

Author's answers to referee 2 of GMDD Discussion paper Geosci. Model Dev. Discuss., 2018 "Development of a module for the Weather Research and Forecasting (WRF) model to support the CORDEX community", by Lluís Fita et al.

We appreciate the positive commentaries of the referee which certainly improve the quality of the manuscript.

Code development suggestions

1. : I would also recommend the authors contact the WRF development team and see about inclusion of this module in the standard release of the code. It will make it easier for new CORDEX participants and make this available to the broader WRF community.

As proposed by the referee, we have already make contact with the WRF development team. We are currently working directly on the repository of the model with a new branch implementing the module in a dedicated branch. It might be possible that the module, after discussion of the developing team, might be included in the main source of the code. A new paragraph has been added in the conclusions.

"The module is currently being implemented in the repository of the code in a dedicated branch. Once the module is fully implemented in the latest version of the model, and some additional tests are made, it might be possible that model developing team decides to include it in the main source of the code."

2. : It might be worth exploring Runtime IO as implemented by WRF. This will enable users to pick which variables to include and which to exclude, allowing for more flexibility.

We agree with the referee that the 'Runtime IO' adds even more flexibility to the execution of the model. But in order to make it work, first, all variables have to be declared and properly incorporated into the code. Now WRF users can use the Runtime IO option to even increase their production by using this option with the CORDEX module. However, as our tests show, performance is not only a matter of which variables are written into file, but also which variables are passed and defined into the modules and subroutines.

Major Comments

1. : One of my main concerns with the paper is that it will only be understood by users with a deep knowledge of the WRF code. I have a very deep understanding of the WRF code and still found the manuscript hard to follow. If this is acceptable, then it is fine, but some cleaning up will improve the readability of the manuscript.

We got a similar comment from first referee. Certain parts of the document have been re-written in order to facilitate the comprehension of WRF structure to the non-familiar readers. Two new subsections has been added ('WRF code main characteristics' and 'Module implementation') and text has been re-organized accordingly.

2. : The authors often refer to the levels of data required by CORDEX (Core Tier1 Tier2). It will be very helpful if a table is included with all the required variables in the different levels and indicate which are included in the new module and which compiler flag activates them.

We agree with the referee, thus a new section labelled 'Requested CORDEX variables' in the appendix has been added with the requested information with the following details:

"Here is provided a generic list of requested variables by CORDEX. Reader is advised that there is not a single CORDEX requirement variables list. It might depend on the experiment. However, hoping to provide a generic list of variables, a table with the CORDEX requirements in tables B1 to B3 is provided. The source of the table is from the ESGF servers at <https://www.earthsystemcog.org/doc/detail/1065/>. Same variable might appear at different levels (Core, Tier-1, Tier-2) as function of the requested frequency and/or if should be provided as statistical value between output frequency or instantaneous value, as well as, depending on the experiment (FPS_ Alps experiment requested additional variables provided in table B4)."

3. : The authors also go on to say that some additional post-processed is needed. What exactly is still needed and how should a user go about getting it done. I fully appreciate that not all components are provided, just some expansion on what is needed and left to the CORDEX participant will made this much clearer.

We agree with the referee and a new paragraph has been added into the conclusions:

“The module provides almost all the required all the CORDEX variables. However, user still needs to perform some post-processing of the output data in order to meet CORDEX standards.

Mainly:

- *Computation of the required different statistical values as daily, monthly and seasonal extremes (minimum, maximum, accumulations, means)*
- *Comorization of the output understood as: 1 file per variable, right metadata and attributes and general CF-compliant standard specifications"*

4. **On page 6:** there is a long list of variables which are available with the various compiler options. This shorthand list is not very helpful. Again, a table that the authors can point too will be better. If variables need to be called out, long names are going to make this much easier to read.

The idea with the list of variables was to provide a summarized overview of the variables provided with the module. In the appendix, a more detailed description of the variables is provided in table form. A reference to the section now is included into the text as follows:

“According to the value given to the pre-compilation CDXWRF flag, different amount of variables is written out to the ‘wrfcdx’ output file (see more detail in appendix C):”

5. : In a number of places, the authors say users need to make code changes. Is there a guide available so users know what to do? If yes, refer to it. Similarly, is it left to user to add new bits to the namelist, or are there examples? Please mention.

