MODUL

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

Teknik RGB pada SATAID

Teknik algoritma satelit

Instalasi WRF Ubuntu 14 dan 16 LTS

Instalasi WRF-Chem

Pengelolaan WRF-Chem

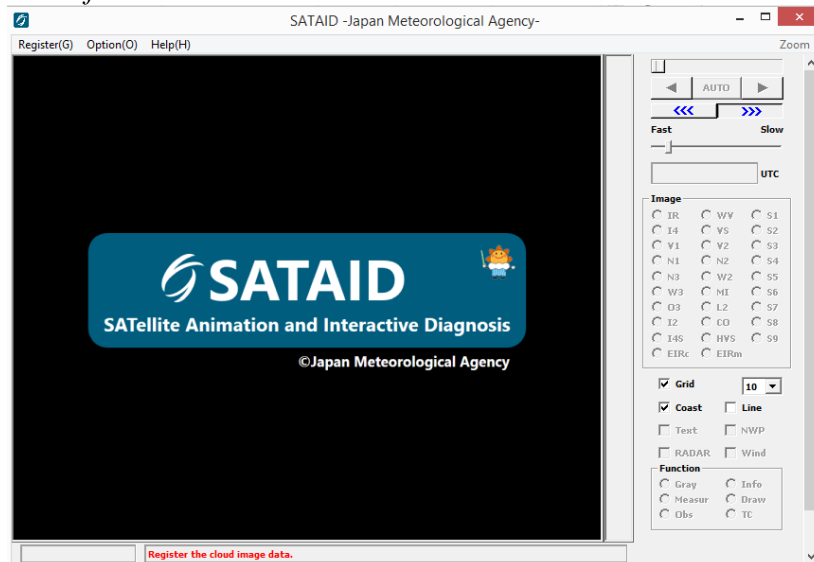**Instalasi WRF Ubuntu 18 dan 20 LTS**

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11.16.0025

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

2020

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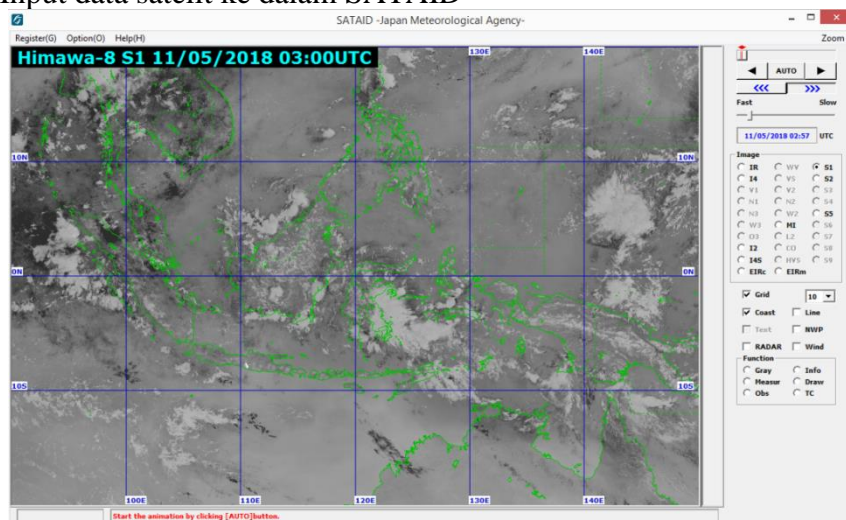
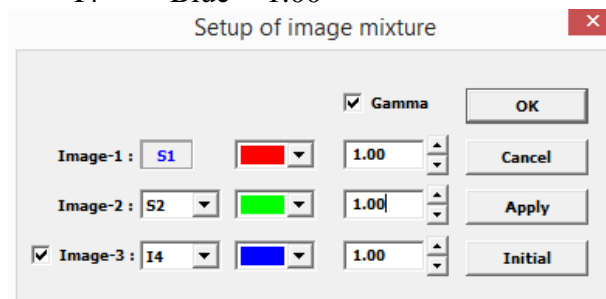4. Selanjutnya tentukan image yang dibutuhkan. Klik opsi S1. Kemudian klik Function Gray dan klik Color

