
CPP = /lib/cpp -P -traditional
CPPFLAGS = -DIO_NETCDF -DIO_GRIB1 -DIO_BINARY -DRECL4 -Dbytesw
```

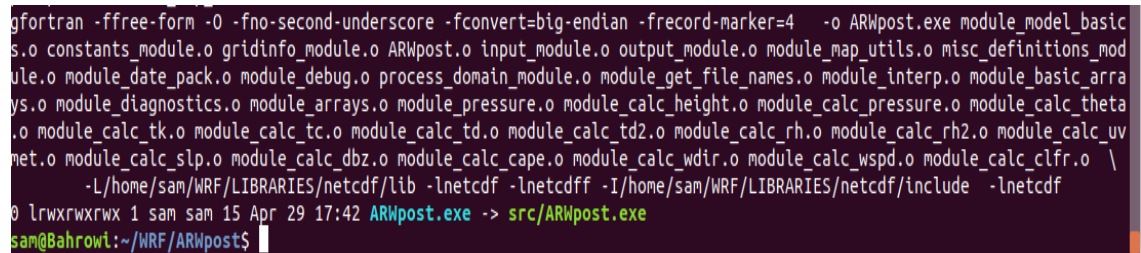
Selanjutnya **keluar** dan **save**(Ctrl+X > Y > Enter).

Ricko D. Yudistira

Lalu ketikkan dan jalankan perintah berikut.

**`./compile && ls -ls *.exe`**

Hasil tampilan harus seperti ini :

A terminal window with a dark background and light-colored text. The command being executed is a long gfortran compilation command. The output shows the creation of ARWpost.exe with permissions -rwxrwxrwx. The prompt is sam@Bahrowi:~/WRF/ARWpost\$.

```
gfortran -ffree-form -O -fno-second-underscore -fconvert=big-endian -frecord-marker=4 -o ARWpost.exe module_model_basic
s.o constants_module.o gridinfo_module.o ARWpost.o input_module.o output_module.o module_map_utils.o misc_definitions_mod
ule.o module_date_pack.o module_debug.o process_domain_module.o module_get_file_names.o module_interp.o module_basic_arra
ys.o module_diagnostics.o module_arrays.o module_pressure.o module_calc_height.o module_calc_pressure.o module_calc_theta
.o module_calc_tk.o module_calc_tc.o module_calc_td.o module_calc_td2.o module_calc_rh.o module_calc_rh2.o module_calc_uv
met.o module_calc_slp.o module_calc_dbz.o module_calc_cape.o module_calc_wdir.o module_calc_wspd.o module_calc_clfr.o \
-L/home/sam/WRF/LIBRARIES/netcdf/lib -lnetcdf -lnetcdff -I/home/sam/WRF/LIBRARIES/netcdf/include -lnetcdf
0 lrwxrwxrwx 1 sam sam 15 Apr 29 17:42 ARWpost.exe -> src/ARWpost.exe
sam@Bahrowi:~/WRF/ARWpost$
```

## Building WRF DomainWizard

- Masuk ke folder **WRFDomainWizard**  
**`cd/home/sam/WRF/WRFDomainWizard`**

Buka terminal,ketikkan perintah berikut dan jalankan.

**`sudo chmod +x run_DomainWizard`**

**`./run_DomainWizard`**

# INSTALASI WRF-CHEM

Masukan file **global\_emissions\_v3** dan file **prep\_chem\_sources\_v1.3** yang telah di ekstrak kedalam folder **CHEM**

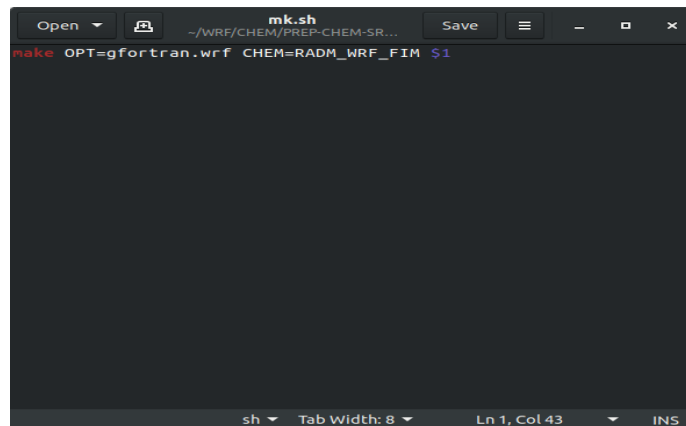
- Masuk ke folder **build**

**cd /home/cko/WRF/CHEM/PREP-CHEM-SRC-1.5/bin/build**

edit file **mk.sh**, disesuaikan dengan script dibawah

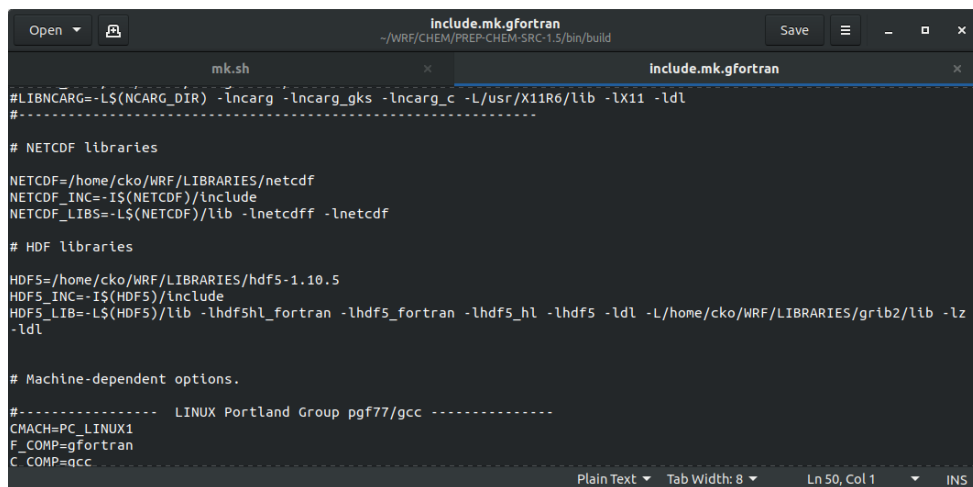
**OPT=gfortran.wrf CHEM=RADM\_WRF\_FIM**

Tampilan seperti pada gambar berikut :



Setelah itu **Save**. edit file **include.mk.gfortran** dan file **include.mk.gfortran.wrf** sesuai gambar (pengeditan sama untuk kedua file)

Tampilan seperti pada gambar berikut :



```
Open  include.mk.gfortran  Save  -  x
~/WRF/CHEM/PREP-CHEM-SRC-1.5/bin/build

mk.sh  include.mk.gfortran

#LIBNCARG=-L$(NCARG_DIR) -lncarg -lncarg_gks -lncarg_c -L/usr/X11R6/lib -lX11 -ldl
#-----
# NETCDF libraries
NETCDF=/home/cko/WRF/LIBRARIES/netcdf
NETCDF_INC=-I$(NETCDF)/include
NETCDF_LIBS=-L$(NETCDF)/lib -lnetcdff -lnetcdf