In order to reduce the text of the article, we preferred to avoid to include all the details in the text. We already make reference to a WIKI page with more details and explanations. At the same time there is a README provided with the module with deeper details on the manage, use and compilation of the module. We included in the article a larger explanation in:

- *at the ‘The CORDEX module’ section:*

“Here we introduce the module and we explain the modifications introduced in the model. The steps necessary to follow in order to compile and use the module are provided as well. For a complete and detailed description of the steps to follow, reader is referred to the wiki page of the module: <http://wiki.cima.fcen.uba.ar/mediawiki/index.php/CDXWRF> and the README file provided with the module labeled README.cordex. The module has been implemented following standards of modularity which facilitates the upgrading and the introduction of new variables to it. ”

- *at the ‘Module use’ section as follows:*

“A series of steps have to be made in order to use the CORDEX-WRF modifications. These steps encompass compilation of the module and its specific set-up to be used during the execution time of the model and are described in the following subsections.”

6. : The authors provide a list of namelist options, but it is unclear if some of them are preferred/required by CORDEX. Please either say clearly that CORDEX does not have a preference and leaves it up to the research to pick which diagnostic method to use, or indicate which method is needed by CORDEX.

We agree with the referee, thus two specifications has been added into the table for the different values of the namelist. Accordingly new text has been added to the caption of the table as follows:

“The methodologies preferred by CORDEX are marked by ^a, the ones without preference by CORDEX are marked by ^b in these cases, users can select the method according to their experience.”

7. : The term "generic" is introduced on page 11. I would like some explanation of what 'generic' means here. It becomes clear later, but will be helpful to have some explanation here. Also, if the authors have a table as mentioned above, it can be used to indicate which diagnostics are scheme dependent and to which schemes.

The term 'generic' was already introduced at page 3 a the paragraph starting at line 31 of the manuscript as follows:

"The modifications also aim to establish a series of homogenization of certain diagnostics. These diagnostics can be computed following different methodologies, and consequently they may be model and/or even physical parameterization dependent. In order to avoid dependency on the model configuration (mainly sensitivity to the choice of the available different physical schemes), and to allow for a fair comparison between different simulations, a series of additional 'generic' definitions of some diagnostics are presented when possible."

Also a mark has been added to the table of CORDEX variables when they present a dependency on the scheme being used.

8. : Explain eta levels somewhere. Not all readers will be familiarly with the term and concept.

An explanation about the levels has been added into the 'WRF code main characteristics' section as follows:

"WRF model integrates the atmosphere using η as vertical variable (see more detail in, Skamarock et al., 2008) defined in equation 1 (being p_{surf} : surface pressure, p_{top} : pressure at top, p hydrostatic pressure and $\eta = 1$, surface and $\eta = 0$ on top of the atmosphere)."

$$\eta = \frac{p - p_{top}}{p_{surf} - p_{top}} \quad (1)$$

9. : The manuscript can definitely benefit from an English speaker to review it for readability.

A re-lecture of the entire manuscript has been carried out, and significant parts of the text have been re-written and improved.

Minor Comments

1. **Figure 1:** is not very useful.

Figure is used in different parts of the text and it is used to provide detail about when the variables are initialized/computed. We would like to keep it as a graphical way to help the explanations

2. : The word "specie" is used in a number of places. The correct word is "species". Specie refers to money.

Corrected as suggested

3. **Page 3 line 1:** add an explanation of what netCDF is.

A short explanation has been added as follows:

"... criteria in netcdf format (netCDF, Network Common Data Form <https://www.unidata.ucar.edu/software/netcdf/> a binary self-describing and machine-independent file format)."

Some of the major English errors I picked up. There can be more.

4. **Page 3, line 3:**

Sentence has been rewritten to:

"... exist which facilitate the manipulation of netcdf files ..."

5. Page 5, line 4: Apart

Changed to 'Aside' in all text

6. Page 8, line 28:

Sentence has been rewritten:

"statistics: values obtained as statistics of consecutive instantaneous values along a given period of time"

7. Page 9, lines 7 and 11:

Sentences have been re-written as:

"... require other variables or requires some of them at different frequency of output in comparison to a standard CORDEX requested list of variables ..."

"... the diagnostic is updated following the configuration from the namelist ..."

8. Page 11, line 16:

Sentence has been re-written:

"These are the basic variables required by CORDEX"

9. Page 16, line 3:

Sentence has been re-written:

"...when the spatial smoothing is applied"

10. Page 24, line 25:

Sentence has been re-written to:

"In order to solve this problem, ..."

11. Page 30, line 5:

Second 'are' has been removed

12. Page 37, line 8:

Sentence has been rewritten as:

"Usually these experiments require long periods of time for the period of simulation."

13. Page 41, line 26:

Sentence has been re-written to:

"This would facilitate the creation of a community of ..."