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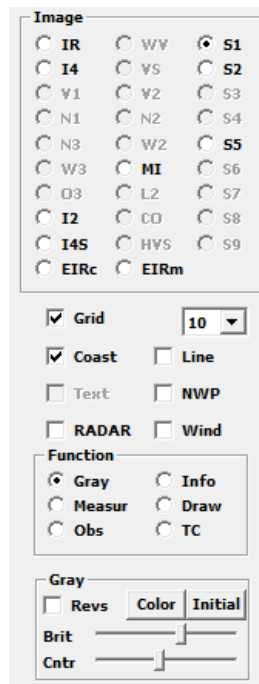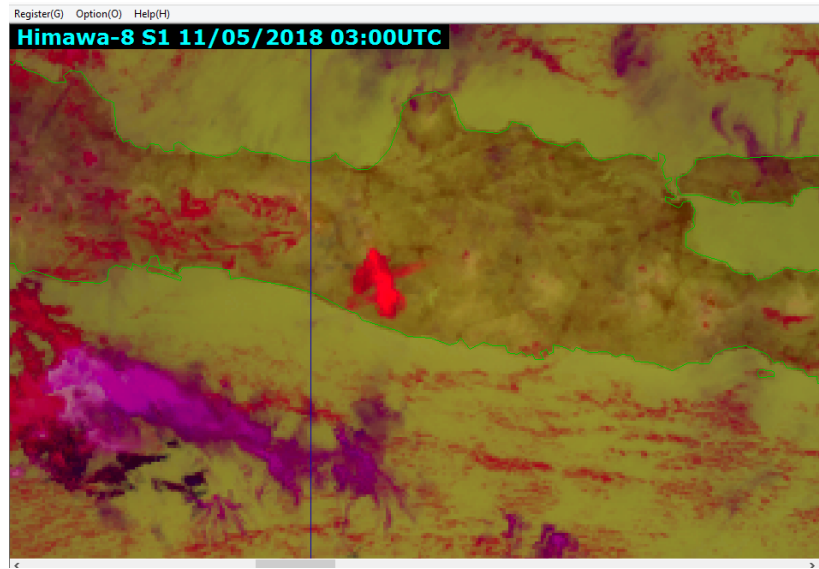
5. Pilih Mix dan kemudian klik kanan pada opsi Mix
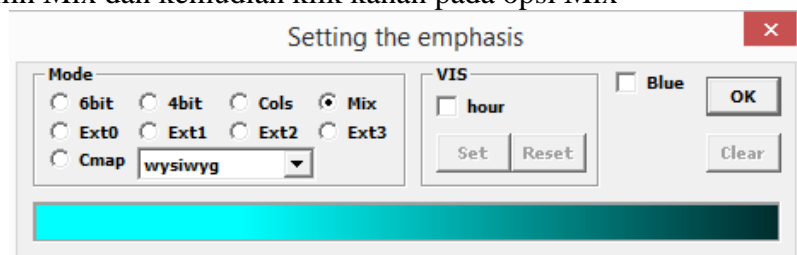
6. Sesuaikan kombinasi warna dan nilai pada masing-masing kanal

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

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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 :

```python
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:
```

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```
                                    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['IR'][0]
plotvarB15 = dsetB15.variables['I2'][0]
plt.title('Volcanic Ash ALL')
print (np.shape(plotvarB07))


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

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```
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
```

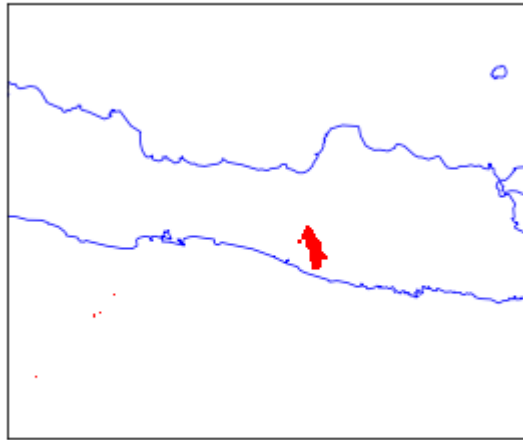c. Untuk teknik Multispectral Bandwidth menggunakan algoritma

```
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**

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Volcanic Ash Dispersion 01.00 UTC (MI)

In [4]:

