

4.3 NCO Utilities

[The NCO \(NetCDF Operators\)](#) provide command-line and scriptable programs for common generic operations on netCDF files.

As an example of third-party software built on top of Unidata's netCDF libraries, the NCO package from Charlie Zender at the University of California at Irvine is particularly useful. It's philosophy is to handle *any* netCDF files (which is what is meant by *generic*).

NCO programs take arbitrary netCDF files as input and produce netCDF files as output. Use of NCO interactively and in simple scripts can often accomplish tasks that would otherwise require programming. The latest version of NCO incorporates both MPI and OpenMP parallel processing.

Currently there are 12 NCO utilities:

- **ncap**: Arithmetic processor (algebra, derived fields)
- **ncatted**: Attribute editor (change attributes)
- **ncbo**: Binary operator (subtraction, addition, ...)
- **ncea**: Ensemble averager (means, min/max, ...)
- **ncecat**: Ensemble concatenator (join files)
- **ncflint**: File interpolator
- **ncks**: Kitchen sink (sub-set, hyperslab, ...)
- **ncpdq**: Pack data, permute dimensions
- **ncra**: Record averager (means, min/max, ...)
- **ncrcat**: Record concatenator (join time-series)
- **ncrename**: Renamer (rename any metadata)
- **ncwa**: Weighted averager (average, mask, integrate, ...)

Some NCO Examples

- Create a new windspeed variable from component wind variables, u and v:
• `ncap -O -s "windspeed=sqrt(u^2+v^2)" in.nc out.nc`
- Compute monthly temperature anomalies from 1985 mean:
• `ncdiff -v T 85_0112.nc 85.nc t_anm_85_0112.nc`
- Average five ensemble members (see [documentation](#) to average N ensemble members):
• `ncea 85_0[1-5].nc 85.nc`
- Concatenate five ensemble members into single file (see [documentation](#) to concatenate N ensemble members):
• `ncecat 85_0[1-5].nc 85.nc`
- Interpolate fields known at times 85 and 87 to time=86:

- `ncflint -i time,86 85.nc 87.nc 86.nc`
- Print value of variable near specified coordinates. For example to print the value of the variable "tos" nearest longitude 203 degrees E and latitude 19.5 degree N from the file sst.nc:
 - `ncks -H -v tos -d lon,203.0 -d lat,19.5 sst.nc`
- Extract variables time and pressure from file in.nc and write to out.nc, including any needed dimensions, coordinate variables, and variable attributes:
 - `ncks -v time,pressure in.nc out.nc`
- Pack all variables in file in.nc and store the results in out.nc, using `scale_factor` and `add_offset` attributes:
 - `ncpack in.nc out.nc`
- Re-order in.nc to dimension order lon,lat,time:
 - `ncpdq -a lon,lat,time in.nc out.nc`
- Average timeseries across five files:
 - `ncra 85_0[1-5].nc 85.nc`
- Concatenate timeseries across five files:
 - `ncrcat 85_0[1-5].nc 85.nc`
- Globally average file, weighting variables by area:
 - `ncwa -w area -a lat,lon in.nc out.nc`

NetCDF-4 note: NCO currently supports netCDF-4 atomic data types and compression, and NCO can read and write netCDF-4 data that uses the classic model.