Updated Tables for GSFLOW versions 1.1.3, 1.1.5, and 1.1.6 from Appendix 1 of GSFLOW Manual (USGS TM 6-D1) (February 2011; January 2012; March 2013)

Several input parameters for the PRMS and GSFLOW modules were added, removed, or changed for GSFLOW versions subsequent to the original release. These additions, deletions, and changes are shown in highlighted yellow text for additions and changes and highlighted and strikethrough text for deletions in the tables provided below. The tables are modified from Appendix 1 of the original GSFLOW manual (USGS TM 6-D1); users should review the original Appendix 1 for additional details about the input instructions for GSFLOW, including the input terminology used for PRMS modules. (Note that several of the table numbers used here have changed from those used in USGS TM 6-D1.)

Notes on the updated tables:

1. Simulation of PRMS detention reservoirs has been removed. The code related to PRMS detention reservoirs has been removed from the PRMS Streamflow Module (strmflow). The modified Streamflow Module does not have any input parameters; therefore, the table describing input parameters for this module has been removed.

2. Many of the PRMS modules have been renamed; see the GSFLOW_v1.1.5_Updates.pdf for details.

3. Information about modules added to the code since its initial release are described in detail in the files found in the GSFLOW documents subdirectory.

4. The PRMS GUI that is referred to in Table A1.1 is a program written in the Java programming language that uses the object user interface library described in Markstrom and Koczot (2008). (Reference: Markstrom, S.L., and Koczot, K.M., 2008, User's manual for the object user interface (OUI)—An environmental resource modeling framework: U.S. Geological Survey Open-File Report 2008-1120, 39 p.)

5. Version 1.1.6: Removed module hru_sum (Hydrologic-Response-Unit Summary Module).

Tables

Table A1–1. Control parameters specified in the GSFLOW Control File.

[Data Type: 1, integer; 2, single precision floating point (real); 3, double precision floating point (real); 4, character string.
Abbreviation: HRU, hydrologic response unit]

Parameter name (NAME)	Definition	Number of values (N_value)	Data type (Data_type)	Default value or optional
	Parameters related to model execution			
model_mode	Model to run (GSFLOW, PRMS, MODFLOW, or WRITE_CLIMATE)	1	4	GSFLOW
start_time[1]	Simulation start time specified in order as: year, month, day, hour, minute, second	6	1	2000, 10, 1, 0, 0, 0
end_time[1]	Simulation end time specified in order as: year, month, day, hour, minute, second	6	1	2001, 9, 30, 0, 0, 0
cascade_flag	Flag to indicate if HRU cascades are computed when the value of dimension ncascade is specified > 0 (0=no; 1=yes)	integer	0 or 1	1
cascadegw_flag	Flag to indicate if GWR cascades are computed when the value of dimension ncascade is specified > 0 (0=no; 1=yes)	integer	0 or 1	1
subbasin_flag	Flag to indicate if internal subbasins are computed (0=no; 1=yes) when the value of nsub is specified to be greater than 0	Integer	0 or 1	1
	Parameters related to model input			
data_file[2,3]	Pathname(s) for PRMS Data File(s); typically, a single Data File is specified for a GSFLOW simulation	Equal to the number of data files	4	prms.data
param_file[3]	Pathname for PRMS Parameter File	1	4	prms.params
modflow_name[3]	Pathname for MODFLOW Name File	1	4	modflow.nam
precip_module[1]	Module name for precipitation-distribution method (climate_hru, precip_1sta, precip_laps, xyz_dist, or precip_dist2)	1	4	precip_1sta
temp_module[1]	Module name for temperature-distribution method (climate_hru, temp_1sta, temp_2sta, xyz_dist, or temp_dist2)	1	4	temp_1sta
solrad_module[1]	Module name for solar-radiation-distribution method (climate_hru, ccsolrad or ddsolrad)	1	4	ddsolrad
transp_module	Module name for transpiration-simulation method (climate_hru or transp_tindex)	1	4	transp_tindex
et_module[1]	Module name for potential-evapotranspiration computation method (climate_hru, potet_hamon, potet_jh, or potet_pan)	1	4	potet_jh
srunoff_module[1]	Module name for surface-runoff/infiltration computation method (srunoff_carea or srunoff_smidx)	1	4	srunoff_smidx
	Parameters related to model input for the Climate by HRU Distribution Module			
orad_flag	Flag to indicate if the input variable *orad* is included in swrad_day input file (0=no; 1=yes)	1	1	0
potet_day	File name of daily time series of potential evapotranspiration for each HRU (in units of inches)	1	4	potet.day
precip_day	File name of daily time series of precipitation for each HRU (in units defined by precip_units)	1	4	precip.day
swrad_day	File name of daily time series of solar radiation for each HRU (in units of Langleys)	1	4	swrad.day
tmax_day	File name of daily time series of maximum air temperature for each HRU (in units defined by temp_units)	1	4	tmax.day
tmin _day	File name of daily time series of minimum air temperature for each HRU (in units defined by temp_units)	1	4	tmin.day
transp _day	File name of daily time series of on-versus-off flags for transpiration for each HRU (allowed values are 0 for no transpiration and 1 for transpiration)	1	4	transp.day