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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
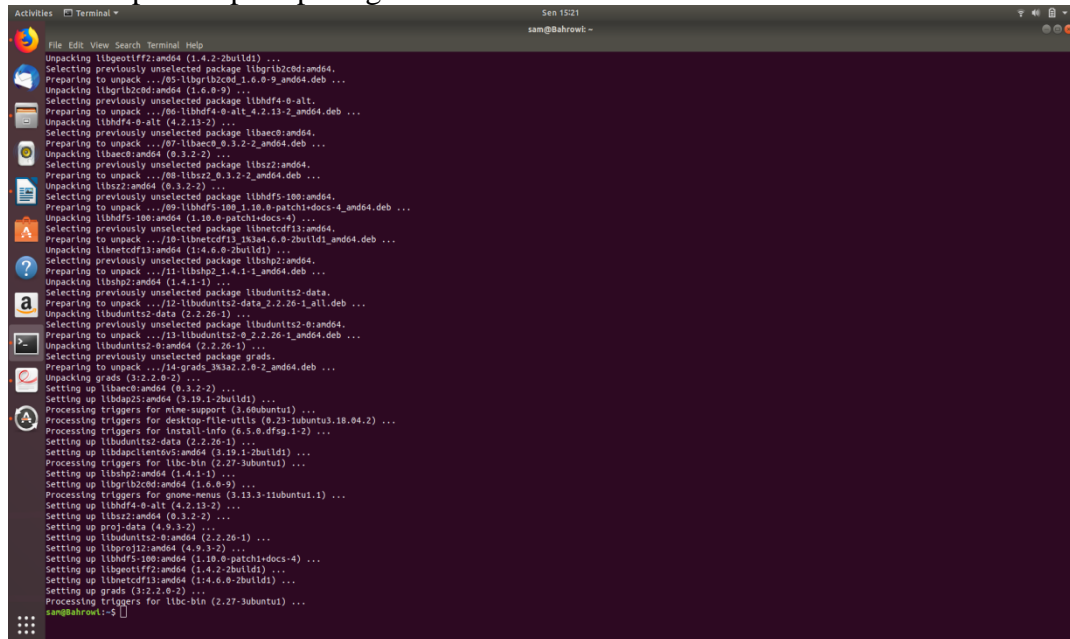
Hal yang perlu dipersiapkan antara lain:

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)

6.   global emissions_v3 ftp://aftp.fsl.noaa.gov/divisions/taq/global_emissions

7.   ARWpost 3.1 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

   1)   Geog_complete 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-1.900.1http://www.ece.uvic.ca/~frodo/jasper/

   2)   libpng-1.6.37http://www.libpng.org/pub/png/libpng.html

   3)   mpich-3.0.4https://www.mpich.org/downloads/

   4)   netcdf-4.1.3https://www.unidata.ucar.edu/software/netcdf/

   5)   zlib-1.2.11 http://www.zlib.net/)

   6)   hdf5-1.10.5http://www.hdfgroup.org/ftp/HDF5/current/src/

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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 :

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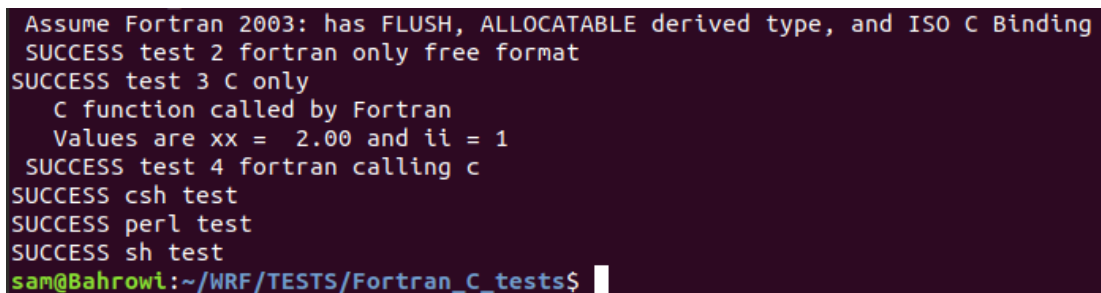
●   Buka terminal di **/home/sam/WRF/TESTS**, ketikkan perintah berikut dan kemudian jalankan.

untuk Ubuntu 64 bit

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**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 :

