User Guide For Mf5to6

Version mf6.1.0—December 12, 2019

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Introduction

This document contains instructions for running Mf5to6, a utility for converting input files for selected models based on MODFLOW-2005 (Harbaugh, 2005) to a new set of files suitable for use with MODFLOW 6. In many cases output of the resulting MODFLOW 6 model will essentially duplicate the original model. However, MODFLOW 6 does not exactly reproduce all of the original model capabilities, and some user modifications to Mf5to6-generated MODFLOW 6 files may be needed to obtain satisfactory results. In addition, some packages are not yet supported by MODFLOW 6, and some packages supported by MODFLOW 6 are not yet supported by Mf5to6. The current version of Mf5to6 is designed to work with MODFLOW 6 version mf6.1.0.

MODFLOW 6 does not support parameters as they are used in MODFLOW-2005. However, Mf5to6 supports MODFLOW-2005-style input files that use parameters. When parameters are defined in model input, Mf5to6 uses parameter values, which may be defined in a PVAL file, and it uses the multiplication and zone arrays as defined in MULT and ZONE files, respectively, to appropriately assign values in MODFLOW 6 input.

Mf5to6 will attempt to convert any input file listed in the original name file. Mf5to6 will identify most files listed in the original name file as either input or output files, based on the file type. However, DATA and DATA(BINARY) files can be either input or output files. To distinguish between input and output files having the DATA or DATA(BINARY) file type, ensure that either "OLD" or "REPLACE" is listed in the name file after the file name of each of these input or output files, respectively. Mf5to6 will report an error if OLD or REPLACE is omitted where needed.

The versions of MODFLOW that are supported for conversion by Mf5to6 are listed in Table 1.

Table 1. MODFLOW versions supported by Mf5to6.

MODFLOW version	Reference
MODFLOW-2005	Harbaugh (2005)
MODFLOW-LGR	Mehl and Hill (2007)
MODFLOW-NWT	Niswonger and others (2011)

Using Mf5to6

Mf5to6 is designed to be run at a command prompt. The syntax is as follows:

mf5to6 *mf2005-name-file basename*

where: *mf2005-name-file* is the name of an existing name file for a supported model (Table 1), and

basename is a text string to be used as the base for names of MODFLOW 6 input and output files.

Invoke Mf5to6 in the folder where the name file for your original model resides; Mf5to6 creates new MF6 input files in the same folder. The names of all new input and output files will start with the basename you provide.

In the MODFLOW-2005 DIS input file, ensure that ITMUNI (seconds=1; minutes=2; hours=3; days=4; years=5) and LENUNI (feet=1; meters=2; centimeters=3) are defined appropriately with non-zero values.

For an LGR model, which uses multiple MODFLOW-2005 name files to define parent and child models, *mf2005-name-file* is the name of the main LGR input file. Mf5to6 will convert the parent model and each child model.

Output Generated By Mf5to6

To inform the user of progress as Mf5to6 processes each input file, a message identifying the file type is displayed in the command-prompt window. In addition to output sent to the command-prompt window, Mf5to6 writes output to a file named *basename*_conversion_messages.txt. This file will contain most of the input-echoing output normally written by the supported models. Additional information generated by Mf5to6 will be written at the bottom of this file.

After all input files have been processed, messages related to the conversion process are written to the command-prompt window and to the *basename*_conversion_messages.txt file. The messages may be notes, warnings, or errors, and are identified accordingly. If a MODFLOW-2005 file type not supported by Mf5to6 is encountered, a warning is issued and processing continues. Errors generally cause the program to halt. Users are advised to carefully read all notes, warnings, and errors. These messages can help the user track down problems that may arise in running the resulting set of MODFLOW 6 input files. Most importantly, files of types that are not supported are identified. Acceptable results are unlikely if the MODFLOW 6 model does not include input corresponding to all MODFLOW-2005 input files.

The Iterative Model Solution (IMS) is the only solver supported in MODFLOW 6. IMS is not supported in MODFLOW-2005. As a result, an IMS input file needs to be generated for use with MODFLOW 6. Mf5to6 attempts to generate an IMS file with settings assigned appropriately for the model, based on input provided for the original solver package. However, it may be necessary to modify the IMS file to obtain solver convergence. If the solver your model uses is not supported by MODFLOW-2005, an error message will be issued. In this situation, remove (or comment out) the line in the name file that activates the non-supported solver, and Mf5to6 will generate an IMS input file with default values. Adjust these values as needed to obtain convergence.