# HDF libraries
HDF5=/home/cko/WRF/LIBRARIES/hdf5-1.10.5
HDF5_INC=-I$(HDF5)/include
HDF5_LIBS=-L$(HDF5)/lib -lhdf5hl_fortran -lhdf5_fortran -lhdf5_hl -lhdf5 -ldl -L/home/cko/WRF/LIBRARIES/grib2/lib -lz -ldl

# Machine-dependent options.
#-----  LINUX Portland Group pgf77/gcc -----
CMACH=PC_LINUX1
F_COMP=gfortran
C_COMP=gcc
Plain Text  Tab Width: 8  Ln 50, Col 1  INS
```

**NETCDF=/home/cko/WRF/LIBRARIES/netcdf** (disesuaikan dengan folder netcdf)

**HDF5=/home/cko/WRF/LIBRARIES/hdf5-1.10.5** (disesuaikan dengan folder HDF5)

**-L/scratchin/grupos/catt-brams/shared/libs/zlib-1.2.8/lib** diganti menjadi **-L/home/cko/WRF/LIBRARIES/grib2/lib** (disesuaikan dengan folder grib2/lib)

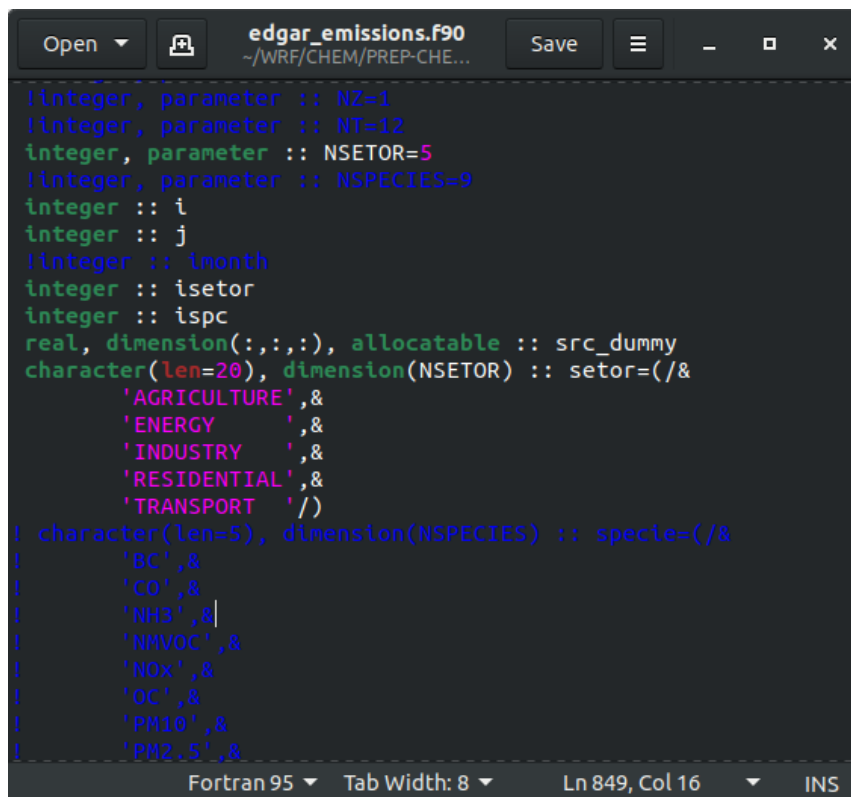
Setelah itu **Save**

- Masuk ke folder **src**

**cd /home/cko/WRF/CHEM/PREP-CHEM-SRC-1.5/src**

Edit file **edgar\_emissions.f90** sesuai gambar (meratakan terhadap RESIDENTAL agar character mencapai 11)

Tampilan seperti pada gambar berikut :



```
!integer, parameter :: NZ=1
!integer, parameter :: NT=12
integer, parameter :: NSETOR=5
!integer, parameter :: NSPECIES=9
integer :: i
integer :: j
integer :: imonth
integer :: isetor
integer :: ispc
real, dimension(:,:,:), allocatable :: src_dummy
character(len=20), dimension(NSETOR) :: setor=(&
'AGRICULTURE',&
'ENERGY',&
'INDUSTRY',&
'RESIDENTIAL',&
'TRANSPORT'&)
character(len=5), dimension(NSPECIES) :: specie=(&
'BC',&
'CO',&
'NH3',&
'NMVOC',&
'NOx',&
'OC',&
'PM10',&
'PM2.5',&
```

- Masuk ke folder **build**

**cd /home/cko/WRF/CHEM/PREP-CHEM-SRC-1.5/bin/build**

Buka terminal, ketikkan perintah berikut dan jalankan

**./mk.sh**

maka akan dihasilkan file **prep\_chem\_sources\_RADM\_WRF\_FIM.exe** pada folder **/home/cko/WRF/CHEM/PREP-CHEM-SRC-1.5/bin**

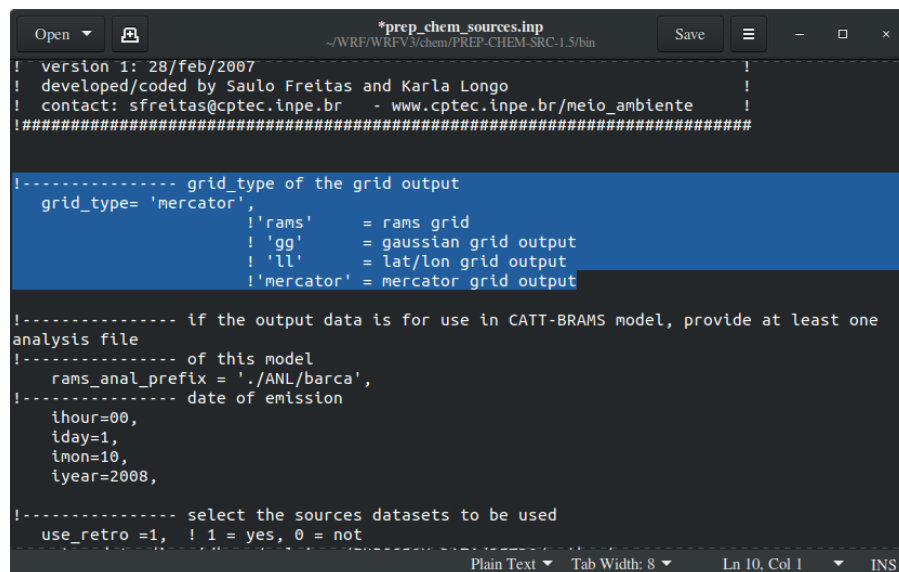
Buka file **prep\_chem\_sources.inp**

- Ganti setiap direktorinya di dalam file tersebut agar disesuaikan dengan folder **Global\_emissions\_v3**

- Ganti bagian **grid\_type** menjadi **'mercator'** dan tambahkan keterangan

**!'mercator' = mercator grid output**

Tampilan seperti pada gambar berikut :



