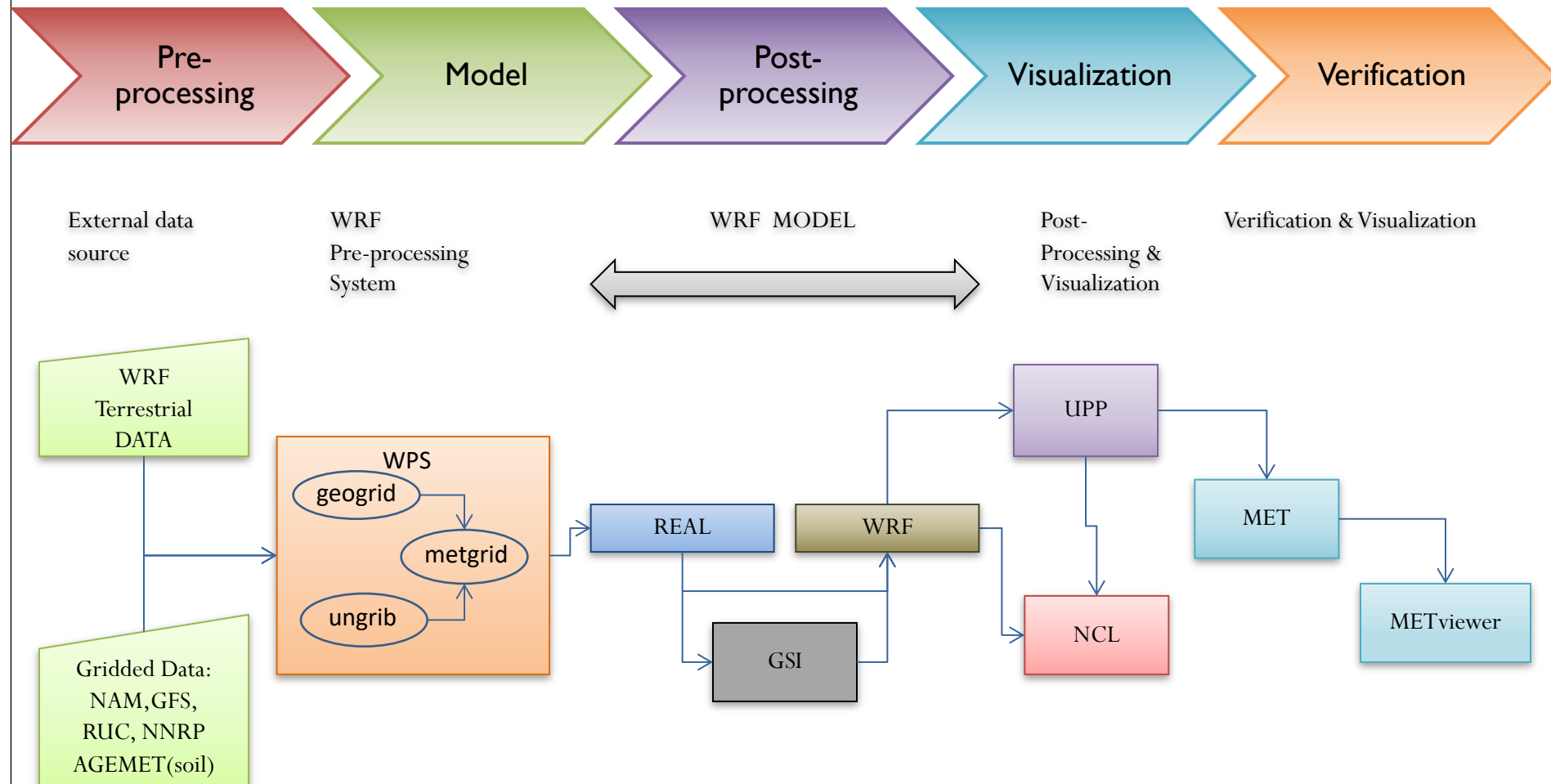


Hands-on Exercise: Running the NWP system

Pre-processing through visualization

Numerical Weather Prediction workflow

<https://dtcenter.org/tutorial-version-3/introduction>



Some environment variables

<https://dtcenter.org/tutorial-version-3/hurricane-sandy-case-27-oct-2012/set-environment>

- Our AWS environment uses the bash shell

```
cd /home/ec2-user
export PROJ_DIR=`pwd`
export CASE_DIR=${PROJ_DIR}/sandy
mkdir -p ${CASE_DIR}
cd ${CASE_DIR}
mkdir -p wpsprd wrfprd gsiprd postprd nclprd metprd metviewer/mysql
```

We also recommend logging on in a second window and running the first three commands again; this will allow us to follow along with log files while executables are running

Breaking down docker commands

- A breakdown of our docker commands:

```
docker run --rm -it -e LOCAL_USER_ID=`id -u $USER` --volumes-from wps_geog --volumes-from sandy \  
-v ${PROJ_DIR}/container-dtc-nwp/components/scripts/common:/home/scripts/common \  
-v ${PROJ_DIR}/container-dtc-nwp/components/scripts/sandy_20121027:/home/scripts/case \  
-v ${CASE_DIR}/wpsprd:/home/wpsprd \  
--name run-sandy-wps dtc-wps_wrf /home/scripts/common/run_wps.ksh
```

docker run	Runs a docker container
--rm	Removes the container when you exit
-it	Runs container in interactive mode
-e LOCAL_USER_ID=`id -u \$USER`	-e sets an environment variable; we are passing the variable “LOCAL_USER_ID” to do some trickery that sets correct permissions in our containers
--volumes-from NAME	Mounts directories from the data container “NAME”