Table A1–1. Control parameters specified in the GSFLOW Control File.—Continued

[Data Type: 1, integer; 2, single precision floating point (real); 3, double precision floating point (real); 4, character string.
Abbreviation: HRU, hydrologic response unit]

Parameter name (NAME)	Definition	Number of values (N_value)	Data type (Data_type)	Default value or optional
	Parameters related to model output			
gsflow_output_file[3]	Pathname for GSFLOW Water-Budget File of summaries of each component of GSFLOW water budget	1	4	gsflow.out
model_output_file[3]	Pathname for PRMS Water-Budget File of summaries of each component of PRMS water budget	1	4	prms.out
csv_output_file[3]	Pathname for GSFLOW Comma-Separated-Values (CSV) File of GSFLOW water budget and mass balance results for each time step	1	4	gsflow.csv
gsf_rpt	Switch to specify whether or not the GSFLOW Comma-Separated-Values (CSV) File is generated (0=no; 1=yes)	1	1	1
rpt_days	Frequency that summary tables are written to GSFLOW Water-Budget File (0=none, >0 frequency in days, e.g., 1=daily, 7=every 7th day)	1	1	7
statsON_OFF[1]	Switch to specify whether or not PRMS Statistic Variables (statvar) File of selected time-series values is generated (0=no; 1=yes)	1	1	0
stat_var_file[3]	Pathname for PRMS Statistic Variables (statvar) File of time-series values; required only when statsON_OFF = 1	1	4	optional
nstatVars[1]	Number of variables to include in PRMS Statistic Variables File and names specified in statVar_names; required only when statsON_OFF = 1	1	1	optional
statVar_names[1]	List of variable names for which output is written to PRMS Statistic Variables File; required only when statsON_OFF = 1	nstatVars	4	optional
statVar_element	List of identification numbers corresponding to variables specified in statVar_names file (1 to variable's dimension size); required only when statsON_OFF = 1. These values are specified as character strings to account for dimensions with named elements.	nstatVars	4	optional
aniOutON_OFF[1]	Switch to specify whether or not PRMS Animation Variables File(s) of spatially-distributed values is generated (0=no; 1=yes)	1	1	0
ani_output_file[1,3]	Root pathname for PRMS Animation Variables File(s) to which a filename suffix based on dimension names associated with selected variables is appended; required only when gisOutOn_Off = 1	1	4	optional
naniOutVars[1]	Number of output variables specified in the aniOutVar_names list; required only when aniOutON_OFF = 1.	1	1	optional
aniOutVar_names[1]	List of variable names for which all values of the variable (that is, the entire dimension size) for each time step are written to PRMS Animation Variables File(s), use only for aniOutON_OFF = 1	naniOutVars	4	optional

Table A1–1. Control parameters specified in the GSFLOW Control File.—Continued

[Data Type: 1, integer; 2, single precision floating point (real); 3, double precision floating point (real); 4, character string.
Abbreviation: HRU, hydrologic response unit]

