10.4 NDEDIT: A TOOL FOR BROWSING AND SUBSETTING 4D NETCDF FILES

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1. INTRODUCTION

NdEdit is an interactive Java tool developed to facilitate selecting and subsetting data from large in-situ data collections (Osborne and Denbo, 2002). It features display of ocean metadata in six "cut panels" views that represent two-dimensional slices through a four-dimensional region defined by location (latitude, longitude, and depth) and time. It also features filter tools for showing/removing data by location and time criteria and selection tools for selecting subsets of data files for processing in other desktop analysis tools.

Until recently NdEdit was limited to manipulating metadata of oceanographic point observations, time series, and profiles. As part of NOAA-funded enhancements to Java OceanAtlas (JOA, a visualization tool for section-oriented profile data), improvements to NdEdit are underway to allow inter-comparison of in-situ ocean profile data with fields from numeric models and gridded in-situ products (e.g. WODB). Comparing in-situ data with gridded products requires the ability to extract "virtual" sections from gridded 4D data sets that match the spatial and temporal domain of the in-situ data. A user must be able to quickly view the structure of gridded data and have access to tools for extracting subsets. The NdEdit user interface is an ideal paradigm for viewing the axis structure of gridded data files and NdEdit's existing selection tools can be used for defining subsets such as virtual sections. NdEdit will be enhanced to parse and display the grid structure of a gridded 4D data file. In addition, NdEdit will be extended to allow multiple cut panels of any arbitrary two-dimensional slice (e.g., latitude-longitude) to accommodate the multiple grids typical of many models and include a facility for mapping the axes reported in the 4D file to NdEdit's standard axes (longitude, latitude, depth, time). Initially, enhanced NdEdit will work with files only in the netCDF file format that adhere to defined standards such as EPIC, COARDS, and Climate and Forecast Metadata Conventions (CF).

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2. USER INTERFACE

The NdEdit user interface has been extended to allow opening and browsing the grid structure of 4D netCDF files. These new features were modeled after similar features available in ncBrowse, a netCDF file browser developed at PMEL by Donald Denbo (Denbo, 2001). The main additional user interface element is a dialog for selecting variables from a netCDF file, displaying the variable's axes, and mapping a dimension to one of NdEdit's space and time axes.

After opening a netCDF file, the user selects variables of interest from the variable list. The Source panel then displays the axes on which the variables are reported. If the variables are all on the same grid, the user can proceed to the next step. If the variables are on different grids, the user will have to click the Regrid button and interpolate the variable values onto a common grid. There will be a choice of regridding algorithms available.

After variables have been selected that are on the same grid (or have been gridded to a common grid), NdEdit will attempt to the map the variable's axes to one of its standard spatial or time axes. For automatic mapping to succeed, the source file must have axes names "longitude," "latitude," "depth", and "time" or have attributes that make it unambiguous to which of NdEdit's axes a grid axis corresponds. Users can also define mappings manually by dragging a named axis for a variable from the Source list to a corresponding NdEdit axis in the Target panel.

To accommodate model output where the results are reported in different units from the NdEdit axes (degrees, meters, time since a starting time), users can define an axis mapping transformation, for example, meters from a reference location to degrees longitude. Transformations can be either linear by defining a slope and intercept or by explicitly defining value pairs between axis values (or indices) in the input file and values on the NdEdit axes. NdEdit will also include the capability to create a new netCDF file derived from the input file that contains axis mappings that can be used in future NdEdit sessions.

3. THE COMBINED NDEDIT DISPLAY

After a user has selected a variable (or variables) and axes mapping, the source file's grid structure is drawn in NdEdit's various cut panels. The source file grid will be displayed using a contrasting color/symbol to distinguish it from observed data locations. The user can change the "stacking" order of the gridded and observed displays if one display is obscured by the other.

At this point, the user can use NdEdit's standard visual filters to identify a common spatial/ temporal domain for both the gridded and the in-situ data. Using NdEdit's selection tools, a virtual section can be extracted from the original netCDF file for analysis in Java OceanAtlas or other desktop tools. Selection tools will be enhanced so that selection regions will return results in either the in-situ or gridded data or both. Extracted data will be in the form of a new netCDF file.

4. OUTPUT PRODUCTS

NdEdit will extract data from gridded files into individual netCDF files that represent individual profiles. In addition a "pointer" file will be created that describes the components of a virtual section created using the selection tools. Users will have the option of producing a copy of the original data files that contains attributes describing any mappings created for associated the file's axes with NdEdit's axes.

5. LOOKING TO THE FUTURE

As part of future Java OceanAtlas enhancements, virtual sections extracted from gridded netCDF files will be directly comparable to measured, in-situ sections. Users will be able to over plot a contoured field from a model run onto a contoured field generated from in-situ data or plot a residual field by differencing a measured section from an extracted virtual section. Other pats of JOA will be enhanced so that in-situ data can be better distinguished from model output in property-property plots and profile plots.

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7. REFERENCES

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