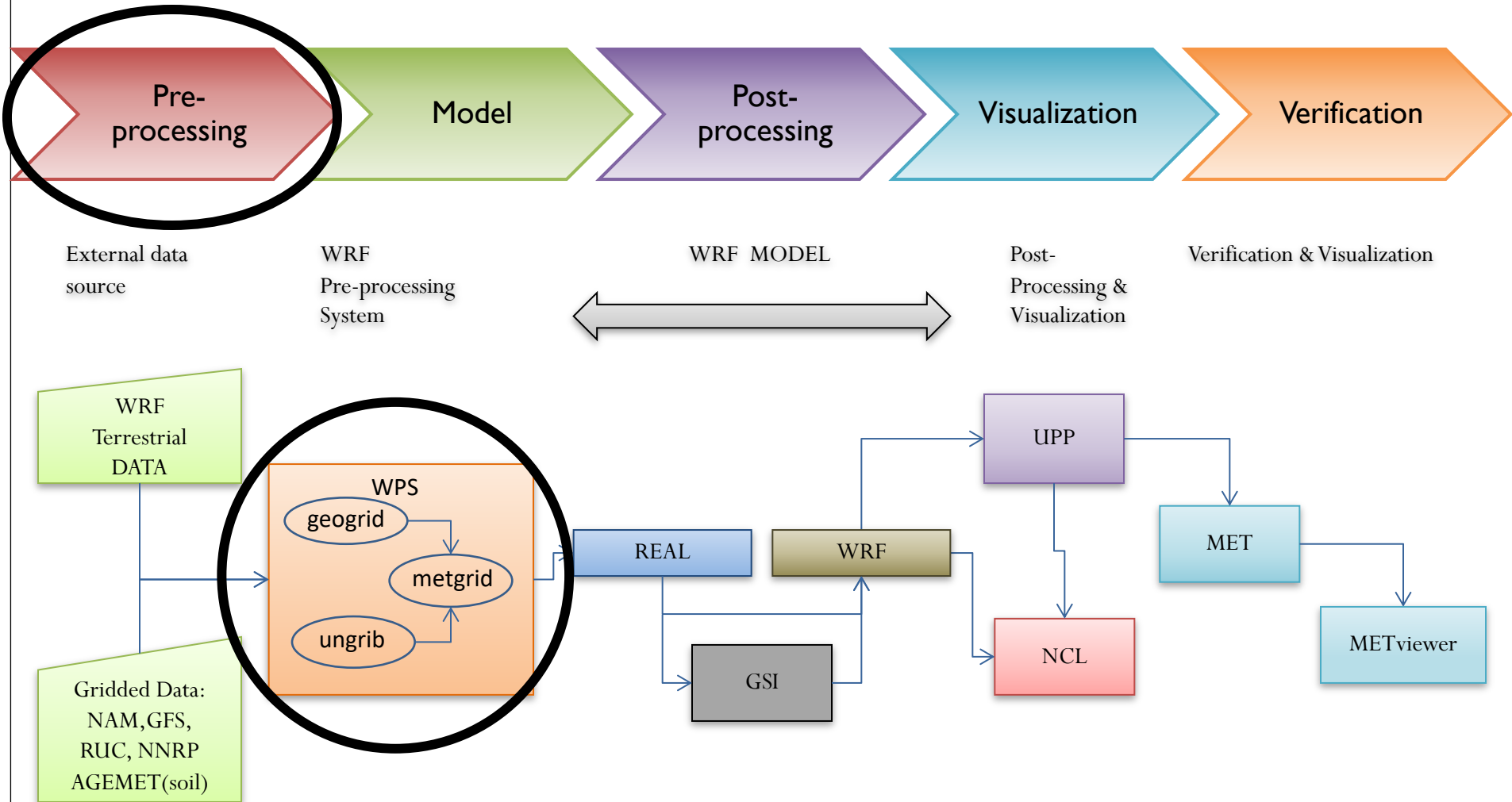
Breaking down docker commands

- A breakdown of our docker commands:

```
docker run --rm -it -e LOCAL_USER_ID=`id -u $USER` --volumes-from wps_geog --volumes-from sandy \  
-v ${PROJ_DIR}/container-dtc-nwp/components/scripts/common:/home/scripts/common \  
-v ${PROJ_DIR}/container-dtc-nwp/components/scripts/sandy_20121027:/home/scripts/case \  
-v ${CASE_DIR}/wpsprd:/home/wpsprd \  
--name run-sandy-wps dtc-wps_wrf /home/scripts/common/run_wps.ksh
```