```
! Version 1: 28/feb/2007
! developed/coded by Saulo Freitas and Karla Longo
! contact: sfreitas@cptec.inpe.br - www.cptec.inpe.br/meio_ambiente
!#####

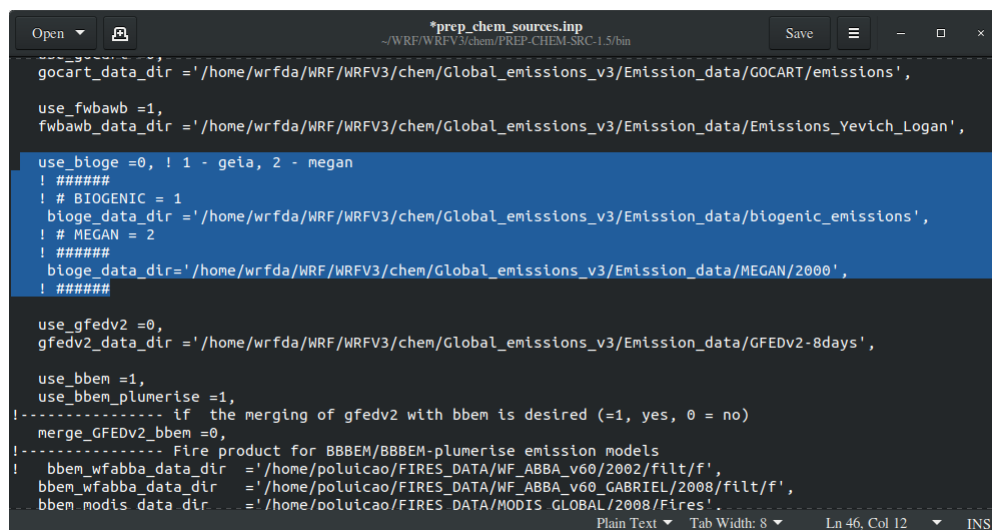
!----- grid_type of the grid output
grid_type= 'mercator',
! 'rams'      = rams grid
! 'gg'        = gaussian grid output
! 'll'        = lat/lon grid output
! 'mercator'  = mercator grid output

!----- if the output data is for use in CATT-BRAMS model, provide at least one
analysis file
!----- of this model
rams_anal_prefix = './ANL/barca',
!----- date of emission
ihour=00,
iday=1,
imon=10,
iyear=2008,

!----- select the sources datasets to be used
use_retro = 1, ! 1 = yes, 0 = not
```

- Ganti bagian **use\_bioge = 1** menjadi **use\_bioge = 0**

Tampilan seperti pada gambar berikut :



```
gocart_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/Emission_data/GOCART/emissions',
use_fwabw = 1,
fwabw_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/Emission_data/Emissions_Yevich_Logan',

use_bioge = 0, ! 1 - geia, 2 - megan
! #####
! # BIOGENIC = 1
bioge_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/Emission_data/biogenic_emissions',
! # MEGAN = 2
! #####
bioge_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/Emission_data/MEGAN/2000',
! #####

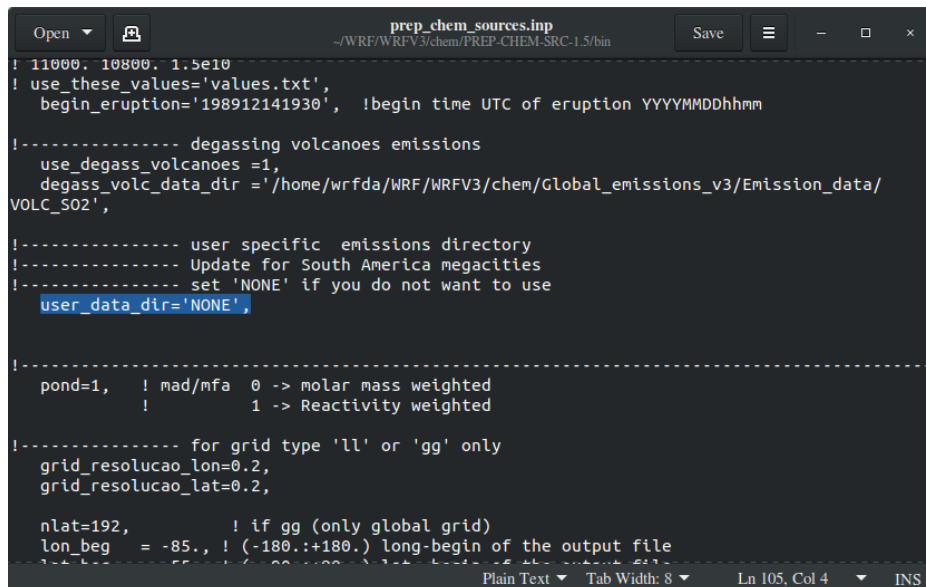
use_gfedv2 = 0,
gfedv2_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/Emission_data/GFEDv2-8days',

use_bbem = 1,
use_bbem_plumerise = 1,
!----- if the merging of gfedv2 with bbem is desired (=1, yes, 0 = no)
merge_GFEDv2_bbem = 0,
!----- Fire product for BBBEM/BBBEM-plumerise emission models
! bbem_wfabba_data_dir = '/home/polucao/FIRES_DATA/WF_ABBA_v60/2002/filt/f',
bbem_wfabba_data_dir = '/home/polucao/FIRES_DATA/WF_ABBA_v60_GABRIEL/2008/filt/f',
bbem_modis_data_dir = '/home/polucao/FIRES_DATA/MODIS_GLOBAL/2008/Fires'
```

Pada bagian **degassing volcanoes emissions**. Ganti bagian **user\_data\_dir=** pada bagian South America menjadi **'NONE'**



Tampilan seperti pada gambar berikut :



```
Open prep_chem_sources.inp Save
~/WRF/WRFV3/chem/PRP-CHEM-SRC-1.5/bin

! 11000. 10800. 1.5e10
! use_these_values='values.txt',
! begin_eruption='198912141930', !begin time UTC of eruption YYYYMMDDhhmm

!----- degassing volcanoes emissions
! use_degass_volcanoes =1,
! degass_volc_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/Emission_data/
VOLC_S02',

!----- user specific emissions directory
!----- Update for South America megacities
!----- set 'NONE' if you do not want to use
! user_data_dir='NONE',