      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

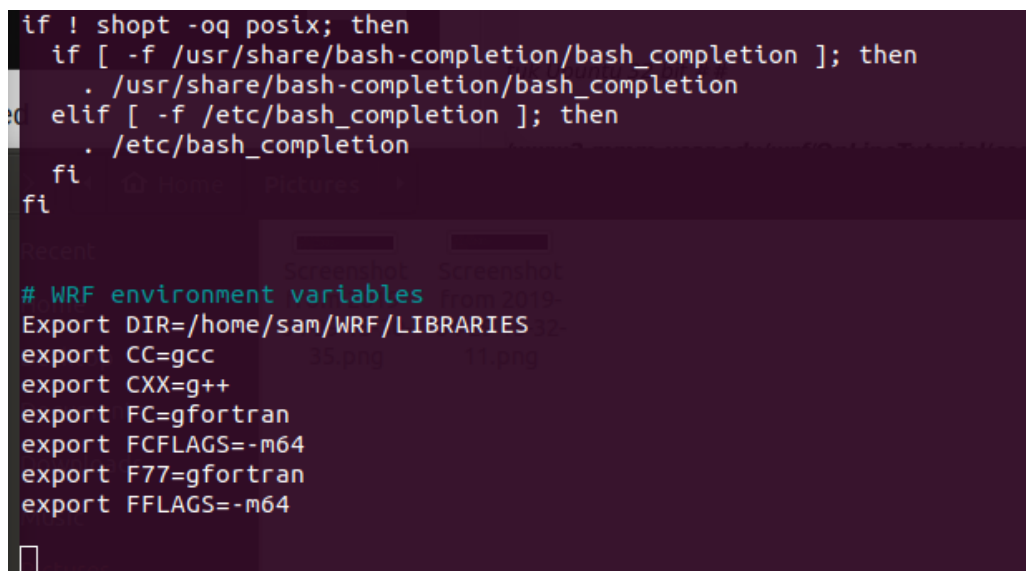●   Masuk ke folder **LIBRARIES**

     cd/home/sam/WRF/LIBRARIES

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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 :

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

source ~/.bashrc

● Masuk ke folder **netcdf**
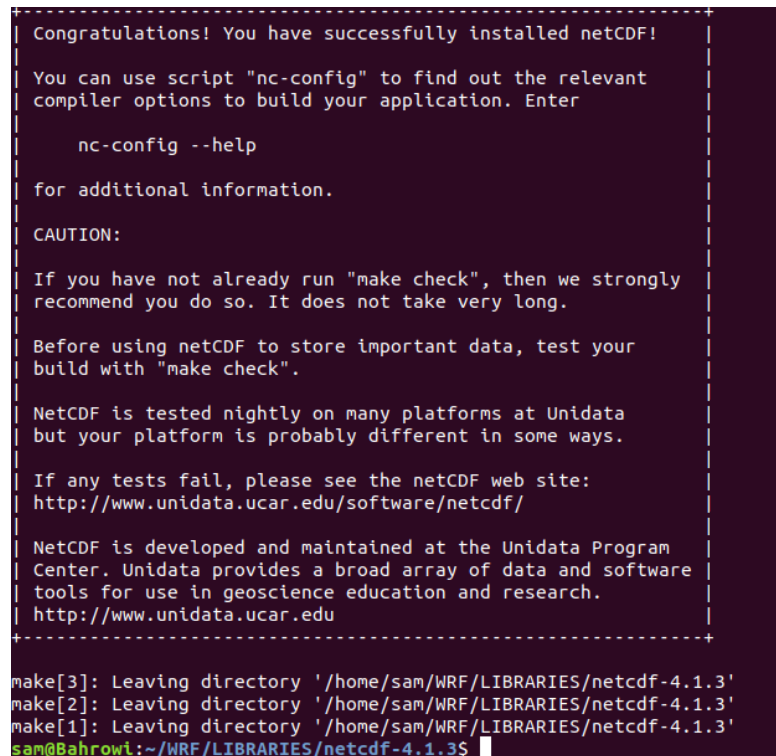
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cd /home/sam/WRF/LIBRARIES/netcdf* .

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 :

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```
# 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@Bahrowi:~/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

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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 :

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```
# 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 :

● Masuk ke folder **libpng**

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

Buka terminal, ketikkan perintah berikut dan jalankan.

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

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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@Bahrowi:~/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@Bahrowi:~/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 :

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```
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
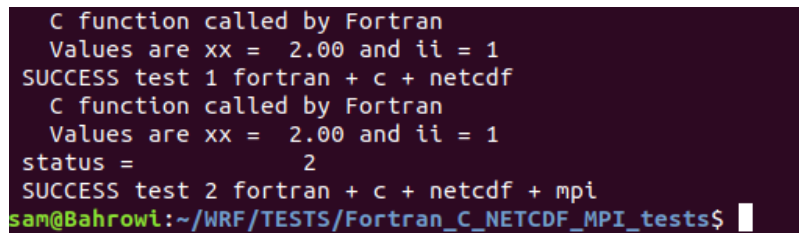
Hasil tampilan seperti pada gambar berikut :

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

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Hasil tampilan seperti pada gambar berikut :

BuildingWRFV3

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 pilhan dalam bentuk barisan seperti berikut.

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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 :

Kemudian cek compile WRF dengan mengetikkan perintah berikut

> **sudo nano configure.wrf**

Kemudian cek apakah tertampil hal berikut.

em_real (3d real case)

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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.

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./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
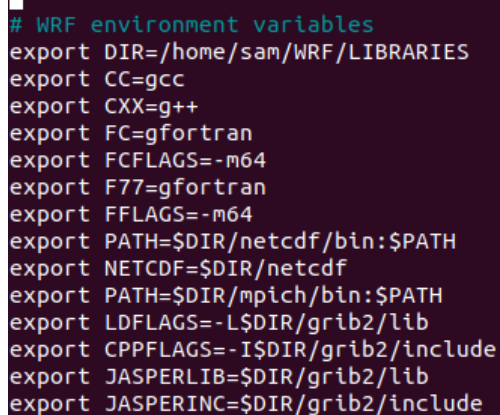
-     Masuk ke folder **WPS**

    cd/home/sam/WRF/WPS

Buka terminal,ketikkanperintahberikutdanjalankan.