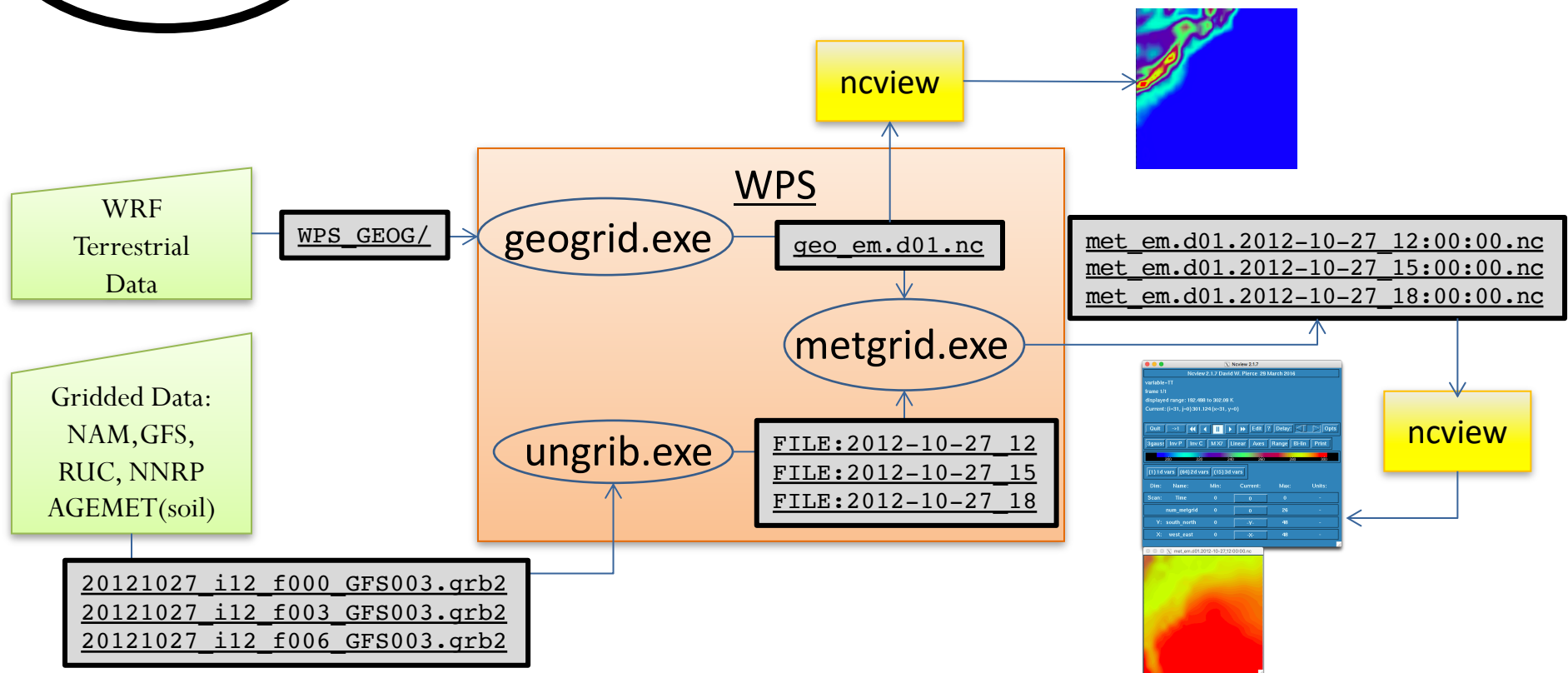
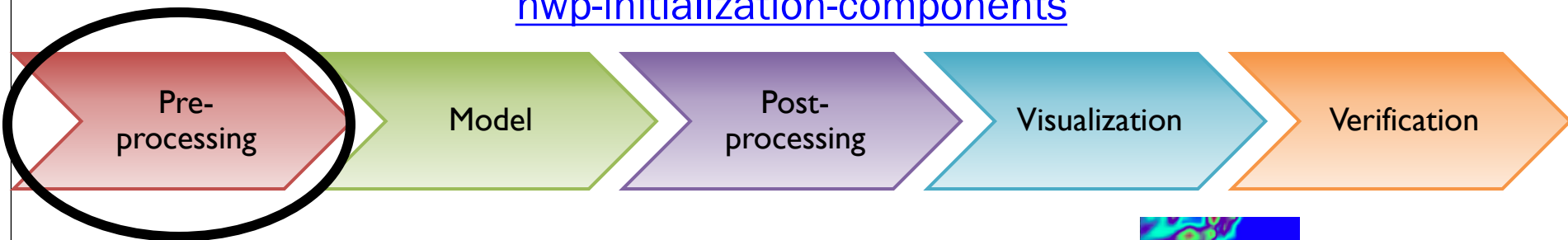
-v DIR1:DIR2	Mounts DIR1, a directory on the home system (outside of container-land), into DIR2, a directory inside the container. Files created in DIR2 inside the container will persist outside of it in DIR1
--name run-sandy-wps	Name this new container “run-sandy-wps”
dtc-wps_wrf	The name of the image we are using to create the container
/home/scripts/common/run_wps.ksh	A script that will execute inside the container; it will run WPS

WRF Preprocessing System (WPS)

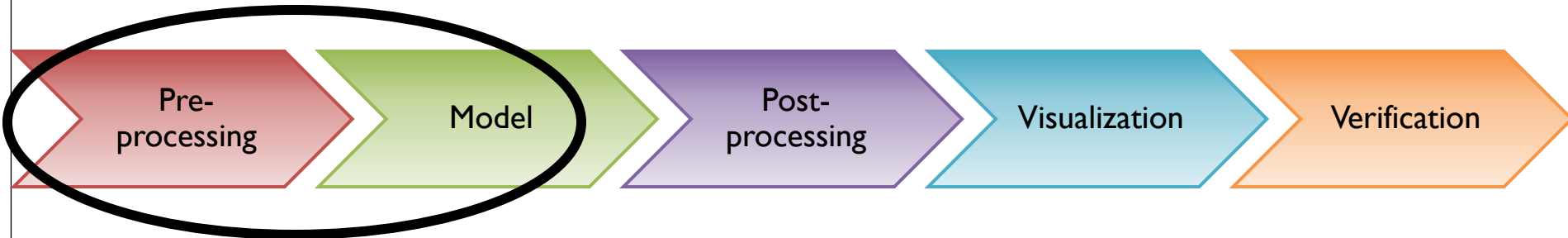


WRF Preprocessing System (WPS)

<https://dtcenter.org/tutorial-version-3/hurricane-sandy-case-27-oct-2012/run-nwp-initialization-components>