!-----
! pond=1, ! mad/mfa 0 -> molar mass weighted
! 1 -> Reactivity weighted

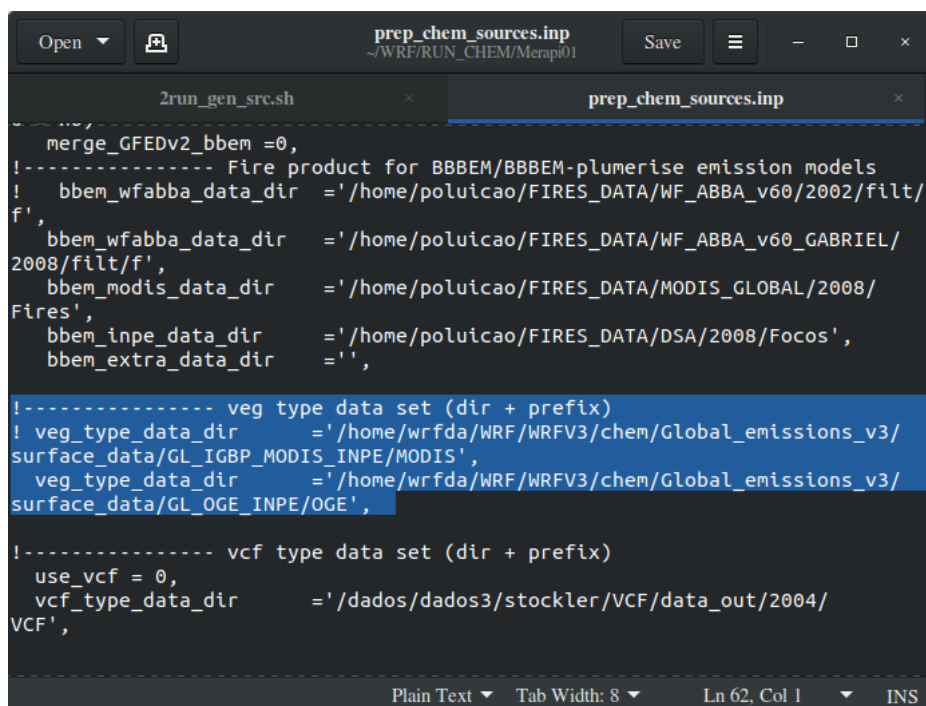
!----- for grid type 'll' or 'gg' only
! grid_resolucao_lon=0.2,
! grid_resolucao_lat=0.2,

! nlat=192, ! if gg (only global grid)
! lon_beg = -85., ! (-180.:+180.) long-begin of the output file

Plain Text Tab Width: 8 Ln 105, Col 4 INS
```

Pada bagian **veg type data set**. Ganti lokasi **veg\_type\_data\_dir** = disesuaikan dengan folder **MODIS** dan folder **OGE** yang ada pada folder **Global\_emissions\_v3/surface\_data**

Tampilan seperti pada gambar berikut :



```
Open prep_chem_sources.inp Save
~/WRF/RUN_CHEM/Merapi01

2run_gen_src.sh prep_chem_sources.inp

merge_GFEDv2_bbem =0,
!----- Fire product for BBBEM/BBBEM-plumerise emission models
! bbem_wfabba_data_dir = '/home/poluicao/FIRES_DATA/WF_ABBA_v60/2002/filt/
f',
! bbem_wfabba_data_dir = '/home/poluicao/FIRES_DATA/WF_ABBA_v60_GABRIEL/
2008/filt/f',
! bbem_modis_data_dir = '/home/poluicao/FIRES_DATA/MODIS_GLOBAL/2008/
Fires',
! bbem_inpe_data_dir = '/home/poluicao/FIRES_DATA/DSA/2008/Focos',
! bbem_extra_data_dir = '',

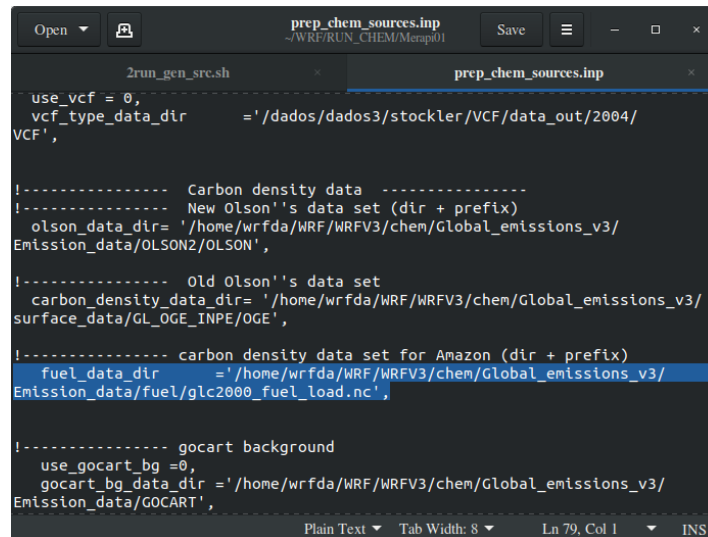
!----- veg type data set (dir + prefix)
! veg_type_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/
surface_data/GL_IGBP_MODIS_INPE/MODIS',
! veg_type_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/
surface_data/GL_OGE_INPE/OGE',

!----- vcf type data set (dir + prefix)
! use_vcf = 0,
! vcf_type_data_dir = '/dados/dados3/stockler/VCF/data_out/2004/
VCF',

Plain Text Tab Width: 8 Ln 62, Col 1 INS
```

Pada bagian **carbon density data set**. Ganti **fuel\_data\_dir =** diganti menjadi **'.../Global\_emissions\_v3/Emission\_data/fuel/glc2000\_fuel\_load.nc'** (meskipun tidak ada, nanti akan tetap terbaca)

Tampilan seperti pada gambar berikut :



```
Open  prep_chem_sources.inp  Save  -  x
~/WRF/RUN_CHEM/Metrap01

2run_gen_src.sh  prep_chem_sources.inp

use_vcf = 0,
vcf_type_data_dir = '/dados/dados3/stockler/VCF/data_out/2004/VCF',

!----- Carbon density data -----
!----- New Olson's data set (dir + prefix)
olson_data_dir= '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/Emission_data/OLSON2/OLSON',

!----- Old Olson's data set
carbon_density_data_dir= '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/surface_data/GL_OGE_INPE/OGE',