Parameter name (NAME)	Definition	Number of values (N_value)	Data type (Data_type)	Default value or optional
	Parameters related to model output—Continued			
print_debug	Switch to produce various debugging output that is written to various files (-1=minimize screen output, 0=none, 1=water balances, 2=basin module, 3=obs module, 4=basin_sum module, ~~5=soltab module~~, ~~6=potet module~~, 7=soilzone module, ~~8=xyz_dist module~~, 9=snowcomp module, 13 cascade module, 14 subbasin module; 5, 6, 8, and 10-12 are unused).	1	1	optional, default = 0
ndispGraphs	Number of graphical output variables specified in the dispVar_names list, required when using the PRMS GUI.	1	1	optional, no default
dispGraphsBuffSize	Buffer size for PRMS GUI graphical output, required when using the PRMS GUI.	1	1	optional, no default
dispVar_element	List of identification numbers corresponding to variables specified in dispVar_names parameter (1 to variable's dimension size); required when ndispGraphs>0 and when using the PRMS GUI.	1	4	optional, no default
dispVar_names	List of variable names for which graphical output is produced during a GSFLOW simulation; required when ndispGraphs>0 and when using the PRMS GUI.	1	1	optional, no default
dispVar_plot	Number of separate time-series plots produced when ndispGraphs is specified greater than 1	1	1	optional, no default
executable_desc	Description of the GSFLOW executable that is displayed in the PRMS GUI, required when using the PRMS GUI	1	1	optional, no default
executable_model	Pathname for the GSFLOW executable that is used in a GSFLOW simulation and displayed in the PRMS GUI, required when using the PRMS GUI	1	4	optional, no default
mapOutON_OFF	Switch to specify whether or not mapped output file(s) by a specified number of columns (ncol) of weekly, montly, yearly, or total simulation results is generated (0=no; 1=yes; 2=force use of topological mapping parameters)	1	1	0
mapOutVar_names	List of variable names for which output is written to mapped output files(s); required only when mapOutON_OFF > 0	nmapOutVars	4	none
nmapOutVars	Number of variables to write mapped output results; required only when mapOutON_OFF is greater than 0	1	1	0
	Parameters related to PRMS model initial conditions			
init_vars_from_file[1]	Flag to determine if a PRMS Initial Conditions File is specified as an input file (0=no; 1=yes)	1	1	0
var_init_file[1,3]	Pathname for the PRMS Initial Conditions File; only required when init_vars_from_file = 1	1	4	optional, default = prms_ic.in
save_vars_to_file[1]	Flag to determine if a PRMS Initial Conditions File (var_save_file) will be generated at the end of simulation (0=no; 1=yes)	1	1	0
var_save_file[1,3]	Pathname for the PRMS Initial Conditions File to be generated at end of simulation; only required when save_vars_to_file = 1	1	4	optional

[1]Additional description of parameter provided in TM 6-D1.

[2] Multiple PRMS Data Files can be specified, although typically, only one is used with GSFLOW.

[3] Pathnames can be 1 to 256 characters and must be specified as a valid pathname for the operating system.

Table A1–2. Selected GSFLOW variables for which values can be written to the PRMS Statistic Variables File and PRMS Animation Variables File(s) for each simulation time step.

[**Dimension variable:** nhru, number of HRUs; nhrucell, number of intersections between HRUs and MODFLOW grid cells; one, dimension of one; **Abbreviations:** MF_L, MODFLOW length unit; HRU, hydrologic response unit; cfs, cubic feet per second; T, time unit]