real.exe



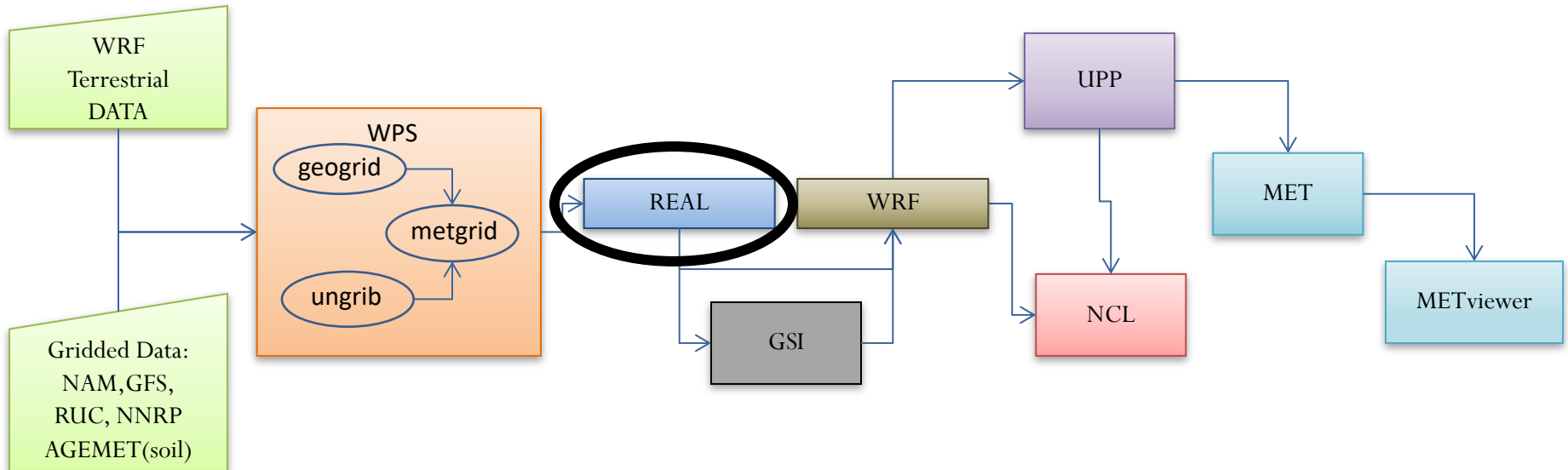
External data source

WRF Pre-processing System

WRF MODEL

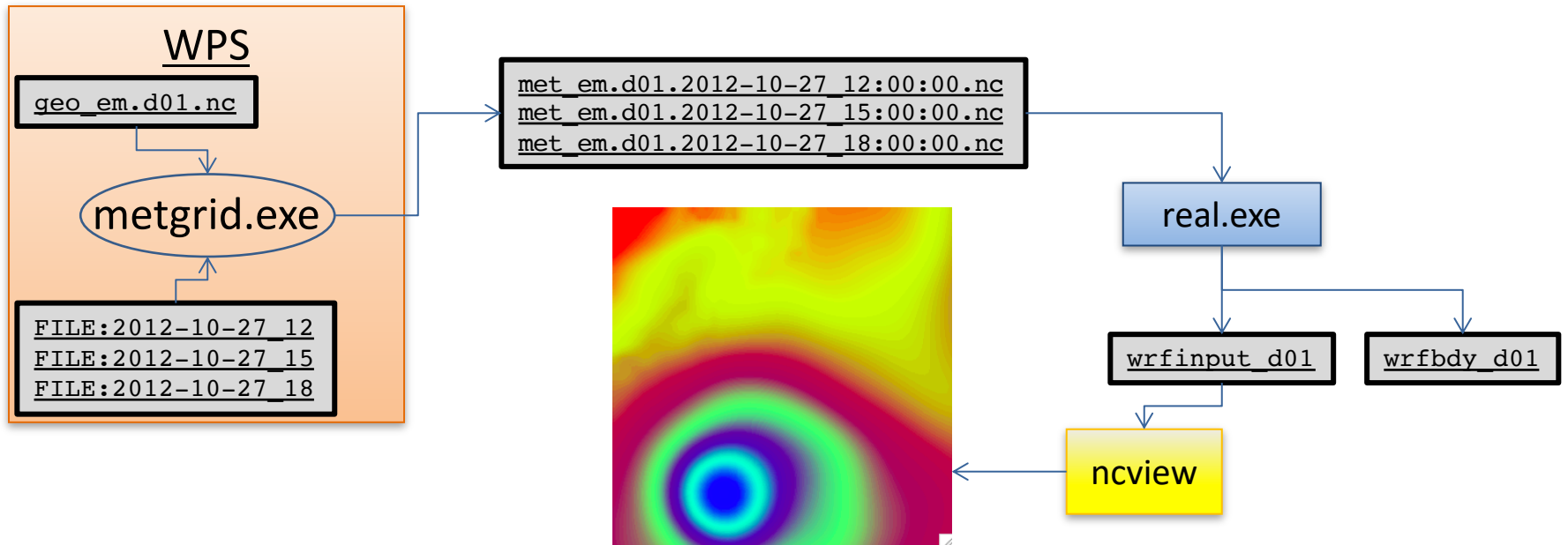
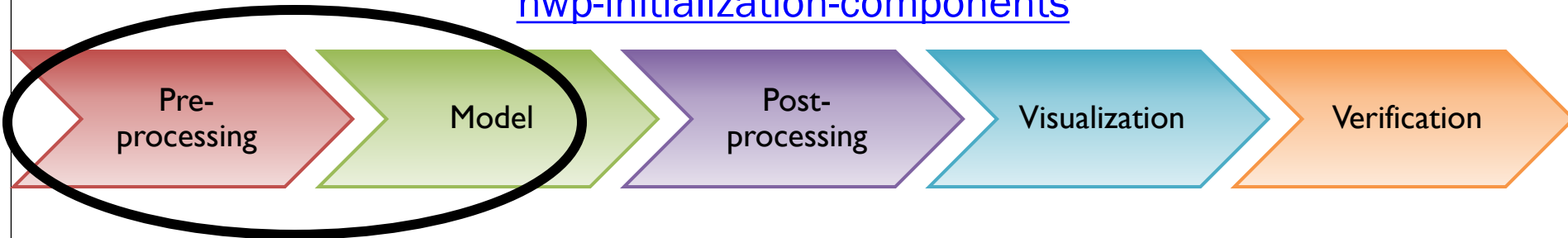
Post-Processing & Visualization

Verification & Visualization

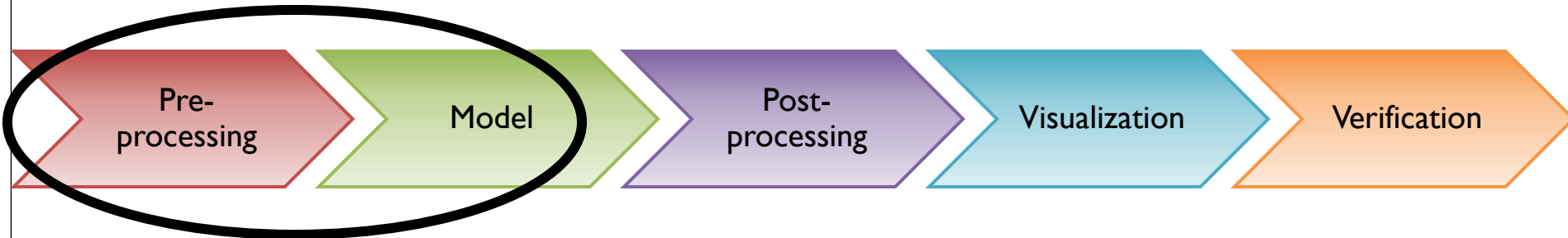


real.exe

<https://dtcenter.org/tutorial-version-3/hurricane-sandy-case-27-oct-2012/run-nwp-initialization-components>



