Output format

MIX Model Output

MIX stores its data in HDF-4 files using the HDF Scientific Data Set. Note: These files are formatted completely different from HDF5. The data model is considerably different.

What is stored?

The MIX HDF file has a 13 global attributes:

- dipole tilt
- MHD time step
- UT (Year, Month, Day, Hour, Min, Sec)
- Parameters of the conductivity model described in .param file.

There are 16 HDF datasets which are float 2D arrays.

Data sets & units

All arrays are stored in the following order: co-latitudinal direction (polar angle direction) is from left to right (i.e. the first column is the pole, the last column is the lower-latitude boundary), longitudinal direction is from top to bottom, the first and the last lines (they should have the same values) being the periodic boundary at noon.

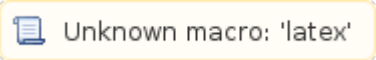| HDF Scientific Data Set	Units
Grid X	R_i (6.5e8 cm)
Grid Y	R_i (6.5e8 cm)
Potential North	V
Potential South	V
FAC North	A/m*m
FAC South	A/m*m
Pedersen conductance North	S
Pedersen conductance South	S
Hall conductance North	S
Hall conductance South	S
Average energy North	keV
Average energy South	keV
Number flux North	1/cm*cm s
Number flux South	1/cm*cm s
Neutral wind speed North	m/s
Neutral wind speed south	m/s

Notes:

- The field-aligned currents are stored as the true field-aligned currents (j dot b), so no extra conventions have to be used. For instance, downward current in the northern hemisphere is positive.
  MIX Grid

The cartesian MIX grid is is stored in `Grid x` and `Grid Y` in SM coordinates on the unit sphere (ie. units of of ionosphere radius `RION=6.5e8 cm`). The z-

coordinate is not stored because it's redundant: ⊟ Unknown macro: 'latex' . When converting between cartesian (x,y) to cylindrical (r, theta) or lat/lon coordinates, we use:

```
r=sqrt(x^2+y^2)
theta = arctan2(y,x)
where( theta < 0 ){
   theta = theta + 2*pi
}
```

Note that the MIX grid is periodic in longitudes: `theta[n+1] = theta[1]`

There is one key distinction between the grid for the Northern & Southern hemispheres: The MIX spherical system for the southern hemisphere as the SM coordinate system rotated by pi about the x-axis, so that the Z axis points toward the southern pole and the y-axis flips its direction. This is important for the conversion of the MIX coordinates into SM coordinates.

How do I read data?

Several tools are available to read HDF4 MIX model output. One option is the "ReadOvertureIon" module in CISM_DX. Read below for more advanced methods of reading data.

C/C++

See the "IO" class the repository at `MIX/src/IO.C`

Matlab

See the Post-processing with Matlab page for details.

NetCDF conversion

The NCAR Command Language (NCL) includes a utility to convert from HDF4 to NetCDF: `ncl_convert2nc`. See the NCL documentation for more information.

Python

See the Post-processing with Python page for details.