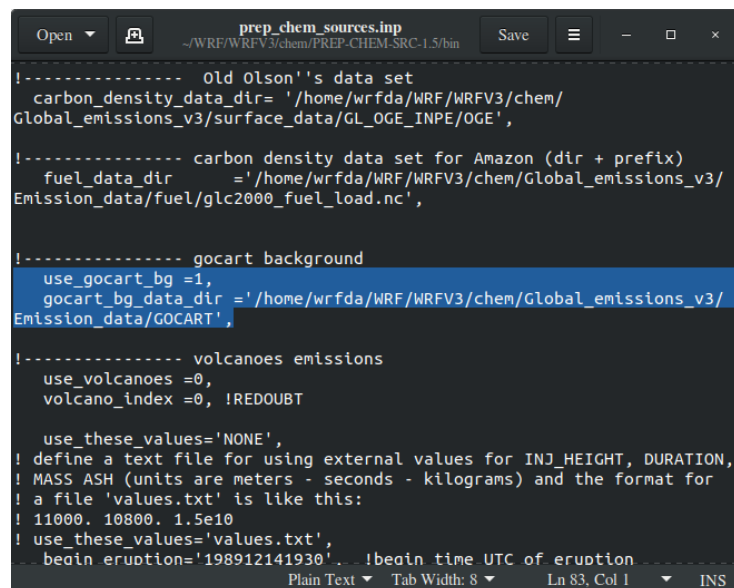
!----- carbon density data set for Amazon (dir + prefix)
fuel_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/Emission_data/fuel/glc2000_fuel_load.nc',

!----- gocart background
use_gocart_bg =0,
gocart_bg_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/Emission_data/GOCART',

Plain Text  Tab Width: 8  Ln 79, Col 1  INS
```

Pada bagian **gocart background**. Ganti **use\_gocart\_bg =** menjadi **1**

Tampilan seperti pada gambar berikut :



```
Open  prep_chem_sources.inp  Save  -  x
~/WRF/WRFV3/chem/PREP-CHEM-SRC-1.5/bin

!----- Old Olson's data set
carbon_density_data_dir= '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/surface_data/GL_OGE_INPE/OGE',

!----- carbon density data set for Amazon (dir + prefix)
fuel_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/Emission_data/fuel/glc2000_fuel_load.nc',

!----- gocart background
use_gocart_bg =1,
gocart_bg_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/Emission_data/GOCART',

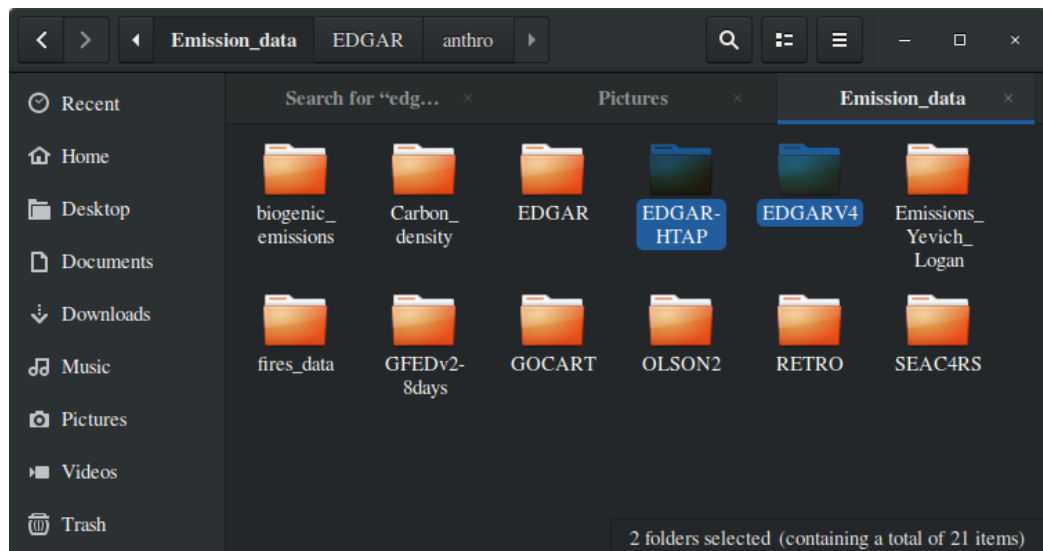
!----- volcanoes emissions
use_volcanoes =0,
volcano_index =0, !REDOUBT

use_these_values='NONE',
! define a text file for using external values for INJ_HEIGHT, DURATION,
! MASS ASH (units are meters - seconds - kilograms) and the format for
! a file 'values.txt' is like this:
! 11000. 10800. 1.5e10
! use_these_values='values.txt',
! begin eruption='198912141930'... !begin time UTC of eruption -----

Plain Text  Tab Width: 8  Ln 83, Col 1  INS
```

Pindahkan semua file dalam folder **EDGAR-HTAP** dan folder **EDGARV4** ke dalam folder **EDGAR/anthro**

Tampilan seperti pada gambar berikut :



# PENGELOLAAN WRF-CHEM

Buat folder baru **RUN\_CHEM**

Masuk ke terminal kemudian jalankan perintah (lokasi file disesuaikan dengan punya masing-masing) :

```
ln -fs ~/WRF/WPS/*exe .
```

```
ln -fs ~/WRF/WRFV3/main/*exe .
```

```
ln -fs ~/WRF/WRFV3/chem/*exe .
```

```
ln -fs ~/WRF/WRFV3/chem/ozone* .
```

```
cp ~/WRF/WRFV3/chem/PREP-CHEM-SRC-1.5/bin/prep_chem* .
```

```
ln -fs ~/WRF/ARWpost/ARWpost.exe
```

```
cp ~/WRF/ARWpost/namelist* .
```

```
ln -fs ~/WRF/WRFV3/run/*TBL .
```

```
ln -fs ~/WRF/WRFV3/run/*DATA .
```

```
ln -fs ~/WRF/WRFV3/run/tr* .
```

```
ln -fs ~/WRF/WRFV3/run/*formatted .
```

```
ln -fs ~/WRF/WPS/link_grib.csh .
```

```
ln -fs ~/WRF/WPS/util/plotgrids_new.ncl .
```

```
ln -fs ~/WRF/WPS/ungrib/Variable_Tables/Vtable.GFS Vtable
```

## LANGKAH-LANGKAH

1. Jalankan **Domain Wizard** untuk mendapatkan file **met\_em\*** (lokasi dan waktu disesuaikan dengan keinginan sendiri)

2. Pindahkan file **met\_em\*** dan file **namelist\*** ke folder **RUN\_CHEM**

3. Buka file **namelist.input**

a) Tambahkan script pada bagian terakhir **&time\_control** :

```
io_form_auxinput5 = 2,
```

```
io_form_auxinput6 = 2,
```

```
io_form_auxinput7 = 2,
```

**io\_form\_auxinput8 = 2,**

**io\_form\_auxinput13 = 2,**

b) Tambahkan script &chem pada barisan paling bawah (nanti diratakan):

**&chem**

**chem\_opt = 0,**

**emiss\_opt = 6, 0,**

**kemit = 1,**

**bioemdt = 0,**

**photdt = 360,**

**chemdt = 5,**

**io\_style\_emissions = 2,**

**chem\_in\_opt = 0, 0,**

**phot\_opt = 1, 0,**

**gas\_drydep\_opt = 1, 1,**

**aer\_drydep\_opt = 1, 1,**

**bio\_emiss\_opt = 0, 0,**

**dust\_opt = 1,**

**dmseemis\_opt = 1,**

**seas\_opt = 1,**

**gas\_bc\_opt = 1, 0,**

**gas\_ic\_opt = 1, 0,**

**aer\_bc\_opt = 1, 0,**

**aer\_ic\_opt = 1, 0,**

**gaschem\_onoff = 1, 0,**

**aerchem\_onoff = 1, 0,**

**wetscav\_onoff = 0, 0,**

**cldchem\_onoff = 0, 0,**

**vertmix\_onoff = 1, 0,**

**chem\_conv\_tr = 1, 0,**

**biomass\_burn\_opt = 1, 0,**

**plumerisefire\_frq = 30, 0,**

**have\_bcs\_chem = .false., .false., .false.,**

**aer\_ra\_feedback = 1,**