GSI data assimilation



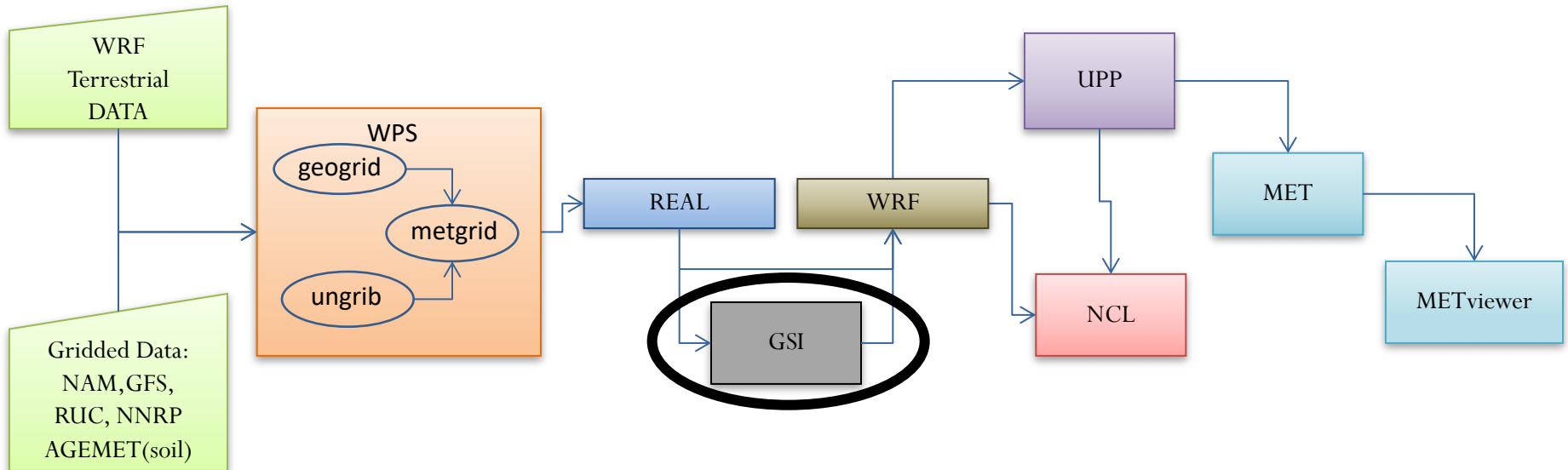
External data source

WRF Pre-processing System

WRF MODEL

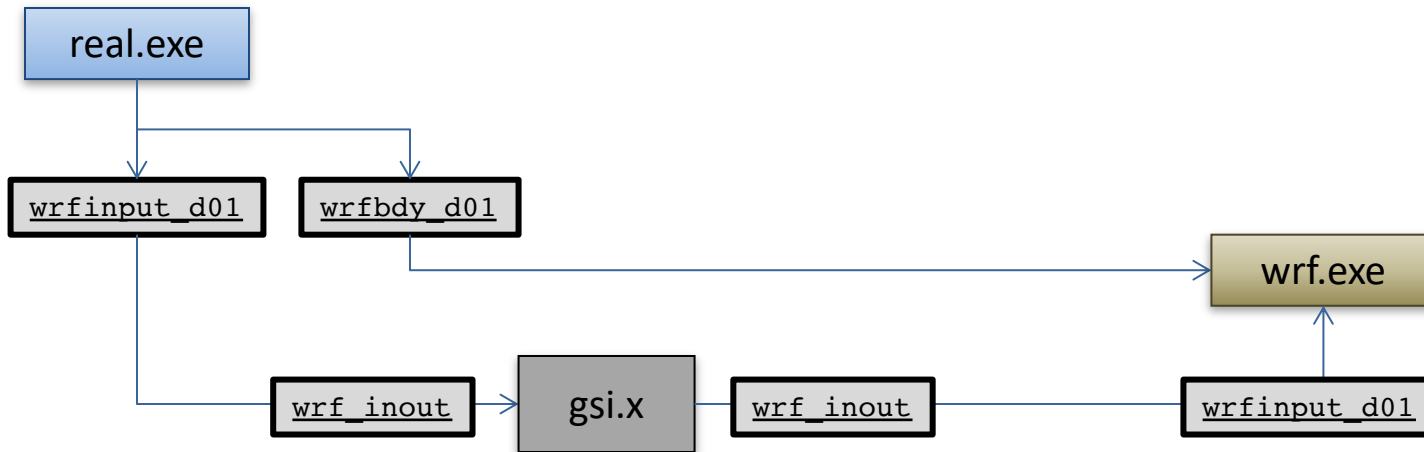
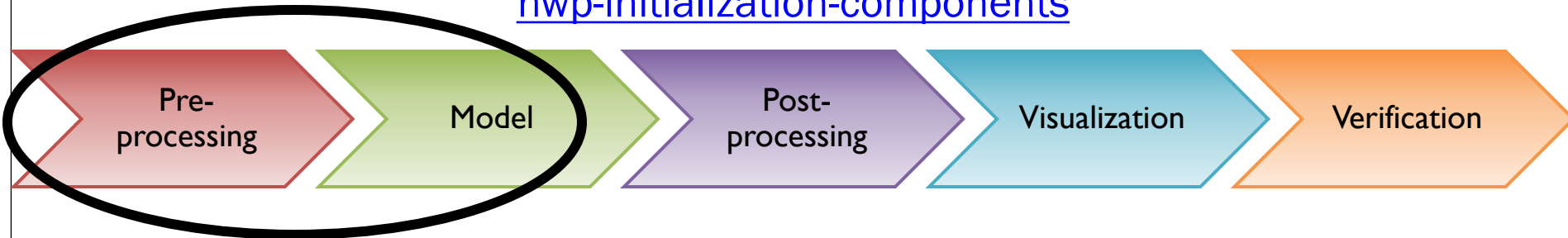
Post-Processing & Visualization