Variable name	Definition	Units	Dimension variable
basin_cfs	Streamflow out of watershed	cfs	one
basin_et	Total evapotranspiration on watershed as sum for evaporation from snowpack, impervious areas, plant canopy, and soil zone and transpiration from soil zone	inches	one
basin_gwflow_cfs	Area-weighted average ground-water flow for watershed	cfs	one
basin_potet	Area-weighted average potential evapotranspiration for watershed	inches	one
basin_ppt	Area-weighted average precipitation for watershed	inches	one
basin_pweqv	Area-weighted average pack-water equivalent of snowpack for watershed	inches	one
basin_reach_latflow	Area-weighted average lateral flow into stream reaches for watershed	cfs	one
basin_sroff_cfs	Area-weighted average Hortonian and Dunnian surface runoff into stream reaches for watershed	cfs	one
basin_ssflow_cfs	Area-weighted average interflow into stream reaches for watershed	cfs	one
basinactet	Volumetric flow rate of evapotranspiration for watershed	(MF_L)3T-1	one
basingravstor	Total volume of soil water in gravity reservoirs of soil zone for watershed	(MF_L)3	one
basingw2sz	Volumetric flow rate of ground-water discharge added to soil zone for watershed	(MF_L)3T-1	one
basininfilprev	Volumetric flow rate of soil infiltration into preferential-flow reservoirs of soil zone including precipitation, snowmelt, and cascading Hortonian flow for watershed	(MF_L)3T-1	one
basininfil_tot	Volumetric flow rate of soil infiltration into capillary reservoirs of soil zone including precipitation, snowmelt, and cascading Hortonian flow for watershed	(MF_L)3T-1	one
basininterflow	Volumetric flow rate of slow interflow to stream reaches for watershed	(MF_L)3T-1	one
basinprefstor	Total volume of soil water in preferential-flow reservoirs of soil zone for watershed	(MF_L)3	one
basinpweqv	Total volume of water in snowpack storage for watershed	(MF_L)3	one
basinsnowevap	Volumetric flow rate of snowpack sublimation for watershed	(MF_L)3T-1	one
basinsnowmelt	Volumetric flow rate of snowmelt for watershed	(MF_L)3T-1	one
basinsoilmoist	Total volume of soil water in capillary reservoirs of soil zone for watershed	(MF_L)3	one
basinsroff	Volumetric flow rate of Hortonian and Dunnian surface runoff for watershed	(MF_L)3T-1	one
basinstrmflow	Volumetric flow rate of streamflow leaving the watershed	(MF_L)3T-1	one
gw2sm	Average ground-water discharge to soil zone in an HRU	inches	nhru
gwc_head	Head at each MODFLOW ground-water cell	MF_L	ngwcell
gwflow2strms	Volumetric flow rate of ground-water discharge to stream reaches	(MF_L)3T-1	one
hru_ppt	Adjusted precipitation on HRU	inches	nhru
kkiter	Current iteration in GSFLOW simulation	dimensionless	one
obsq_cfs	Streamflow at streamflow-gaging station	cfs	nobs
pkwater_equiv	Pack-water equivalent of snowpack	inches	nhru
reach_cfs	Streamflow leaving each stream reach	cfs	nreach

Table A1–2. Selected GSFLOW variables for which values can be written to the PRMS Statistic Variables File and PRMS Animation Variables File(s) for each simulation time step.—Continued

[**Dimension variable:** nhru, number of HRUs; nhrucell, number of intersections between HRUs and MODFLOW grid cells; one, dimension of one; **Abbreviations:** MF_L, MODFLOW length unit; HRU, hydrologic response unit; cfs, cubic feet per second; T, time unit]

Variable name	Definition	Units	Dimension variable
reach_latflow	Lateral flow (surface runoff and interflow) into each stream reach	cfs	nreach
reach_wse	Water-surface elevation in each stream reach	MF_L	nreach
sat_store	Total storage in saturated MODFLOW cells	(MF_L)3	one
sm2gw_grav	Gravity drainage from each gravity reservoir to each MODFLOW cell	inches	nhrucell
snowcov_area	Fraction of snow-covered area on HRU	dimensionless	nhru
snowmelt	Snowmelt from the snowpack on HRU	inches	nhru
soil_moist	Water content of capillary reservoir for HRU	inches	nhru
soil_moisture_frac	Decimal fraction of the saturation of capillary reservoir	dimensionless	nhru
sroff	Surface runoff to streams for HRU	inches	nhru
ssr_to_gw	Area-weighted average gravity drainage from soil zone for HRU	inches	nhru
ssres_flow	Interflow to streams for HRU	inches	nhru
ssres_stor	Average gravity reservoir storage for HRU	inches	nhru
stream_leakage	Total leakage from stream segments to associated MODFLOW cells	(MF_L)3	one
sward	Computed shortwave radiation for HRU	langleys	nhru
tmaxf	Adjusted daily maximum temperature for HRU	degrees Fahrenheit	nhru
tminf	Adjusted daily minimum temperature for HRU	degrees Fahrenheit	nhru
unsat_store	Total storage in unsaturated MODFLOW cells as simulated by the Unsaturated-Zone Flow Package	(MF_L)3	one
uzf_infil	Net gravity drainage to the unsaturated zone as simulated by the Unsaturated-Zone Flow Package	(MF_L)3	one

Table A1–3. Time-series data that can be specified in a PRMS Data File.

