WRF-ARW data conversion

The conversion program "arw2arl" was developed to convert WRF model output in NetCDF format to the HYSPLIT compatible format (or so called ARL format).

For PC users, the source code is available in the \hysplit4\data2arl\arw2arl directory. To run the converter on a PC, go to the GUI and select *Meteorology / Convert to ARL / WRF-ARW* menu tab, and then locate the WRF-ARW files. This will execute the converter "arw2arl" to generate an ARL formatted file for use by HYSPLIT.

For UNIX users, the source code of the converter locates in ~/trunk/data2arl/arw2arl directory and the executable is in ~/trunk/exec directory. The NetCDF library is required to compile and run the converter on a UNIX machine. The correct NetCDF path should be set in the Makefile in the arw2arl directory.

> [exec directory]/arw2arl -i[WRF file path/WRF filename] -o[ARL formatted filename] -c1[or 2 or 3]

The "-c" flag refers to creating different WRF variable namelist files (WRFDATA.CFG): -c1 (default) is the instantaneous wind configuration file, -c2 is the averaged wind flux configuration file, and -c3 is the TKE configuration file. The WRFDATA.CFG file can be manually edited to include other variables (such as TKE or time-averaged wind fields) to the ARL formatted output.

An example of WRFDATA.CFG:
```
&SETUP
 num3dv = 9,
 arw3dv = 'P','T','U','V','W','X','QVAPOR','TKE_PBL','X',
 cnv3dv =  0.01, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0,
 arl3dv = 'PRES','TEMP','UWND','VWND','WWND','DIFW','SPHU','TKEN','DIFT',
 num2dv = 12,
 arw2dv = 'HGT','PSFC','RAIN','X','PBLH','UST','SWDOWN','HFX','LH','T2','U10','V10',
 cnv2dv = 1.0, 0.01, 0.001, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0,
 arl2dv = 'SHGT','PRSS','TPP1','DIFR','PBLH','USTR ','DSWF','SHTF','LHTF','T02M','U10M','V10M',
/
```

If the input file contains data for a single time period, users can use the UNIX command "cat" to merge multiple ARL formatted files generated from each execution.

> cat [ARLDATA_01.BIN ARLDATA_02.BIN ARLDATA_03.BIN …] >> ARLDATA_out.BIN

List of WRF-ARW variables converted to the use of HYSPLIT.

Variable in WRF-ARW	Variable in HYSPLIT	Note
P (i.e P+PB)	PRES	Total pressure
T (i.e T+300.0)	TEMP	Converting potential temperature (WRF) to ambient temperature
U (or AVGFLX_RUM)	UWND	U component of wind (or time-averaged mass coupled u-wind)
V (or AVGFLX_RVM)	VWND	V component of wind (or time-averaged mass coupled v-wind)
W (or AVGFLX_WWM)	WWND	Converting vertical velocity (m/s) to omega (hPa/s) (or time-averaged mass coupled eta-dot, unit Pa/s, no conversion)
X	DIFW	Writing difference field for greater precision for vertical velocities
QVAPOR	SPHU	Water vapor mixing ratio
TKE_PBL	TKEN	Turbulent Kinetic Energy (TKE) from PBL schemes
X	DIFT	Writing difference field for greater precision for TKE
HGT	SHGT	Terrain elevation
PSFC	PRSS	Surface pressure
RAIN (i.e RAINC+RAINNC)	TPP1	Total precipitation
X	DIFR	Writing difference field for greater precision for precipitation
PBLH	PBLH	Boundary layer height
UST	USTR	Friction velocity
SWDOWN	DSWF	Downward shortwave flux
HFX	SHTF	Sensible heat flux
LH	LHTF	Latent heat flux
T2	T02M	Temperature at 2 m
U10	U10M	U component of wind at 10 m
V10	V10M	V component of wind at 10 m

NOTE: 'X' is not a variable in WRF but a placeholder used in the WRFDATA.CFG to process the difference field for greater precision.