Verification & Visualization

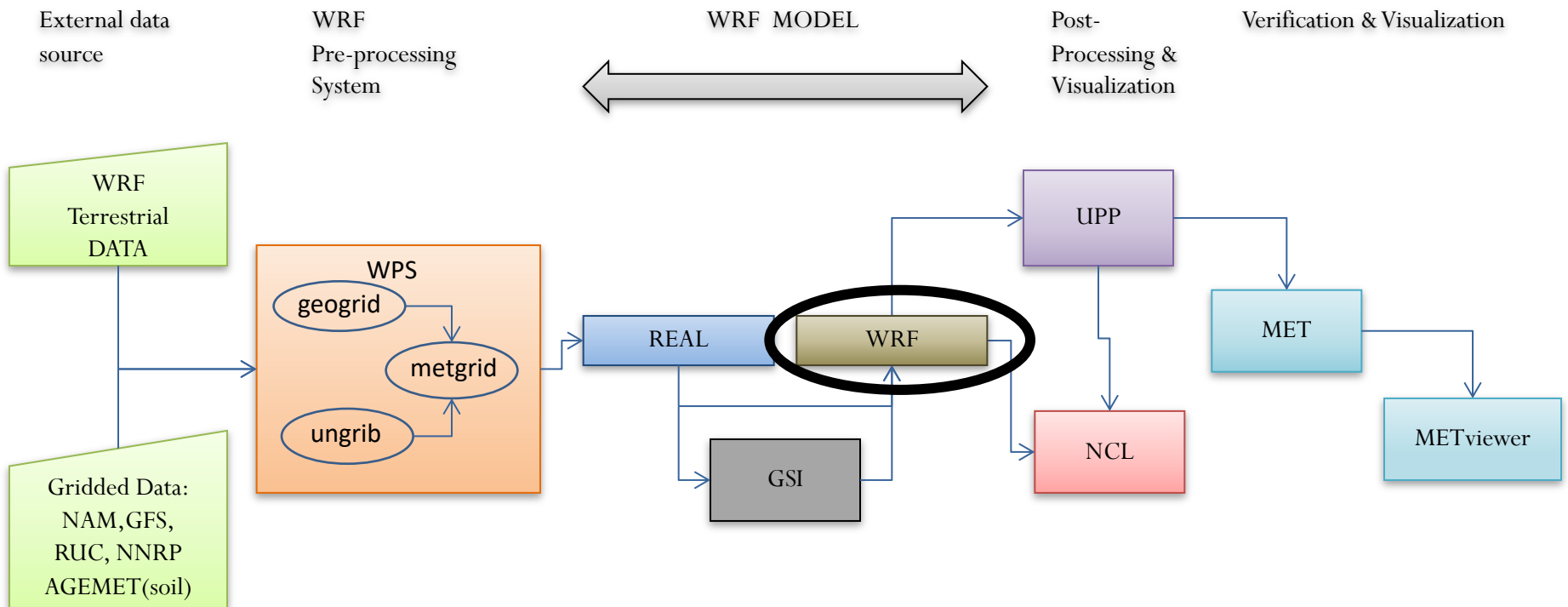
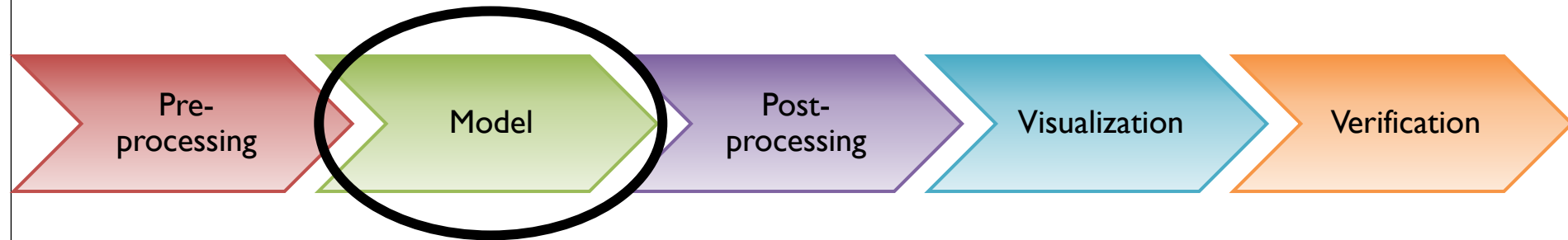


GSI data assimilation

<https://dtcenter.org/tutorial-version-3/hurricane-sandy-case-27-oct-2012/run-nwp-initialization-components>

