STEP 1

Convert vol/ele/azi files to netcdf

- RUN *convert-raine-x-band-time-series.sh*
    - CALLS *convert-raine-x-band-day.sh* foreach day
        - CALLS *convert-raine-x-band-hour.sh* for 6 hours of data
            - CALLS *get-raine-input-files.sh*

raine_defaults.cfg sets the chunk size which is currently 6 hours.

RadxConvert uses the parameters file:
/home/users/lbennett/lrose/ingest_params/raine/RadxConvert.raine.uncalib

Example output:

[INFO] Running for: 2019123123
[INFO] Running: sbatch -p short-serial -t 03:00:00 -o
/gws/smf/j04/ncas_radar/lbennett/lotus-output//raine/2020/07/23/2019123118.out -e
/gws/smf/j04/ncas_radar/lbennett/lotus-output//raine/2020/07/23/2019123118.err --wrap="time
/home/users/lbennett/proc_test/convert-rai
ne-x-band-hour-scratch.sh -t vol 2019123118 2019123119 2019123120 2019123121 2019123122
2019123123"

INPUT: */gws/nopw/j04/ncas_obs/amf/raw_data/ncas-mobile-x-band-radar-1/data/raine/*

OUTPUT: */gws/nopw/j04/ncas_radar_vol2/data/xband/raine/cfradial/uncalib_v1/*

STEP 2

Process the uncalibrated cfradials to calculate offsets for ZDR (same methodology as that written up in raine directory, see pdf there)

- Run *process_raine_vert_scans.sh*
    - CALLS *process_raine_vert_scans.py*

INPUT: */gws/nopw/j04/ncas_radar_vol2/data/xband/raine/cfradial/uncalib_v1/vert/*
OUTPUT: */gws/nopw/j04/ncas_radar_vol2/data/xband/raine/calibrations/ZDRcalib/*

- Run *process_raine_hourly_zdr.sh*
    - CALLS *process_raine_hourly_zdr.py*

INPUT: */gws/nopw/j04/ncas_radar_vol2/data/xband/raine/calibrations/ZDRcalib/*/day_ml_zdr.csv*
OUTPUT: */gws/nopw/j04/ncas_radar_vol2/data/xband/raine/calibrations/ZDRcalib/*/hourly_ml_zdr.csv*

Use notebook *plot_raine_zdr_full_series.ipynb* to plot the results and calculate biases

STEP 3

Process the uncalibrated cfradials to calculate offsets for Z

- Run *process_raine_dbz.sh*
    - CALLS *process_raine_dbz.py*
        - CALLS *calibrate_day_att* in *calib_functions.py*

INPUT: */gws/nopw/j04/ncas_radar_vol2/data/xband/raine/cfradial/uncalib_v1/sur/*

OUTPUT:
/gws/nopw/j04/ncas_radar_vol2/data/xband/raine/calibrations/Zcalib/phi_files/010620_att/
/gws/nopw/j04/ncas_radar_vol2/data/xband/raine/calibrations/Zcalib/phase/

Use notebook *plot_raine_zcalib.ipynb* to plot whole time series and estimate a bias for the project.
Use *plot_initial_phase.ipynb* to examine changes in initial differential phase

See PDFs for ZDR and Z Calibration methods and results
raine_zdr_calibration_method.pdf
raine_Z_calibration_method.pdf

STEP 4

Apply the calibration offsets to the data

- Run *python calibrate_raine_by_date.py*
  - CALLS *calibrate_raine.sh*
    - CALLS *calibrate_raine_chunk.sh*

Example usage:

```
python calibrate_raine_by_date.py start_time end_time scan_type params_index
python calibrate_raine_by_date.py 20181025000000 20181113235959 sur 1
```

Where the date strings correspond to the start and end days/times, sur is the scan_type and the params_index refers to which parameters file to use:
/home/users/lbennett/lrose/ingest_params/raine/RadxConvert.raine.calib.0X

The python script finds all the data files for the specified time period and then breaks them into equal "chunks". For example, for vol files which are the largest files (~40-70MB), we split into 6-hourly chunks, which equates to approximately 60 files for each chunk. Each chunk of files is submitted to SLURM for processing.

INPUT: */gws/nopw/j04/ncas_radar_vol2/data/xband/raine/cfradial/uncalib_v1/*
OUTPUT: First written to scratch */work/scratch-nopw/lbennett/raine/calib_v1/*
and then immediately copied to the GWS
/gws/nopw/j04/ncas_radar_vol2/data/xband/raine/cfradial/calib_v1/

Log files are written to:
/gws/smf/j04/ncas_radar/lbennett/logs/
Lotus output files are written to:
/gws/smf/j04/ncas_radar/lbennett/lotus-output/