    ./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 pilihan dalam bentuk barisan seperti berikut.

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```
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 :

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```
# 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

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BuildingWPS_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**
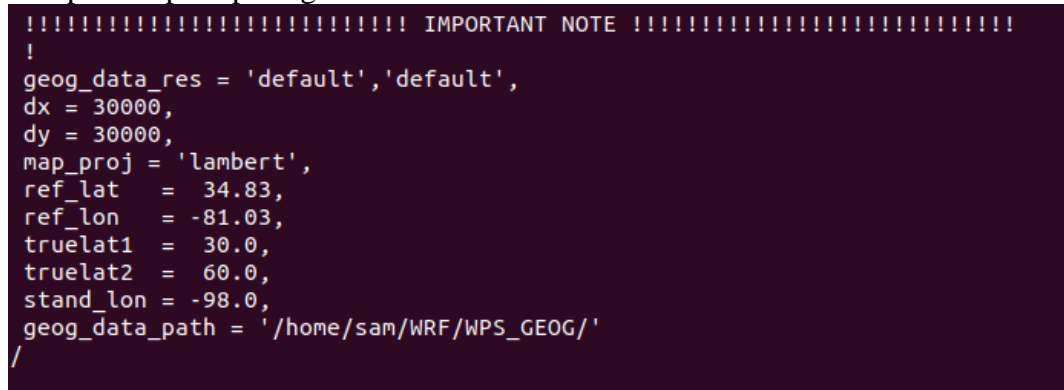
    cd /home/sam/WRF/WPS

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).

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Building Post Processing

- Masuk ke folder **ARWpost**

  cd/home/sam/WRF/ARWpost

Buka terminal,ketikkan perintah berikut dan jalankan.

    ls -las && ./configure

Akan muncul pilihan 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

F77FLGAS = -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
#########################################################
```
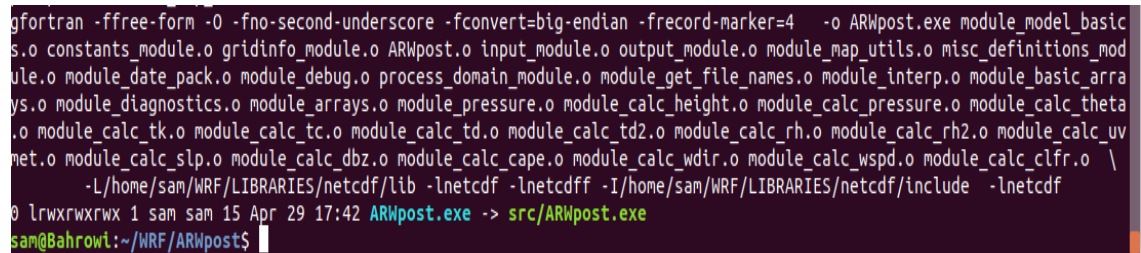
Selanjutnya **keluar** dan **save**(Ctrl+X > Y > Enter).

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Lalu ketikkan dan jalankan perintah berikut.

./compile && ls -ls *.exe

Hasil tampilan harus seperti ini :

```
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

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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
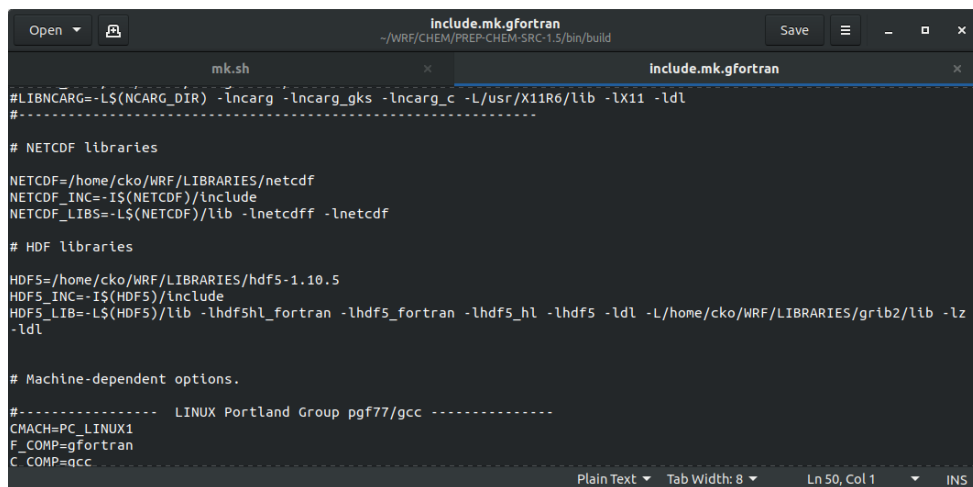
OPT=gfortran.wrf CHEM=RADM_WRF_FIM