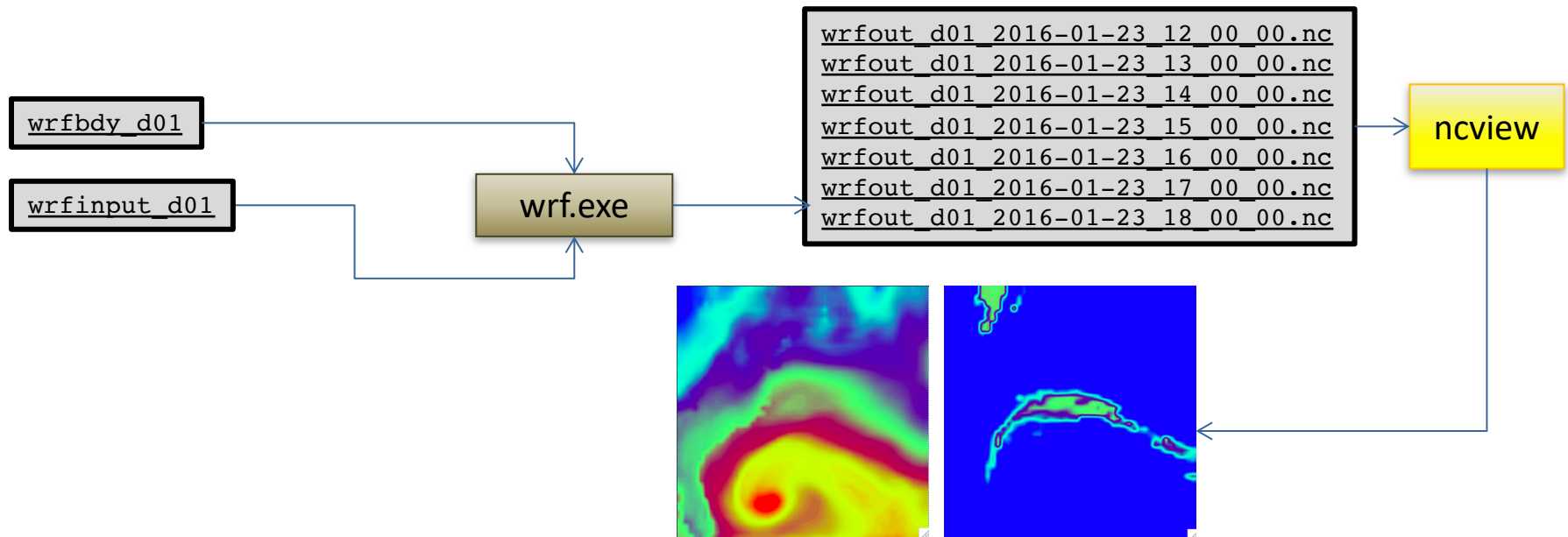


WRF Model

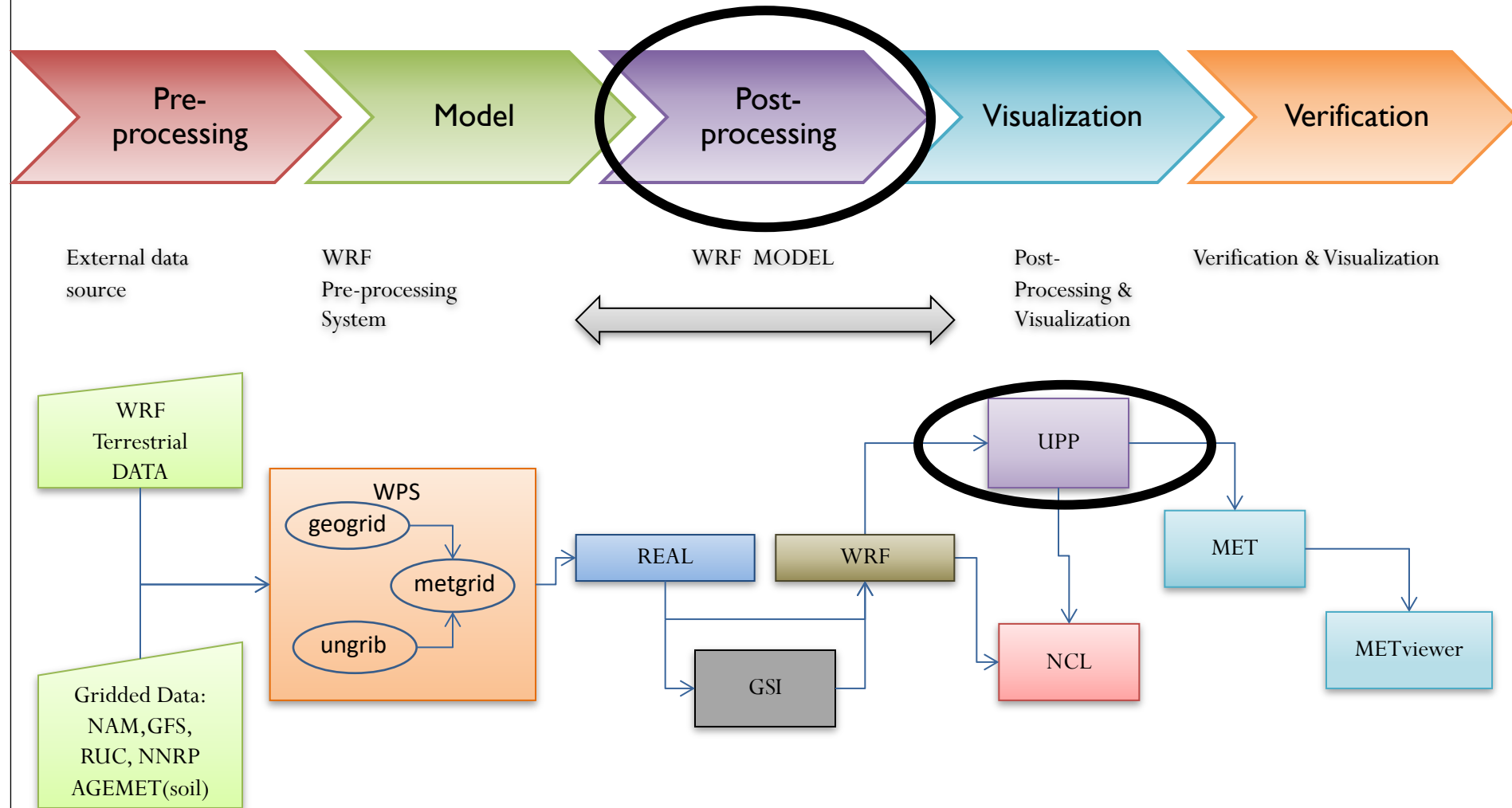


WRF Model

https://dtcenter.org/tutorial-version-3/hurricane-sandy-case-27-oct-2012/run_nwp-initialization-components

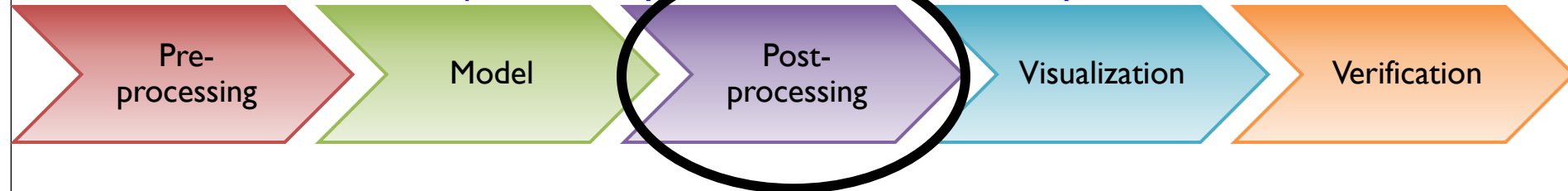


Unified Post-Processor (UPP)



Unified Post-Processor (UPP)

<https://dtcenter.org/tutorial-version-3/hurricane-sandy-case-27-oct-2012/run-nwp-initialization-components>

