Date: 30-Sep-2023

WRF-IMDAA User Guide

I   When only download the IMDAA data

If you only want to download the IMDAA data, please make a shell script like below and then execute the script. Choose variables from *IMDAA 3-Hourly Pressure Level Dataset* or *IMDAA 1-Hourly Single Level Dataset* as per your requirement. Select the "GRIB" file format. Click the Submit button. After a successful process of submitting a query, you will receive an email with a data download link (wget shell script). Download and run that .sh script, it will download multiple GRIB2 files. A sample bash script extracts and sorts these four variables (UGRD-prl, VGRD-prl, TMP-prl, and TMP-sfc) in six hourly intervals as follows:

Users can modify the variables and intervals as per their relevance:

```bash
#!/bin/bash
yyyy=2020     # year in four-digit
mm=01         # month in two-digit
dd=01         # day in two-digit
date=${yyyy}${mm}${dd}
mkdir finaldata

for param in UGRD-prl VGRD-prl TMP-prl TMP-sfc
do
        for hour in 00 06 12 18
        do rundate=${date}${hour}
                echo "$date of $hour"
                echo $rundate
                wgrib2 *_${param}_* -match_fs "=${rundate}" -match_fs "anl" -grib_out
        finaldata/${param}_${date}_${hour}.grib2
        done
done
```

The upcoming sections describe the process of running WRF using IMDAA. This toolkit only does the WPS part, not the WRF part. After successful completion of this script, the user should go for real.exe and wrf.exe (tc.exe/ndown.exe if required) on their own in a conventional way. After completion, the user will get some useful data information that is required for the namelist.input file (i.e., NUM_LAND_CAT, NUM_METGRID_LEVELS, NUM_SOIL_LAYERS, and NUM_METGRID_SOIL_LEVELS).

II   Download IMDAA Data

1.   log in to https://rds.ncmrwf.gov.in and choose **"IMDAA 1-Hourly Single Level Dataset"**, then select the below variables

       1.1.   10m U-Component of Wind

       1.2.   10m V-Component of Wind

       1.3.   2m Temperature

       1.4.   Surface Temperature (skin)

       1.5.   Mean Sea Level Pressure

       1.6.   Surface Pressure

       1.7.   2m Relative Humidity

       1.8.   Soil Temperature Layer 1 (0-0.1 m below ground)

       1.9.   Soil Temperature Layer 2 (0.1-0.35 m below ground)

       1.10.   Soil Temperature Layer 3 (0.35-1 m below ground)

       1.11.   Soil Temperature Layer 4 (1-3 m below ground)

       1.12.   Soil Moisture Layer 1 (0-0.1 m below ground)

       1.13.   Soil Moisture Layer 2 (0.1-0.35 m below ground)

       1.14.   Soil Moisture Layer 3 (0.35-1 m below ground)

       1.15.   Soil Moisture Layer 4 (1-3 m below ground)

       1.16.   Land Cover (Land Sea Mask)

       1.17   Water equivalent accumulated snow depth

2.   Choose year, month, day, hour. For, example, 2000 (year), January (month), 01 (day), 6 hourly intervals (00, 06, 12, 18). You can opt for 3 hourly intervals, but, all intervals except 0, 6, 12, and 18 are forecast data. Better to opt for 6-hourlies only.

3.   Select "GRIB" file format

4.   Select either the whole region or subset (use lat, lon box to reduce the domain). But make sure your simulation domain lies within the IMDAA domain.

5.   Click the Submit button. After a successful process of submitting a query, you will receive an email with a data download link (wget shell script). Download and run that .sh script, it will download multiple GRIB2 files. (Make a new folder and keep the .sh script inside that folder, then execute the script).

6. Now again choose **"IMDAA 3-Hourly Pressure Level Dataset"**, then select the below variables

      6.1. U-Component of Wind

      6.2. V-Component of Wind

      6.3. Temperature

      6.4. Geopotential Height

      6.5. Relative Humidity

      6.6. Vertical Velocity

7. Select "all pressure levels".

8. Select the same year, month, day, hour, and intervals (**same as in steps 2, 3, and 4**).

9. Click the Submit button. After a successful process of submitting a query, you will receive an email with a data download link (wget shell script). Download and run that .sh script, it will download multiple GRIB2 files. Make sure to keep the .sh script inside the previously created folder (where surface fields GRIB2 files are downloaded), then execute the script.

10. If you are using the WRF_IMDAA git repository, please keep all downloaded files (both single-level datasets and pressure-level datasets) in a single folder, this is required while running the script.

11. To run the WRF model using IMDAA data as the initial and lateral boundary conditions, use the instructions given in the following GitHub link: https://github.com/NCMRWF/WRF_IMDAAv2

    Note: You may also choose other variables if you have a proper Vtable and METGRID table entry.

III   Prepare the WRF-IMDAA preprocessing toolkit

1. Clone the package from the GitHub repository using the command.

    Git clone https://github.com/NCMRWF/WRF_IMDAAv2

2. Fill all the required details in **user_input.sh** file. Do not make any changes in **runscript_ncmrwf.sh**. One sample user_input.sh is kept for reference.

3. If you are downloading this repository (not cloning), please download all the files including the "**tables**" directory, and keep it as it is.

4. Make **runscript_ncmrwf.sh** executable by typing:

   chmod +x runscript_ncmrwf.sh

5. Make sure, you have these essential libraries in your system:
   NETCDF4, MPI (if opting for parallel), ECCODES, WGRIB2, and NCKS

6. Run the main shell script **runscript_ncmrwf.sh** in the current folder:
   ./runscript_ncmrwf.sh
   or
   bash runscript_ncmrwf.sh

7. Follow the instructions in the script, if an error occurs during running.

   This page will be updated in the future if required.