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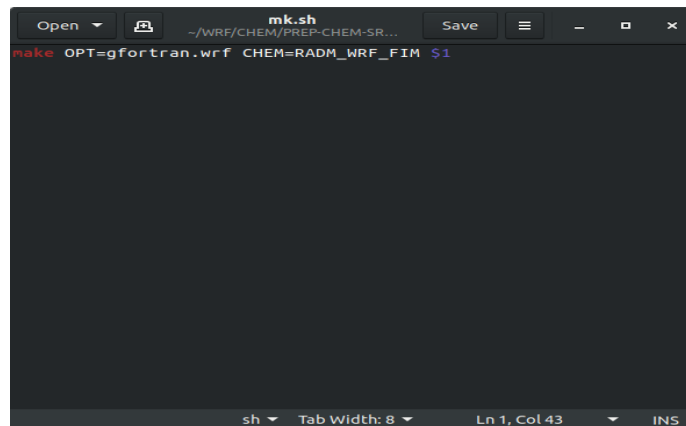
Setelah itu **Save.** edit file **include.mk.gfortran** dan file **include.mk.gfortran.wrf** sesuai gambar (pengeditan sama untuk kedua file)

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Tampilan seperti pada gambar berikut :

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)
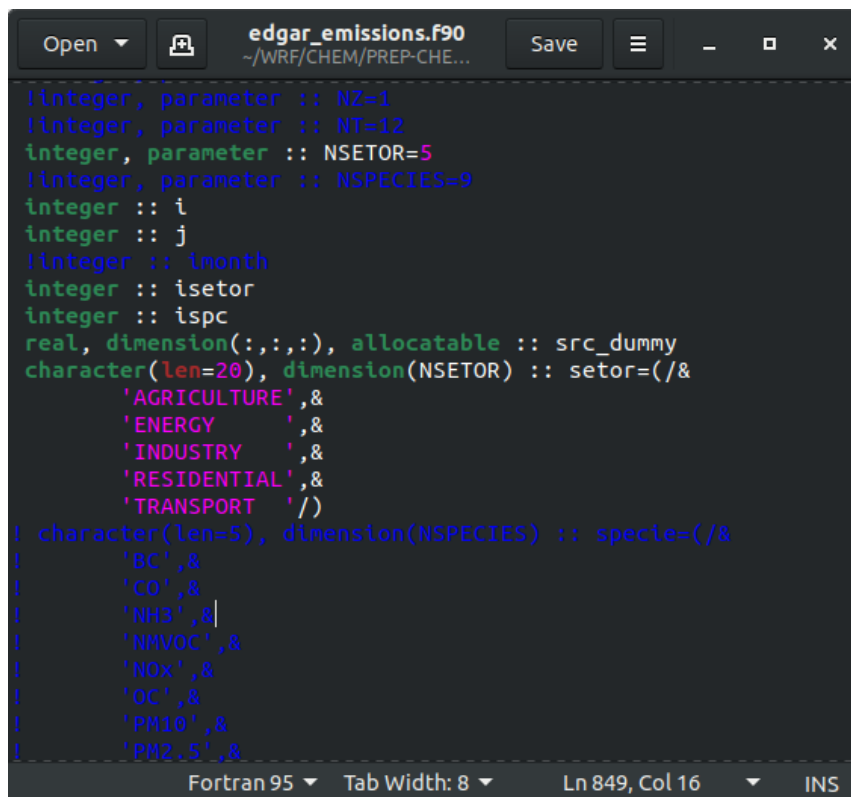
Setelah itu **Save**

- 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)

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Tampilan seperti pada gambar berikut :