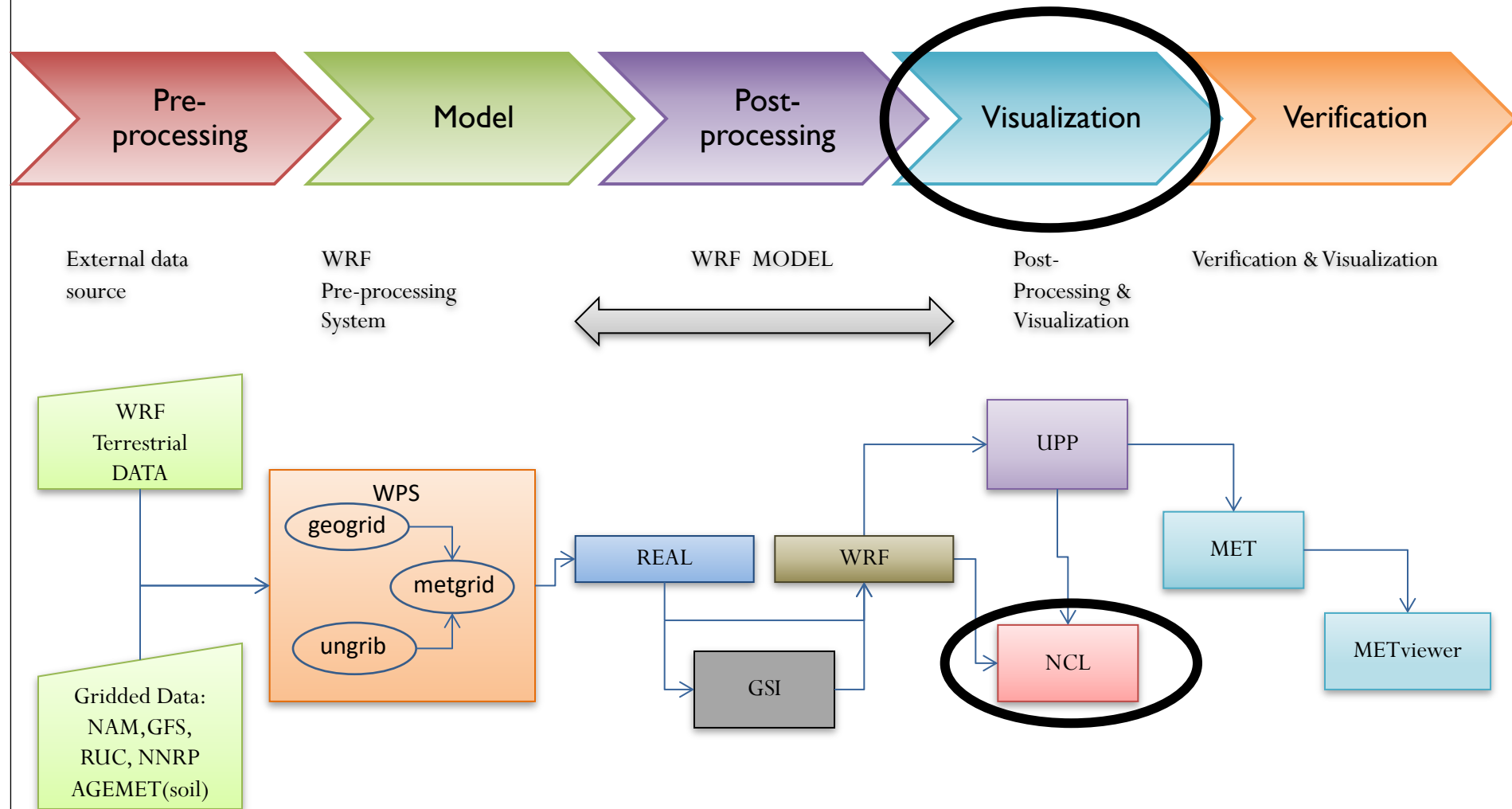


```
wrfout_d01_2016-01-23_12_00_00.nc  
wrfout_d01_2016-01-23_13_00_00.nc  
wrfout_d01_2016-01-23_14_00_00.nc  
wrfout_d01_2016-01-23_15_00_00.nc  
wrfout_d01_2016-01-23_16_00_00.nc  
wrfout_d01_2016-01-23_17_00_00.nc  
wrfout_d01_2016-01-23_18_00_00.nc
```

unipost.exe

```
wrfprs_d01.12  
wrfprs_d01.13  
wrfprs_d01.14  
wrfprs_d01.15  
wrfprs_d01.16  
wrfprs_d01.17  
wrfprs_d01.18
```

NCL Graphics



NCL Graphics

<https://dtcenter.org/tutorial-version-3/hurricane-sandy-case-27-oct-2012/run-nwp-initialization-components>

Pre-processing

Model

Post-processing

Visualization

Verification

```
wrfout_d01_2016-01-23_12_00_00.nc  
wrfout_d01_2016-01-23_13_00_00.nc  
wrfout_d01_2016-01-23_14_00_00.nc  
wrfout_d01_2016-01-23_15_00_00.nc  
wrfout_d01_2016-01-23_16_00_00.nc  
wrfout_d01_2016-01-23_17_00_00.nc  
wrfout_d01_2016-01-23_18_00_00.nc
```

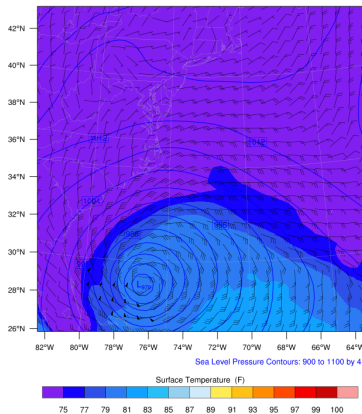
ncl

```
DBZ1_d01.gif  
Precip_total_d01.gif  
Surface_multi_d01.gif  
plt_Precip_multi_total_d01.000001.png  
plt_Precip_multi_total_d01.000002.png  
...  
wps_show_dom.png
```

REAL-TIME WRF

Init: 2012-10-27_12:00:00
Valid: 2012-10-27_12:00:00

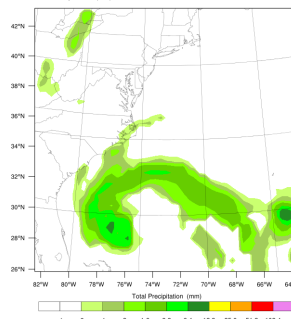
Surface Temperature (F)
Sea Level Pressure (hPa)
Wind (kts)



REAL-TIME WRF

Init: 2012-10-27_12:00:00
Valid: 2012-10-27_13:00:00

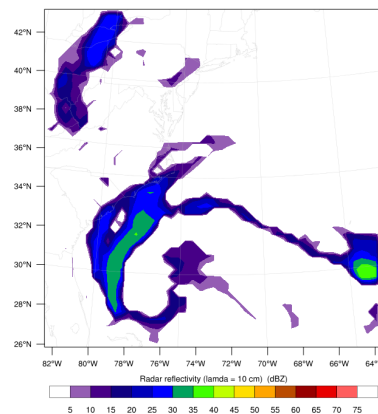
Total Precipitation (mm)



REAL-TIME WRF

Init: 2012-10-27_12:00:00
Valid: 2012-10-27_13:00:00

Radar reflectivity (lambda = 10 cm) (dBZ)



display

OUTPUT FROM WRF V4.1.1 MODEL
WE = 50 SN = 50 Levels = 60 Ds = 40m Phys Opt = 4 PBL Opt = 1 Cu Opt = 1