[**Dimension variable:** nevap, number of measurement stations that measure pan evaporation; nobs, number of streamflow gaging stations; nrain, number of measurement stations that measure precipitation; nsol, number of measurement stations that measure solar radiation; ntemp, number of measurement stations that measure air temperature; nform, is either 0 or 1. **Abbreviation:** cfs: cubic feet per second]

Variable name	Definition	Units	Valid range	Dimension variable
pan_evap	Pan evaporation at each measurement station that measures pan evaporation	inches	greater than 0.0	nevap
runoff[1]	Streamflow at each streamflow-gaging station	cfs	greater than 0.0	nobs
precip[1]	Precipitation at each measurement station that measures precipitation	inches	greater than 0.0	nrain
solrad	Solar radiation at each measurement station that measures solar radiation	langleys	greater than 0.0	nsol
tmax[1]	Daily maximum air temperature at each measurement station that measures air temperature	degrees Celsius or Fahrenheit	-50 to 150	ntemp
tmin[1]	Daily minimum air temperature at each measurement station that measures air temperature	degrees Celsius or Fahrenheit	-50 to 150	ntemp
~~form_data[1]~~	~~Form of precipitation (0=not known; 1=snow; 2=rain)~~	dimensionless	0, 1, or 2	nform
rain_day	Day is treated as a rain day (0=no; 1=yes)	dimensionless	0 or 1	one

[1]Additional description of parameter provided in TM 6-D1.

Note: form_data is no longer used; if it is specified, it will be read but ignored by the code

Table A1–4. Parameters[1] specified in the dimensions section of the PRMS Parameter File.

[HRU, hydrologic response unit]

Parameter name	Definition	Default value
	Spatial dimensions	
ngw	Number of PRMS ground-water reservoirs (used in PRMS-only simulations)	1
ngwcell	Number of MODFLOW finite-difference cells in a layer (includes active and inactive cells)	0
nhru	Number of HRUs	1
nhrucell	Number of unique intersections between gravity reservoirs in PRMS soil zone and MODFLOW finite-difference cells	0
nreach	Number of stream reaches on all stream segments	0
nsegment	Number of stream segments	0
~~nsfres~~	Number of on-channel detainment reservoirs (used in PRMS-only simulations)	0
nssr	Number of PRMS subsurface reservoirs (must be specified equal to nhru)	1
nsub	Number of subbasin HRU groups	0
	Time-series input data dimensions	
nevap	Number of measurement stations that measure pan evaporation	0
~~nform~~	~~Number of input columns in PRMS Data File used to specify form of precipitation (0 if no form data, 1 if form data); if it is specified, it will be ignored~~	0
nobs	Number of channel inflow data sets (used in subbasin)	0
nrain	Number of measurement stations that measure precipitation	0
nsol	Number of measurement stations that measure solar radiation	0
ntemp	Number of measurement stations that measure air temperature	0
	Computation dimensions	
~~mxnsos~~	Maximum number of table values for computing storage in and flow from detention reservoirs using Puls routing (PRMS-only simulations)	0
ncascade	Number of cascade paths associated with HRUs	0
ncascdgw	Number of cascade paths associated with PRMS ground-water reservoirs	0
ndepl	Number of snow-depletion curves used for snowmelt calculations	1
ndeplval	Number of snow-depletion values for each snow-depletion curve	ndepl*11
	Fixed dimensions	
ndays	(No longer needs to be specified.) Maximum number of days in a year	366
nlapse	Number of lapse rates in the x, y, and z directions (used by module xyz_dist)	3
nmonths	(No longer needs to be specified.) Number of months in a year	12
one	(No longer needs to be specified.) A constant	1

[1]These parameters were referred to as ‘dimensional variables’ in the original GSFLOW manual (USGS TM 6-D1).

Table A1–5. Parameters in the PRMS Parameter File listed alphabetically and their associated modules.