- 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**
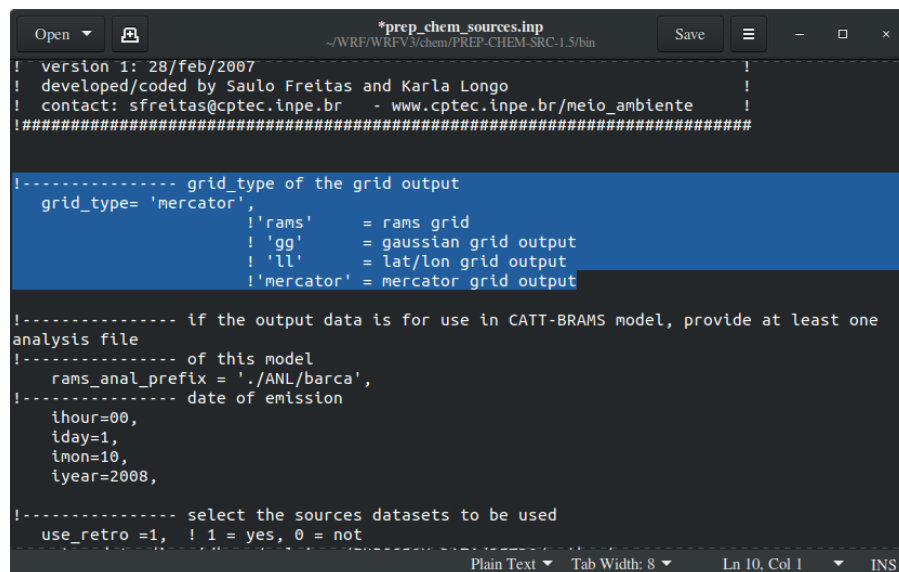
Buka file **prep_chem_sources.inp**

- Ganti setiap direktorinya di dalam file tersebut agar disesuaikan dengan folder **Global_emissions_v3**

- Ganti bagian grid_type menjadi **'mercator'** dan tambahin keterangan

!'mercator' = mercator grid output

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Tampilan seperti pada gambar berikut :

- Ganti bagian **use_bioge = 1** menjadi **use_bioge = 0**

Tampilan seperti pada gambar berikut :

Pada bagian **degassing volcanoes emissions**. Ganti bagian **user_data_dir=** pada bagian South America menjadi **'NONE'**

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Tampilan seperti pada gambar berikut :

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 :
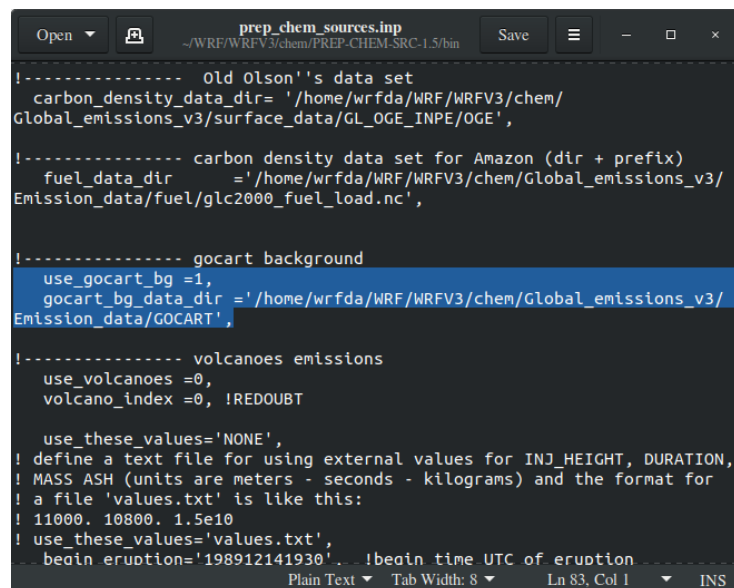
Pada bagian **carbon density data set**. Ganti **fuel_data_dir** = diganti menjadi **'.../Global_emissions_v3/Emission_data/fuel/glc2000_fuel_load.nc'** (meskipun tidak ada, nanti akan tetap terbaca)

Tampilan seperti pada gambar berikut :

Pada bagian **gocart background**. Ganti **use_gocart_bg** = menjadi **1**

Tampilan seperti pada gambar berikut :

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

Tampilan seperti pada gambar berikut :

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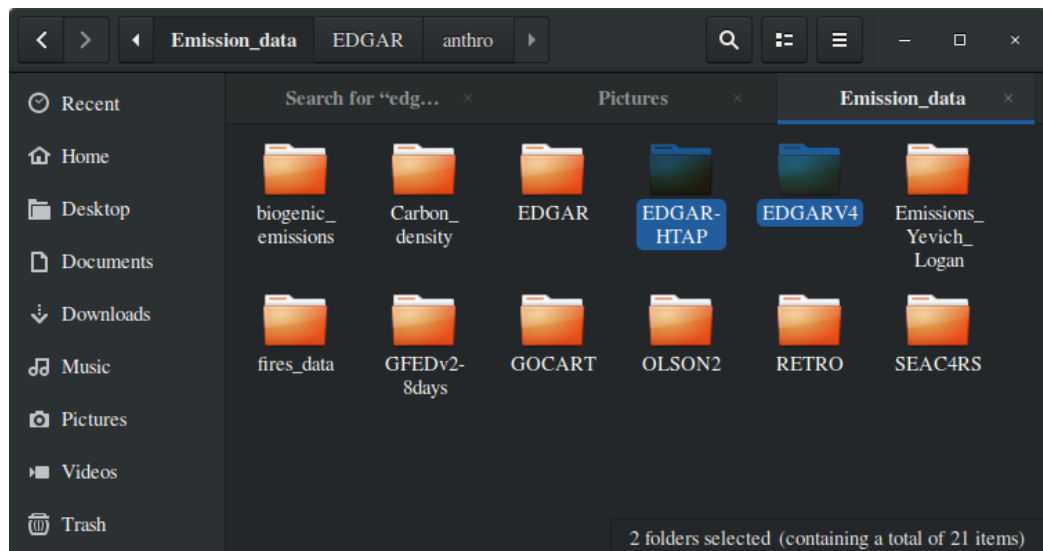
PENGELOLAAN WRF-CHEM