```

aer_op_opt          = 1,
opt_pars_out         = 0,
diagnostic_chem      = 0,
/

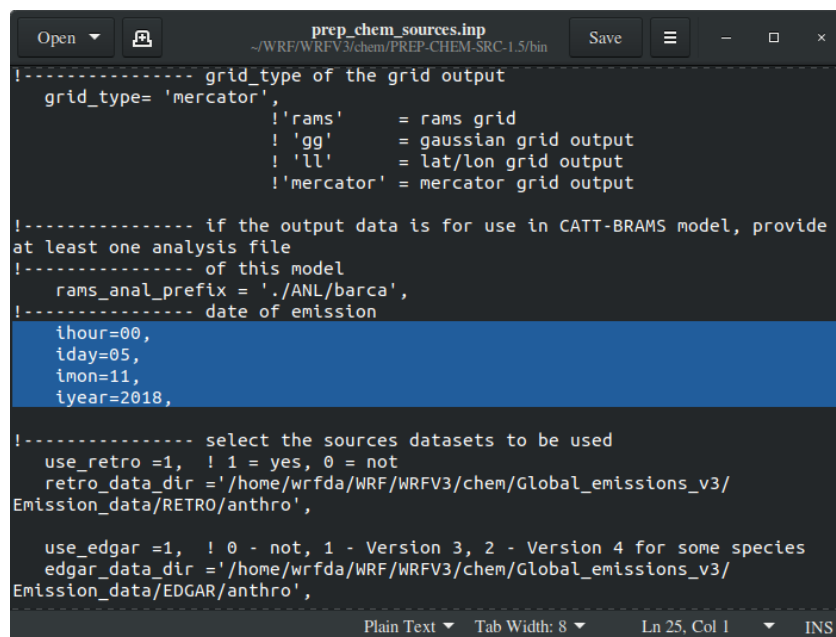
```

4. Jalankan **./real.exe** pada folder **RUN\_CHEM** untuk mendapatkan file **wrfbdy\_01** dan file **wrfinput\_01**

5. Jika terjadi **error**, dapat dilihat pada file **rsl.error.0000**, kemudian lihat bagian **fatal**. Segera diperbaiki sesuai ketentuan yang disarankan. Kemudian jalankan kembali **./real.exe** hingga menghasilkan file yang diinginkan

6. Buka file **prep\_chem\_sources.inp**, ganti tanggal dan pusat domain sesuai file **namelist.input**

#### a) Ganti tanggal



```

prep_chem_sources.inp
~/WRF/WRFV3/chem/PREP-CHEM-SRC-1.5/bin

!----- grid_type of the grid output
grid_type= 'mercator',
! 'rams'      = rams grid
! 'gg'        = gaussian grid output
! 'll'        = lat/lon grid output
! 'mercator'  = mercator grid output

!----- if the output data is for use in CATT-BRAMS model, provide
at least one analysis file
!----- of this model
rams_anal_prefix = './ANL/barca',
!----- date of emission
ihour=00,
iday=05,
imon=11,
iyear=2018,

!----- select the sources datasets to be used
use_retro =1, ! 1 = yes, 0 = not
retro_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/
Emission_data/RETRO/anthro',

use_edgar =1, ! 0 - not, 1 - Version 3, 2 - Version 4 for some species
edgar_data_dir = '/home/wrfda/WRF/WRFV3/chem/Global_emissions_v3/
Emission_data/EDGAR/anthro',

```

#### b) Ganti nama\_output

```

Open  prep_chem_sources.inp  Save  ~ /WRF/WRFV3/chem/PREP-CHEM-SRC-1.5/bin
latl = -90., -90., -90.,
latf = +90., +90., +90.,
lonl = -180., -180., -180.,
lonf = 180., 180., 180.,

!----- project rams grid (polar sterogr) to lat/lon: 'YES' or
'NOT'
proj_to_ll='YES',

!----- output file prefix (may include directory other than the
current)
chem_out_prefix = 'merapi01',
chem_out_format = 'vfm',
!----- convert to WRF/CHEM (yes,not)
! convert_to_wrf = 'yes',
special_output_to_wrf = 'YES',

$END
Plain Text  Tab Width: 8  Ln 161, Col 4  INS

```

### c) Ganti domain

```

Open  prep_chem_sources.inp  Save  ~ /WRF/WRFV3/chem/PREP-CHEM-SRC-1.5/bin
NNXP = 40,50,86,46,      ! Number of x gridpoints
NNYP = 40,50,74,46,      ! Number of y gridpoints
NXTNEST = 0,1,1,1,      ! Grid number which is the next coarser grid
DELTAX = 6000,
DELTAY = 6000,          ! X and Y grid spacing

! Nest ratios between this grid and the next coarser grid.
NSTRATX = 1,2,3,4,      ! x-direction
NSTRATY = 1,2,3,4,      ! y-direction

NINEST = 1,10,0,0,      ! Grid point on the next coarser
NJNEST = 1,10,0,0,      ! nest where the lower southwest
                        ! corner of this nest will start.
                        ! If NINEST or NJNEST = 0, use CENTLAT/LON
POLELAT = 40.,          ! If polar, latitude/longitude of pole point
POLELON = -115.,        ! If lambert, lat/lon of grid origin (x=y=0.)