[Note: many of the module names shown here were changed with the release of GSFLOW version 1.1.5]

Parameter name	Module or modules
adj_by_hru	climate_hru
adjmix_rain	precip_dist2, precip_laps, precip_1sta, xyz_dist, climate_hru
adjust_rain	xyz_dist
adjust_snow	xyz_dist
albset_rna	Snowcomp
albset_rnm	Snowcomp
albset_sna	Snowcomp
albset_snm	Snowcomp
basin_area	basin (parameter is now optional)
~~basin_cfs_init~~	~~gsflow_budget, strmflow~~
~~basin_lat~~	~~Soltab~~
basin_solsta	ccsolrad, ddsolrad
basin_tsta	~~basin_sum~~, ~~ccsolrad~~, temp_1sta, temp_dist2, temp_laps, climate_hru
~~basin_tsta_hru~~	~~basin_sum, xyz_dist~~
carea_max	srunoff_carea, srunoff_smidx
carea_min	srunoff_carea
cascade_flg	Cascade
cascade_tol	Cascade
ccov_intcp	Ccsolrad
ccov_slope	Ccsolrad
cecn_coef	Snowcomp
circle_switch	Cascade
conv_flag	xyz_dist
cov_type	intcp, snowcomp, soilzone
covden_sum	~~hru_sum~~, intcp, ~~snowcomp~~, ~~soilzone~~
covden_win	~~hru_sum~~, intcp, snowcomp, ~~soilzone~~
crad_coef	Ccsolrad
crad_exp	Ccsolrad
dday_intcp	Ddsolrad
dday_slope	Ddsolrad
den_init	Snowcomp
den_max	Snowcomp
dist_max	precip_dist2, temp_dist2
~~elev_units~~	~~basin, xyz_dist~~
emis_noppt	Snowcomp
epan_coef	intcp, potet_pan
fastcoef_lin	Soilzone
fastcoef_sq	Soilzone
freeh2o_cap	Snowcomp
gvr_cell_id	gsflow_budget, gsflow_mf2prms, gsflow_prms2mf, gsflow_setconv, map_results
gvr_cell_pct	~~gsflow_prms2mf~~, gsflow_setconv, map_results

Table A1–5. Parameters in the PRMS Parameter File listed alphabetically and their associated modules.—Continued

[Note: many of the module names shown here have changed with the release of GSFLOW version 1.1.5; see the file GSFLOW_1.1.5_Updates.pdf for the new names.]

Parameter name	Module or modules
gvr_hru_id	gsflow_budget, gsflow_mf2prms, gsflow_prms2mf, soilzone, map_results
gvr_hru_pct	~~gsflow_budget, gsflow_mf2prms~~, gsflow_prms2mf, ~~soilzone~~
gw_down_id	cascade
gw_pct_up	cascade
gw_strmseg_down_id	cascade
gw_up_id	cascade
gwflow_coef	gwflow
gwsink_coef	gwflow
gwstor_init	gwflow
gwstor_min	gwflow
hamon_coef	potet_hamon
hru_area	basin, cascade, ccsolrad, ddsolrad, gsflow_budget, ~~gsflow_mf2prms~~, gsflow_prms2mf, gwflow, intcp, potet_hamon, potet_jh, potet_pan, precip_dist2, precip_laps, precip_1sta, snowcomp, soilzone, soltab, srunoff_carea, srunoff_smidx, ~~strmflow~~, subbasin, temp_1sta, temp_dist2, temp_laps, xyz_dist
hru_aspect	soltab
hru_deplcrv	snowcomp
hru_down_id	cascade
hru_elev	basin, precip_laps, temp_1sta, temp_dist2, temp_laps, xyz_dist
hru_gwres	~~basin~~, ~~cascade~~, gwflow, ~~strmflow~~
hru_lat	soltab
hru_pansta	potet_pan
hru_pct_up	cascade
hru_percent_imperv	basin~~, hru_sum, srunoff_carea, srunoff_smidx~~
hru_plaps	precip_laps
hru_psta	precip_laps, precip_1sta
hru_solsta	ccsolrad, ddsolrad
~~hru_segment~~	~~gsflow_prms2mf~~
~~hru_sfres~~	~~strmflow~~
hru_slope	~~basin,~~ soltab
~~hru_ssres~~	~~basin~~
hru_strmseg_down_id	cascade
hru_subbasin	Subbasin, climate_hru
hru_tlaps	~~obs_adjust~~, temp_laps
hru_tsta	~~obs_adjust~~, temp_1sta, temp_laps
hru_type	basin, ~~cascade,~~ gsflow_budget~~, gsflow_mf2prms,~~ gsflow_prms2mf~~, hru_sum, intcp, snowcomp,~~ soilzone~~, srunoff_carea, srunoff_smidx~~
hru_up_id	cascade
hru_x	xyz_dist

Table A1–5. Parameters in the PRMS Parameter File listed alphabetically and their associated modules.—Continued

[Note: many of the module names shown here have changed with the release of GSFLOW version 1.1.5; see the file GSFLOW_1.1.5_Updates.pdf for the new names.]