Supported Packages

MODFLOW-2005 packages supported by the current version of Mf5to6 and their corresponding packages in MODFLOW 6 are listed in Table 2. In some cases, input in a MODFLOW-2005 file may contribute to input for more than one MODFLOW 6 file – for such cases, the MODFLOW-2005 file type appears in more than one table row. Similarly, MODFLOW 6 may require input from more than one MODFLOW-2005 file, and these are listed individually. MODFLOW-2005 input files that are not listed are not converted, but the program will continue to process input files that are listed. Warnings are issued for unsupported file types. File types that are not supported by MODFLOW-2005 will result in an error and cause the program to terminate prematurely.

History

This section describes changes introduced into the MODFLOW 6 converter with each official release. These changes may substantially affect users.

- Version mf6.1.0—December 12, 2019

    – Fixed an issue in the conversion of MNW2 wells into the MODFLOW 6 format. The converter did not produce correct results when multiple MNW wells were present and when the wells spanned multiple model layers.

References Cited

Harbaugh, A.W., 2005, MODFLOW-2005, the U.S. Geological Survey modular ground-water model—the Ground-Water Flow Process: U.S. Geological Survey Techniques and Methods, book 6, chap. A16, variously paged, accessed June 27, 2017, at https://pubs.usgs.gov/tm/2005/tm6A16/.

Mehl, S.W., and Hill, M.C., 2007, MODFLOW-2005, the U.S. Geological Survey modular ground-water model – Documentation of shared node local grid refinement (LGR) and the boundary flow and head (BFH) package: U.S. Geological Survey Techniques and Methods, book 6, chap. A21. 13 p., accessed June 27, 2017, at https://pubs.usgs.gov/tm/2007/06A21/.

Niswonger, R.G., Panday, Sorab, and Ibaraki, Motomu, 2011, MODFLOW-NWT, A Newton formulation for MODFLOW-2005: U.S. Geological Survey Techniques and Methods, book 6, chap. A37, 44 p., accessed June 27, 2017, at https://pubs.er.usgs.gov/publication/tm6A37.

Table 2.   Packages supported by Mf5to6. Packages are identified by file type as used in the MODFLOW name file.

MF2005 Package	MF6 Package	Note
BAS6	CHD6	Constant heads from IBOUND arrays
BAS6	DIS6	Time and length units
BAS6	IC6	Starting heads
BAS6	NPF6	Confined/unconfined units; active cells
BCF6	NPF6	Aquifer properties
BCF6	STO6	Storage properties
CHD	CHD6	Time-varying specified heads
CHOB	CHD6	Constant-head flow observations
DE4	IMS6	Solver input
DIS	DIS6	Spatial discretization
DIS	TDIS6	Temporal discretization
DRN	DRN6	Drains
DROB	DRN6	Drain flow observations
EVT	EVT6	Evapotranspiration
ETS	EVT6	Evapotranspiration
FHB	WEL6	Time-varying specified flows
FHB	CHD6	Time-varying specified heads
GBOB	GHB6	General-head boundary flow observations
GHB	GHB6	General-head boundaries
GMG	IMS6	Solver input
HFB6	HFB6	Horizontal-flow boundaries
HOB	OBS6	Head observations
LAK	LAK6	Lakes
LPF	NPF6	Aquifer properties
LPF	STO6	Storage properties
MNW2	MAW6	Multi-aquifer wells
MULT	various packages	Multiplier arrays used in MODFLOW-2005
NWT	IMS6	Solver input
OC	OC6	Output control
PCG	IMS6	Solver input
PCGN	IMS6	Solver input
PVAL	various packages	Parameter values used in MODFLOW-2005
RCH	RCH6	Recharge
RIV	RIV6	Rivers
RVOB	RIV6	River flow observations
SFR2	SFR6	Streamflow routing. Not all SFR2 options are supported in SFR6
SIP	IMS6	Solver input
UPW	NPF6	Upstream weighting
UZF	UZF6	Unsaturated zone flow
WEL	WEL6	Wells
ZONE	various packages	Zone arrays used in MODFLOW-2005