Introduction

This README explains how to use the RAMS code, namelists, scripts, and Matlab analysis scripts to reproduce the results described in Grant et al. (2020, GRL).

Within the top level directory, *rams_20180508_release_6.2.08/*, there is file called README-FIRST-RAMS.pdf. This is the most important file for getting RAMS compiled and working. It contains a summary of RAMS, the directory structure, necessarily libraries, how to compile and run RAMS, etc. Make sure you understand the contents of this file before moving forward.

- Please note that this is not the clean version of the 6.2.08 code. A few modifications have been made to the source files for the simulations in Grant et al. (2020). Some files normally included in the clean RAMS code release have also been excluded in this distribution because they were not needed for this project, including example data and scripts in *bin.revu/*, *bin.dp.grib*/*, and *bin.block/* directories, and the orographic cloud run example in *bin.rams/*.
- Make sure to change the *RAMS_ROOT* variable (replace text *[path_to_code_base]*) in the include.mk file in the top level directory, and modify include.mk as necessary for your environment!

The run/ directory

The *run/* directory is not described in the README-FIRST-RAMS.pdf file. The *run/* directory is where all the simulations can be executed from. The following items can be found in this directory:

- RAMSIN files for all experiments:
  - RAMSIN_U2_day0-20, RAMSIN_U5_day0-20, and RAMSIN_U10_day0-20: days 0-20 of the three wind experiments
  - RAMSIN_U2_CONTROL, RAMSIN_U5_CONTROL, and RAMSIN_U10_CONTROL: CONTROL simulations, i.e. days 20-25, for the three wind experiments
  - RAMSIN_U2_NO-EVAP, RAMSIN_U5_NO-EVAP, and RAMSIN_U10_NO-EVAP: NO-EVAP simulations (days 20-25) for the three wind experiments
  - Make sure to change the output paths (search for test *[path_to_output_directory]*) and understand all the options that have been set in the RAMSIN files!
  - The day0-20 and the CONTROL (day 20-25) simulations are identical in their model settings except for the state and lite file output frequency and the variables output into the lite files.
  - If you need to do a history restart, the only things that need to be changed in the RAMSIN are:
    - (1) set *RUNTYPE = HISTORY*
    - (2) set *HFILIN* to the correct file name to restart from
    - Do NOT change anything else such as the simulation start time or duration.

- x.runrams.sh: This is a run script should you wish to use it (see comments in the script).
  - Make sure to edit paths, RAMSIN names, number of nodes, etc. as needed in the first section of the script!
- x.repack.sh: This is a script to compress the hdf5 files.
  - Note that if your version of HDF5 (such as the version included with this code) does not support on-line compression during file writeout for parallel simulations, then files need to be compressed after they are fully written. Compressing files is very important as it saves a lot of disk space.
  - This script can repack files either while the simulation is running or after the simulation is finished. Make sure to edit the settings in the ONLYEDIT THESE section for your simulation and computing environment!
- *Matlab_scripts/* directory, which contains these files:
  - vintcond_stats.m: This is the primary analysis script needed for reproducing these results. This script will produce the convective object database and associated plots. Be sure to edit the "*edit these!*" section for your output paths etc.!
  - Scripts or functions that are called by vintcond_stats.m:
    - read_zlevs_hfile.m: This script reads the heights of the vertical levels from the RAMS header files
    - multipan.m: This script makes subplots, similar to the built-in Matlab function "subplot"
    - set_figsize.m: This script sets the figure GUI display size/position and the figure print size and properties

Running the CONTROL simulations

The RAMS code version bundled here is ready to run the CONTROL simulations. Places where the code was changed from the clean version can be found by grepping for "LDG"

Files within the *src/6.2.08/* directory that were changed from the clean 6.2.08 release in order to run the CONTROL simulations include:
- radiate/rrad2.f90
- turb/turb_k.f90

To reproduce the day0-20 simulation output, simply compile the code as-is and run the simulations using the *day0-20 RAMSIN files.

To reproduce the CONTROL simulation output (days 20-25), perform restart simulations using the *CONTROL RAMSIN files. Restart using the day 20 output file from the corresponding day0-20 simulation.

Running the NO-EVAP simulations

Files within the *src/6.2.08/micro/* directory that need to be changed and re-compiled in order to run the NO-EVAP simulations include:

- mic_driv.f90 (code changes and comments)
- mic_misc.f90 (comments only)
- mic_vap.f90 (code changes and comments)

There are *.f90_CLEAN and *.f90_NO-EVAP versions of these three micro/ files. In this code distribution the *.f90 files are the same as the *.f90_CLEAN files; these CLEAN versions of the files are therefore used to run the day0-20 and the CONTROL simulations.

However, the *.f90_NO-EVAP versions of these files need to be used to create the NO-EVAP simulations.

To reproduce the NO-EVAP simulation output (days 20-25), copy the three micro files with the *.f90_NO-EVAP extension to the corresponding *.f90 file and **re-compile the code**. Then perform restart simulations using the *NO-EVAP RAMSIN files. Restart using the same day 20 output file from the corresponding day0-20 simulation.

Please contact Leah Grant (leah.grant@colostate.edu) with any questions or issues. Thank you!