

MAIC-2

– Quick Start Manual –

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1 Requirements

- UNIX/LINUX system.
- Fortran 90/95 compiler.

2 Installation

- **Option 1: Using subversion**

1. Check out from subversion repository:

```
svn checkout \  
    svn://nye.lowtem.hokudai.ac.jp/maic2/tags/release3 maic2
```

2. You should then have a new folder “maic2”, which contains the entire program package.

- **Option 2: Download as a tarball**

1. Download the gzipped tar archive maic2_release3.tgz from the MAIC-2 web page (<http://maic2.greveweb.net/>).

2. Unpacking with the following commands:

```
gunzip maic2_release3.tgz  
tar -x -v -f maic2_release3.tar
```

3. You should then have a new folder “maic2”, which contains the entire program package.

3 Files and directories in “maic2”

- **runs:**

Shell script (bash) maic2.job for running a single simulation under UNIX/LINUX.

Shell script (bash) multi_maic2.job for running multiple simulations by repeated calls of maic2.job.

Subdirectory **headers**: specification files maic2_specs_run_name.h
(*run_name*: name of run).

Name of Run	Description
run_c01a	Simulation #2 of Greve et al. (2010), only over 1 Martian year with more detailed output
run_c01	Simulation #2 of Greve et al. (2010)
run_c02	Simulation #1 of Greve et al. (2010)
run_c03	Simulation #3 of Greve et al. (2010)
run_c04	Simulation #4 of Greve et al. (2010)
run_t06	Simulation #6 of Greve et al. (2010)
run_t07	Simulation #7 of Greve et al. (2010)
run_t08	Simulation #8 of Greve et al. (2010)
run_t12	Simulation #5 of Greve et al. (2010)
run_t13	Simulation #6 of Greve et al. (2010), continued for 10 Ma into the future

- **src:**

Main program file maic2.F90.

Subdirectory **subroutines**: subroutines for MAIC-2.

- **maic2_in:**

Input data files (orbital forcing) for MAIC-2.

- **docu:**

Directory which contains documentation created by Doxygen.

- `html/index.html` → Source code browser (very useful).
- `latex/refman.pdf` → Reference manual (not so user-friendly).

- **license:**

Directory which contains a copy of the GNU General Public License (version 3).

4 How to run a simulation

1. In the script `maic2.job` (subdirectory `runs/`), search for “greve”, and replace the path names for `RUN_DIR` and `SRC_DIR` with your own ones.

Also, search for “Compiler”, and replace the variables `F90` and `F90FLAGS` according to the syntax of your own Fortran compiler (`F90FLAGS` should do).

2. In the specification files (subdirectory runs/headers/), search for “greve”, and replace the path names for INPATH and OUTPATH with your own ones.

3. The rest is quite simple:

- In order to run simulation run_t06, use the script maic2.job. The command is
`(./maic2.job run_t06) >out_job.dat 2>&1 &`
 (from subdirectory runs/, bash required). Accordingly for the other simulations.

- Alternatively, if you prefer to run all simulations consecutively, you may use the script multi_maic2.job:

`(./multi_maic2.job) >out_mjob.dat 2>&1 &`

The computing times for the simulations, run with the Intel Fortran Compiler for Linux 11.1 (optimization option `-fast`) on an Intel Xeon X5570 (2.93 GHz) PC under openSUSE 11.0 (64 bit), are as follows:

Run	Time	Run	Time
run_c01a	0.1 sec	run_t06	7.0 hrs
run_c01	7.0 hrs	run_t07	7.0 hrs
run_c02	7.0 hrs	run_t08	7.0 hrs
run_c03	7.0 hrs	run_t12	7.0 hrs
run_c04	7.0 hrs	run_t13	14.0 hrs

5 Output files

Output files of simulations are written to a directory specified by the user (OUTPATH in specification files, see above). Each simulation produces an output file **run_name.out** in ASCII format which contains the following data:

Column 1:	Time t [a]
Column 2:	Latitude φ [deg]
Column 3:	Surface temperature $T(\varphi, t)$ [K]
Column 4:	Evaporation rate $E(\varphi, t)$ [$\text{kg m}^{-2} \text{a}^{-1}$]
Column 5:	Condensation rate $C(\varphi, t)$ [$\text{kg m}^{-2} \text{a}^{-1}$]
Column 6:	Water content $\omega(\varphi, t)$ [kg m^{-2}]
Column 7:	Net mass balance $a_{\text{net}}(\varphi, t)$ [mm a^{-1} ice equivalent]
Column 8:	Ice thickness $H(\varphi, t)$ [m]

References

Greve, R., B. Grieger and O. J. Stenzel. 2010. MAIC-2, a latitudinal model for the Martian surface temperature, atmospheric water transport and surface glaciation. *Planet. Space Sci.*, **58** (6), 931–940. doi:10.1016/j.pss.2010.03.002.