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 scirpt pada bagian terakhir &time_control :

   io_form_auxinput5   **= 2,**

   io_form_auxinput6   **= 2,**

   io_form_auxinput7   **= 2,**

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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,
dmsemis_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,

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aer_op_opt = **1,**

opt_pars_out = **0,**

diagnostic_chem = **0,**

/
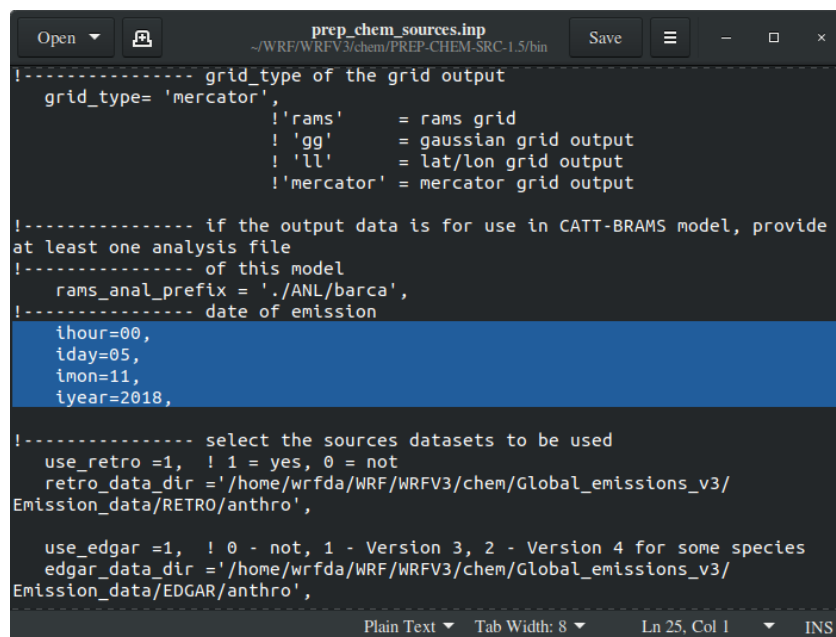
4. Jalankan **./real.exe** pada folder **RUN_CHEM** untuk mendapatkan file **wrfbdy_01** dan file **wrfinput_01**

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**

   b) **Ganti nama_output**

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```
latt = -90.,   -90.,   -90.,
latf = +90.,   +90.,   +90.,
loni = -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
```

c) Ganti domain


```
  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,
```

DELTAX = **dx**

DELTAY = **dy**

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

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

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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 :

<nama_domain>.vfm,	**<nama_domain>.gra**,
<nama_domain>gocartBG.bin,	**<nama_domain>.ctl,**
<nama_domain>volc.bin	**<nama_domain>ab.bin**
<nama_domain>.bb.bin	

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**

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13. Ubah nama fiel **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

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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 :

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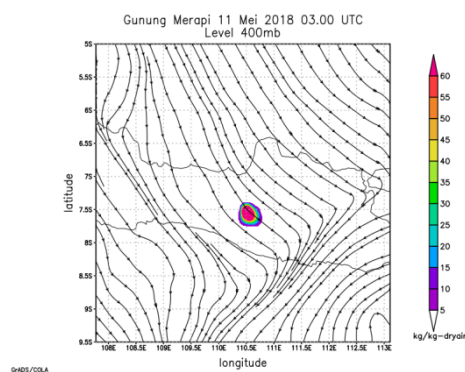
basic package managment

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

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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

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```
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/
```

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```
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
```

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

ARWpost

cd $HOME/WRF/Downloads

wget -c 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/-lnetcdff -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

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

wget -c 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

tar -xvzf geog_high_res_mandatory.tar.gz -C $HOME/WRF

tar -xvzf geog_complete.tar.gz -C $HOME/WRF

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```
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
```

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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.

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