STDLAT1 = 40.,          ! If polar, unused
STDLAT2 = 35.,          ! If lambert, standard latitudes of projection

CENTLAT = 40., -23., 27.5, 27.5,
CENTLON = -115., -46., -80.5, -80.5,
Plain Text  Tab Width: 8  Ln 140, Col 4  INS

```

DELTAX = **dx**

DELTAY = **dy**

POLELAT = STDLAT1 = STDLAT2 = CENTLAT = **pusat latitude** (hanya paling depan yang diganti)

POLELON = CENTLON = **pusat longitude** (hanya paling depan yang diganti)

Ricko D. Yudistira

NNXP = **we** (hanya paling depan yang diganti)

NNYP = **sn** (hanya paling depan yang diganti)

7. Setelah selesai diganti, file **prep\_chem\_sources.inp** di **Save**.  
Selanjutnya jalankan program **./prep\_chem\_sources\_RADM\_WRF\_FIM.exe**

8. Akan ada dihasilkan file berformat :

<b>&lt;nama_domain&gt;.vfm,</b>	<b>&lt;nama_domain&gt;.gra,</b>
<b>&lt;nama_domain&gt;gocartBG.bin,</b>	<b>&lt;nama_domain&gt;.ctl,</b>
<b>&lt;nama_domain&gt;volc.bin</b>	<b>&lt;nama_domain&gt;ab.bin</b>
<b>&lt;nama_domain&gt;.bb.bin</b>	

9. Buka terminal, jalankan proses :

**ln -sf \*-ab.bin emissopt3\_d01**

**ln -sf \*-bb.bin emissfire\_d01**

**cp \*-gocartBG.bin wrf\_gocart\_backg**

10. Buka file **namelist.input** :

a) Hapus script dibawah **debug\_level** pada **&time\_control** atau **no.3a**

b) Tambahkan script (bisa pilih)

**io\_form\_auxinput8 = 2,**

**auxinput13\_interval = 60,**

**io\_form\_auxinput13 = 2,**

c) Tambahkan script pada bagian bawah **&physics** :

**cu\_diag = 1,**

d) Ubah **chem\_opt** menjadi **400** (untuk abu vulkanik)

11. Lalu **Save**. Kemudian jalankan program **./convert\_emiss.exe**

12. Dari proses tersebut akan dihasilkan output file **wrfchemi\_d01** dan **wrfchemi\_gocart\_bg\_d01**



**13.** Ubah nama file **wrfchemi\_d01** menjadi **wrfchemi\_d01\_{tahun}-{bulan}-{tanggal}\_{jam}** disesuaikan dengan tanggal awal runningnya. (contoh : wrfchemi\_d01\_2018-05-11\_00:00:00)

**14.** Jalankan proses **./real.exe** kemudian akan dihasilkan file **wrfbdy\_d01** yang baru

**15.** Lanjutkan proses dengan **./wrf.exe**

**16.** Buka file **Namelist.ARWPost**. Edit waktu awal dan akhir, interval waktunya input\_name, dan output\_name.

**17.** Jalankan proses **./ARWPost.exe**. Makanya nanti akan di hasilkan file **\*.dat** dan **\*.ctl**

**18.** Untuk menampilkan hasil proses **./ARWPost.exe** dapat membuka aplikasi **GraDS** dan di jalankan script sesuai kebutuhan.

**19.** Script GraDS yang saya gunakan sebagai berikut (scriptnya telah saya sesuaikan dengan lokasi penelitian saya)

c

set lev 16

set lat -9.5 -5

set gxout shaded

set mpdset hires

set grads off

Set timelab off

draw shp /media/cko/HD\_Cko/Program Files (Meteo)/ArcGIS 10.3/PETA DASAR INDONESIA/IDN\_adm0.shp

set csmooth on

set gxout stream

```
set strmden 3
```

```
#####
```

```
c
```

```
set t 6
```

```
set clevs 5 10 15 20 25 30 35 40 45 50 55 60
```

```
set ccols 0 9 14 11 5 13 3 10 7 12 8 2 6
```

```
d vash_9/1e+12
```

```
d u;v
```

```
run /home/cko/Documents/cbar/cbarn.gs
```

```
draw title Gunung Merapi 11 Mei 2018 00.00 UTC\ Level 400mb
```

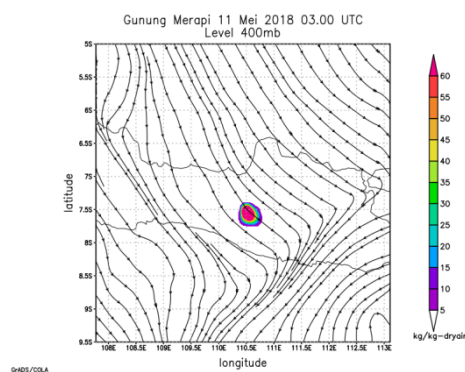
```
draw string 9.5 0.9 kg/kg-dryair
```

```
draw xlab longitude
```

```
draw ylab latitude
```

```
printim /media/cko/HD_Cko/PROGRESS/HASIL_0511/CHEM/16_400/0000.png  
white
```

Hasil tampilan seperti pada gambar berikut :



# basic package managment

sudo apt update && sudo apt upgrade

sudo apt install gcc gfortran g++ libtool automake autoconf make m4 grads default-jre csh

## Directory Listing

mkdir \$HOME/WRF

cd \$HOME/WRF

mkdir Downloads

mkdir Library

## Downloading Libraries

cd Downloads

wget -c https://www.zlib.net/zlib-1.2.11.tar.gz

wget -c https://support.hdfgroup.org/ftp/HDF5/releases/hdf5-1.10/hdf5-1.10.5/src/hdf5-1.10.5.tar.gz

wget -c https://www.unidata.ucar.edu/downloads/netcdf/ftp/netcdf-c-4.7.1.tar.gz

wget -c https://www.unidata.ucar.edu/downloads/netcdf/ftp/netcdf-fortran-4.5.1.tar.gz

wget -c http://www.mpich.org/static/downloads/3.3.1/mpich-3.3.1.tar.gz

wget -c https://download.sourceforge.net/libpng/libpng-1.6.37.tar.gz

wget -c https://www.ece.uvic.ca/~frodo/jasper/software/jasper-1.900.1.zip

# Compilers

sudo nano ~/.bashrc

export DIR=\$HOME/WRF/Library

export CC=gcc

export CXX=g++

export FC=gfortran

export F77=gfortran

source ~/.bashrc

```

# zlib

cd $HOME/WRF/Downloads
tar -xvzf zlib-1.2.11.tar.gz && cd zlib-1.2.11/
./configure --prefix=$DIR && make && make install


# hdf5 library for netcdf4 functionality

cd $HOME/WRF/Downloads
tar -xvzf hdf5-1.10.5.tar.gz && cd hdf5-1.10.5
./configure --prefix=$DIR --with-zlib=$DIR --enable-hl --enable-fortran && make
check && make install

sudo nano ~/.bashrc

    export HDF5=$DIR
    export LD_LIBRARY_PATH=$DIR/lib:$LD_LIBRARY_PATH

source ~/.bashrc


## Install NETCDF C Library

cd $HOME/WRF/Downloads
tar -xvzf netcdf-c-4.7.1.tar.gz && cd netcdf-c-4.7.1/
sudo nano ~/.bashrc

    export CPPFLAGS=-I$DIR/include
    export LDFLAGS=-L$DIR/lib

source ~/.bashrc

./configure --prefix=$DIR --disable-dap && make check && make install

sudo nano ~/.bashrc

    export PATH=$DIR/bin:$PATH
    export NETCDF=$DIR

source ~/.bashrc


## NetCDF fortran library

```

```

cd $HOME/WRF/Downloads
tar -xvzf netcdf-fortran-4.5.1.tar.gz && cd netcdf-fortran-4.5.1/
sudo nano ~/.bashrc
    export LD_LIBRARY_PATH=$DIR/lib:$LD_LIBRARY_PATH
    export CPPFLAGS=-I$DIR/include
    export LDFLAGS=-L$DIR/lib
    export LIBS="-lnetcdf -lhdf5_hl -lhdf5 -lz"
source ~/.bashrc
./configure --prefix=$DIR --disable-shared && make check && make install

```

### ## MPICH

