DOCUMENTATION FOR CONVERSION OF A MODFLOW-2000 GAG PACKAGE TO
MODFLOW-2005

This documentation describes changes to the GAGE Package for conversion to MODFLOW-2005. See Chapter 9 of Harbaugh (2005) for further information about the MODFLOW-2005 program. The GAGE Package was originally documented for lakes in the Lake Package (Merritt and Konikow, 2000). It was modified to include streams (Prudic and others, 2004) and to include unsaturated flow beneath streams (Niswonger and Prudic, 2005). The GAGE Package was further modified to include overland runoff to lakes and streams from the Unsaturated-Zone Flow (UZF1) Package (Niswonger and others, 2006).

1. FORTRAN module GWFGAGMODULE was created to store the shared data for the GAG Package; GWFGAGMODULE incorporates the capability to support Local grid Refinement. The following table describes the data. Dimensions not defined in the following table are defined as follows: NGAGESAR = the greater of NUMGAGE and 1.

Variable Name	Size	Description
NUMGAGE	Integer	<input> Number of gages used by SFR and LAK
IGGLST	(4, NGAGESAR)	<input> Gage information

2. All subroutines were changed to designate 2 for the process version and 7 for the package version: GWF2GAG7.

3. Subroutines GWF1GAG5DF, GWF1GAG5ALP, and GWF1GAG5RPP were combined to form GWF2GAG7AR and subroutine GWF1GAG5RPS was changed to GWF2GAG7RP.

4. GWF2GAG7AR was modified to use ALLOCATE statements to reserve memory for the data in GWFGAGMODULE rather than reserving space in the X, RX, IR, IG, and GX arrays used by MODFLOW-2000.

5. Subroutine arguments that are contained in FORTRAN modules were replaced with USE statements in all subroutines.

6. A few lines of code were added to GWF2GAG7RP to include printing of runoff generated by the Unsaturated-Zone Flow (UZF1) Package (Niswonger and others, 2006, p. 9). The variable IUNITUZF was added to the call of GWF2GAG7RP, and GWF2GAG7RP also includes coding for the additional stream gage types used for unsaturated flow beneath streams as documented in Niswonger and Prudic (2005, p. 30).

7. A few lines of code were added to GWF2GAG7LO (lake gages) to include printing of runoff generated by Unsaturated-Zone Flow (UZF1) Package (Niswonger and others, 2006, p. 9). The variable IUNITUZF was added to the call of GWF2GAG7LO.

8. A few lines of code were added to GWF2GAG7SO (stream gages) to include printing of precipitation, evapotranspiration, and runoff when gage OUTTYPE is 2 and 4. GWF2GAG7SO also includes the additional stream gage types (OUTTYPE 6 and 7) used for unsaturated flow beneath streams as documented in Niswonger and Prudic (2005, p. 30).

9. Subroutine GWF2GAG7DA was created to deallocate memory.

10. To support the Local Grid Refinement capability, subroutine SGWF2GAG7PNT was created to set pointers to a grid, and subroutine SGWF2GAG7PSV was created to save the pointers for a grid. The grid number, IGRID, was added as a subroutine argument to all of the primary subroutines, and subroutines SGWF2GAG7PSV and SGWF2GAG7PNT are called as appropriate.

References

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 6-A16, variously paginated.

Merritt, M.L., and Konikow, L.F., 2000, Documentation of a computer program to simulate lake-aquifer interaction using the MODFLOW ground-water flow model and the MOC3D solute-transport model: Water-Resources Investigations Report 00-4167, 146 p.

Niswonger, R.G., and Prudic, D.E., 2005, Documentation of the Streamflow-Routing (SFR2) Package to include unsaturated flow beneath streams—a modification to SFR1: U.S. Geological Techniques and Methods Book 6, Chapter A13, 47 p.

Niswonger, R.G., Prudic, D.E., and Regan, R.S., 2006, Documentation of the Unsaturated-Zone Flow (UZF1) Package for modeling unsaturated flow between the land surface and the water table with MODFLOW-2005: U.S. Geological Techniques and Methods Book 6, Chapter A19, 62 p.

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