Catacomb Demo Software

This document describes the use of the demo software related to the paper “Cluster-Based Ensemble Means for Climate Model Intercomparison”. The software is written in Matlab ver 2017a, but will probably work on earlier versions although this has not been tested. The software will reproduce the analyses and figures contained in the paper.

The source code is all in readable format. Copyright is retained by the authors and the code is released under the Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0). For details of the licence, see <https://creativecommons.org/licenses/by-nc-sa/4.0/legalcode>. No warranty is provided, the code is not intended for any other use. While every effort has been made to remove software bugs, and improve usability, this software should not be considered ‘complete’ and care should be taken when using any of the results or outputs.

The authors would like to acknowledge the following contributions:

Oliver J. Woodford, for his ‘imdisp.m’ function which is used to display multiple images neatly. This can be downloaded through the Mathworks’ Matlab FileExchange at: <https://uk.mathworks.com/matlabcentral/fileexchange/22387-imdisp>

Oliver J. Woodford and Yair M. Altman, for their ‘export\_fig.m’ function which is used to write high quality images to file. This can be downloaded from: <https://github.com/altmany/export_fig> or through the Mathworks’ Matlab FileExchange.

# Introduction

The paper “Cluster-Based Ensemble Means for Climate Model Intercomparison” discusses the use of clustering algorithms to generate climate model ensembles. The analysis and figures within that paper have been generated using this software and this software is made available to allow the authenticity of the results to be confirmed. The paper is based on a single year (12 months) of data a fixed number of climate models and a set of observations. The data is all provided and contained in the sub-folder ‘source data’. For details of the data sets and their sources refer to the paper.

# Files and Folders

The software contains a number of files and is downloadable from: <https://rhyde67.github.io/CATaCoMB-Climate-Model-Ensemble/>

The folder structure should be kept as is, as some internal file locations etc may be written directly into the code. All folders should lie on the Matlab file path.

# How to Use CATaCoMB

Run the ‘CatacombPaper.m’ file. You will be presented with a GUI interface which allows some selections to be made. Two steps are needed to reproduce the figure from the paper.

1. Step 1 is to run the analyses on the data. To do this, select the required ‘Predicted Truth’ from the drop down menu, then press the green ‘Analyse’ button. (Note: ‘Cluster Type’ is also a drop down menu to allow alternative clustering algorithms in future work. Only DDC is currently available.)
2. After the analysis has been completed, check the plots that you wish to reproduce and press the ‘Plot’ button. The plots are generated without pause, but are saved to a suitably named folder. These will be located as sub-folders of an ‘Outputs’ folder contained in the software’s root folder. The folders will be created if they are not available. Any files currently in the folders will be overwritten without prompting.

During analysis and plotting status messages will be shown. After plotting, further plots of the same analysis can be generated without re-analysis of the data. Re-analysis is only required if the cluster-based-ensemble generation method is changed.

# Notes

1. The software generates analysis data internally that is not required for the journal paper.
2. The journal paper does not use all the available figures from the software, e.g. it uses only the DDC(Simple) analysis plots, not those for the DDC(Sigma). However, these are left in for the user to explore.
3. Trying to plots results before analysis of the data will produce an error.
4. At the time of writing this sections of code are not commented, and extraneous remarked code tested during writing may remain. This will be improved and corrected before final publication.
5. The combined plot figures may have artefacts where they have been cropped and grouped, these have been manually edited for the final figures.