```

cd $HOME/WRF/Downloads
tar -xvzf mpich-3.3.1.tar.gz && cd mpich-3.3.1/
./configure --prefix=$DIR && make && make install
sudo nano ~/.bashrc
    export PATH=$DIR/bin:$PATH
source ~/.bashrc

```

### # libpng

```

cd $HOME/WRF/Downloads
sudo nano ~/.bashrc
    export LDFLAGS=-L$DIR/lib
    export CPPFLAGS=-I$DIR/include
source ~/.bashrc
tar -xvzf libpng-1.6.37.tar.gz && cd libpng-1.6.37/
./configure --prefix=$DIR && make && make install

```

### # JasPer

```

cd $HOME/WRF/Downloads
unzip jasper-1.900.1.zip && cd jasper-1.900.1/

```

```
autoreconf -i && ./configure --prefix=$DIR && make && make install
```

```
sudo nano ~/.bashrc
```

```
export JASPERLIB=$DIR/lib
```

```
export JASPERINC=$DIR/include
```

```
source ~/.bashrc
```

```
##### WRF 4.1.2 #####
```

```
## WRF v4.3
```

```
## Downloaded from git tagged releases
```

```
#####
```

```
#####
```

```
cd $HOME/WRF/Downloads
```

```
wget -c https://github.com/wrf-model/WRF/archive/refs/tags/v4.3.tar.gz
```

```
tar -xvzf v4.3.tar.gz -C $HOME/WRF && cd $HOME/WRF/WRF-4.3
```

```
./clean && ./configure #34, 1 for gfortran and distributed memory
```

```
./compile em_real
```

```
sudo nano ~/.bashrc
```

```
export WRF_DIR=$HOME/WRF/WRF-4.3
```

```
source ~/.bashrc
```

```
## WPSV4.1
```

```
cd $HOME/WRF/Downloads
```

```
wget -c https://github.com/wrf-model/WPS/archive/refs/tags/v4.3.tar.gz
```

```
tar -xvzf v4.3.tar.gz -C $HOME/WRF
```

```
cd $HOME/WRF/WPS-4.3
```

```
./configure #3
```

```
./compile
```

##### Post-Processing Tools #####

## ARWpost

cd \$HOME/WRF/Downloads

wget -c [http://www2.mmm.ucar.edu/wrf/src/ARWpost\\_V3.tar.gz](http://www2.mmm.ucar.edu/wrf/src/ARWpost_V3.tar.gz)

tar -xvzf ARWpost\_V3.tar.gz -C \$HOME/WRF && cd \$HOME/WRF/ARWpost

./clean && sed -i -e 's/-lnetcdf/-lnetcdf -lnetcdf/g'

\$HOME/WRF/ARWpost/src/Makefile

./configure #3

sed -i -e 's/-C -P/-P/g' \$HOME/WRF/ARWpost/configure.arwp && ./compile

##### Model Setup Tools #####

## DomainWizard

cd \$HOME/WRF/Downloads

wget -c <http://esrl.noaa.gov/gsd/wrfportal/domainwizard/WRFDomainWizard.zip>

mkdir \$HOME/WRF/WRFDomainWizard

unzip WRFDomainWizard.zip -d \$HOME/WRF/WRFDomainWizard

chmod +x \$HOME/WRF/WRFDomainWizard/run\_DomainWizard

##### Static Geography Data #####

# [http://www2.mmm.ucar.edu/wrf/users/download/get\\_sources\\_wps\\_geog.html](http://www2.mmm.ucar.edu/wrf/users/download/get_sources_wps_geog.html)

cd \$HOME/WRF

mkdir DATA\_GEOG

cd \$HOME/WRF/DATA\_GEOG

wget -c [https://www2.mmm.ucar.edu/wrf/src/wps\\_files/geog\\_high\\_res\\_mandatory.tar.gz](https://www2.mmm.ucar.edu/wrf/src/wps_files/geog_high_res_mandatory.tar.gz)

wget -c [https://www2.mmm.ucar.edu/wrf/src/wps\\_files/geog\\_complete.tar.gz](https://www2.mmm.ucar.edu/wrf/src/wps_files/geog_complete.tar.gz)

wget -c [https://www2.mmm.ucar.edu/wrf/src/wps\\_files/geog\\_low\\_res\\_mandatory.tar.gz](https://www2.mmm.ucar.edu/wrf/src/wps_files/geog_low_res_mandatory.tar.gz)

tar -xvzf geog\_high\_res\_mandatory.tar.gz -C \$HOME/WRF

tar -xvzf geog\_complete.tar.gz -C \$HOME/WRF

```
tar -xvzf geog_low_res_mandatory.tar.gz -C $HOME/WRF
```

```
## export PATH and LD_LIBRARY_PATH
```

```
echo "export PATH=$DIR/bin:$PATH" >> ~/.bashrc
```

```
echo "export LD_LIBRARY_PATH=$DIR/lib:$LD_LIBRARY_PATH" >>  
~/.bashrc
```



## CARA RUNNING WRF

```
cd $HOME/WRF/Run
mkdir [nama folder] #ex. tarempa
cd $HOME/WRF/Run/tarempa
ln -fs ~/WRF/WRF-4.3/main/*exe .
ln -fs ~/WRF/ARWpost/src/ARWpost.exe
cp ~/WRF/ARWpost/namelist* .
ln -fs ~/WRF/WRF-4.3/run/*TBL .
ln -fs ~/WRF/WRF-4.3/run/*DATA .
ln -fs ~/WRF/WRF-4.3/run/tr* .
ln -fs ~/WRF/WRF-4.3/run/*formatted .
ln -fs ~/WRF/WPS-4.3/link_grib.csh .
ln -fs ~/WRF/WPS-4.3/util/plotgrids_new.ncl .
ln -fs ~/WRF/WPS-4.3/ungrib/Variable_Tables/Vtable.GFS Vtable
```

pindahkan file met\_em\* dan namelist\* dari folder Domain

```
./real.exe
tail -f rsl.error.0000
mpirun -np 4 ./wrf.exe
```

**20.** Buka file **Namelist.ARWPost**. Edit waktu awal dan akhir, interval waktunya input\_name, dan output\_name.

**21.** Jalankan proses **./ARWPost.exe**. Makanya nanti akan di hasilkan file **\*.dat** dan **\*.ctl**

**22.** Untuk menampilkan hasil proses **./ARWPost.exe** dapat membuka aplikasi **GraDS** dan di jalankan script sesuai kebutuhan.