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Interactive comment on ““Gtool5”: a Fortran90 library of input/output interfaces for self-descriptive multi-dimensional numerical data” by M. Ishiwatari et al.

Anonymous Referee #1

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General comments: This paper describes gtool5, a high-level Fortran90 utility library for numerical simulation models. The functionality provided includes input and output with utility subroutines that simplify Fortran90 source code for simulation models. This improves the clarity and maintainability of the source code, as well as pushing the low-level details of creating self-describing files with adequate metadata into the gtool5 library, freeing model developers and users to focus on simulation and science rather than informatics. For example, the gtool5 library supports access to model variables by their names rather than by indirect "handles", and allows reading a subset of model output using spatial and time coordinates rather than lower-level array indices. The authors describe a hierarchy of simulations models they are developing that make use

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the gtools5 library for input and output, providing evidence that the library is mature enough to be useful to external developers and users, outside the authors' research groups.

The gtool5 library provides a layer above the widely used netCDF library that simplifies input and output for models in several ways: fewer subroutines, each of which combines a number of calls to netCDF functions; a complete abstraction layer so that users do not need to know they are even using the lower-level netCDF library; more arguments per subroutine; reference to variables by name rather than by ID; and use of object-oriented Fortran90 structures for variables, dimensions, and attributes.

The authors have achieved the goal of simplifying simulation code by pushing implementation of some details common to most numerical simulation libraries into the gtool5 library, so that what remains is more abstract and simple. The resulting netCDF files contain metadata to make them self-describing. Although the paper mentions use of the Climate and Forecast (CF) metadata conventions, it is not clear whether the files written by gtool5 subroutines are strictly CF compliant. Knowing the degree of CF-compliance would be useful information to determine whether the files would be interoperable with other tools for model analysis and visualization. It might also be useful to know whether users of the gtool5 library could take advantage of compression for model output, as provided by netCDF-4.

It might also be good to point out that one of the benefits of a layer such as gtool5 is the possibility of adding to its capabilities in the future, such as compression capabilities, without changing existing interfaces used in current models, so that relinking with a new version of the library would automatically provide the new functionality.

Technical corrections:

3696, line 24 "UNIDATA of National Center of Atmospheric Research (NCAR)." should be "Unidata, part of the University Corporation for Atmospheric Research (UCAR)."

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Editorial corrections:

Page 3693, lines 23-26 Unclear: "However, netCDF provides a fundamental numerical data environment, which means that the granularity of the netCDF data structure is so coarse that many operational steps are needed for data manipulation, and hence a diversity of software arises."

Suggested replacement: "However, netCDF operations are relatively low-level, so that many small steps are needed for data manipulation. This leads to a diversity of ways to implement input and output in models."

Page 3694, line 25 Unclear "should be verified independently in a certain manner." Suggested replacement: "should be verified independently in some way." or just "should be verified independently."

Page 3694, line 26-27 Word choice: "acquisition of observational data" Suggested replacement: "acquiring observational data"

3695, line 6 Word choice (use of "presume"): "conceptual models used to presume the rough behavior of GCMs" Possible replacements, depending on intent: "conceptual models used to {understand, approximate, capture, perfect, clarify (?)} the rough behavior of GCMs"

3696, lines 8-9 Word choice: "become diverse in the program code" Suggested replacement: "differ"

3698, line 9 Word choice: "outputted" (2 occurrences) Suggested replacement: "output"

3702, line 3 Typo: "represent on approach" Suggested replacement: "represent one approach" or "represent an approach"

3704, line 1 Word choice: "outputted" Suggested replacement: "output"

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Interactive comment on Geosci. Model Dev. Discuss., 4, 3691, 2011.

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