

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 the latest revision (“bleeding edge”) from the subversion repository:

```
svn checkout \  
    svn://wwwice.lowtem.hokudai.ac.jp/maic2/trunk maic2
```

Alternatively, check out release 3 (based on revision 9):

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

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

- **Option 2: Downloading a tarball** (release 3, based on revision 9)

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” that 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 that contains some documentation.

- Subdirectory **quick_start**:

- * \LaTeX source for this manual (PDF must be built with make).

- Subdirectory **doxygen**:

- Documentation created by Doxygen.

- * html/index.html \rightarrow Source code browser.

- * latex/refman.pdf (must be built with make) \rightarrow Reference manual.

- **license:**

Directory that 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
<code>run_c01a</code>	0.1 sec	<code>run_t06</code>	7.0 hrs
<code>run_c01</code>	7.0 hrs	<code>run_t07</code>	7.0 hrs
<code>run_c02</code>	7.0 hrs	<code>run_t08</code>	7.0 hrs
<code>run_c03</code>	7.0 hrs	<code>run_t12</code>	7.0 hrs
<code>run_c04</code>	7.0 hrs	<code>run_t13</code>	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 that contains the following data:

Column 1: Time t [a]
Column 2: Solar longitude L_s [deg]
Column 3: Latitude φ [deg]

Column 4:	Surface temperature $T(\varphi, t)$ [K]
Column 5:	Evaporation rate $E(\varphi, t)$ [$\text{kg m}^{-2} \text{a}^{-1}$]
Column 6:	Condensation rate $C(\varphi, t)$ [$\text{kg m}^{-2} \text{a}^{-1}$]
Column 7:	Water content $\omega(\varphi, t)$ [kg m^{-2}]
Column 8:	Net mass balance $a_{\text{net}}(\varphi, t)$ [mm a^{-1} ice equivalent]
Column 9:	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.