Parameter name	Module or modules
hru_xlong	precip_dist2, temp_dist2
hru_y	xyz_dist
hru_ylat	precip_dist2, temp_dist2
id_obsrunoff	gsflow_sum
imperv_stor_max	srunoff_carea, srunoff_smidx
jh_coef	potet_jh
jh_coef_hru	potet_jh
lake_hru_id	gsflow_budget, gsflow_mf2prms, gsflow_prms2mf
lapsemax_max	temp_dist2
lapsemax_min	temp_dist2
lapsemin_max	temp_dist2
lapsemin_min	temp_dist2
~~local_reachid~~	~~gsflow_prms2mf~~
mapvars_freq	map_results
mapvars_units	map_results
max_lapse	xyz_dist
max_psta	precip_dist2
max_missing	~~obs_adjust~~, temp_1sta, temp_laps
max_tsta	temp_dist2
maxday_prec	precip_dist2
~~maxmon_prec~~	~~precip_dist2~~
melt_force	snowcomp
melt_look	snowcomp
min_lapse	xyz_dist
mnsziter, mxsziter	gsflow_modflow, gsflow_prms2mf
monmax,monmin	temp_dist2
~~moyrsum~~	~~hru_sum~~
ncol	map_results
~~nsos~~	~~strmflow~~
~~numreach_segment~~	~~gsflow_prms2mf~~
~~o2~~	~~strmflow~~
~~objfunc_q~~	~~basin_sum~~
outlet_sta	basin_sum
padj_rn, padj_sn	precip_laps
pmn_mo	precip_laps
~~pmo~~	~~hru_sum~~
potet_sublim	intcp, snowcomp
ppt_add, ppt_div	xyz_dist
ppt_lapse	xyz_dist
ppt_rad_adj	ccsolrad, ddsolrad
precip_units	precip_dist2, precip_laps, precip_1sta~~, xyz_dist,~~ climate_hru
pref_flow_den	soilzone

Table A1–5. Parameters in the PRMS Parameter File listed alphabetically and their associated modules.—Continued

[Note: many of the module names shown here have changed with the release of GSFLOW version 1.1.5; see the file GSFLOW_1.1.5_Updates.pdf for the new names.]

Parameter name	Module or modules
print_freq	basin_sum
~~print_objfunc~~	~~basin_sum~~
print_type	basin_sum
psta_elev	precip_laps, xyz_dist
psta_freq_nuse	xyz_dist
psta_mon	precip_dist2
psta_month_ppt	xyz_dist
psta_nuse	xyz_dist
psta_x, psta_y	xyz_dist
psta_xlong	precip_dist2
psta_ylat	precip_dist2
rad_conv	ccsolrad, ddsolrad
rad_trncf	snowcomp
radadj_intcp	ddsolrad
radadj_slope	ddsolrad
radj_sppt	ccsolrad, ddsolrad
radj_wppt	ccsolrad, ddsolrad
radmax	ccsolrad, ddsolrad
rain_adj	precip_1sta~~, climate_hru~~
rain_cbh_adj	climate_hru
rain_code	obs, xyz_dist
rain_mon	precip_dist2
rain_sub_adj	climate_hru
~~reach_segment~~	~~gsflow_prms2mf~~
runoff_units	~~basin_sum~~, gsflow_sum
~~s2~~	~~strmflow~~
sat_threshold	soilzone
~~segment_pct_area~~	~~gsflow_prms2mf~~
settle_const	snowcomp
~~sfres_coef~~	~~strmflow~~
~~sfres_din1~~	~~strmflow~~
~~sfres_init~~	~~strmflow~~
~~sfres_qro~~	~~strmflow~~
~~sfres_type~~	~~strmflow~~
slowcoef_lin	soilzone
slowcoef_sq	soilzone
smidx_coef	srunoff_smidx
smidx_exp	srunoff_smidx
snarea_curve	snowcomp
snarea_thresh	snowcomp

Table A1–5. Parameters in the PRMS Parameter File listed alphabetically and their associated modules.—Continued

[Note: many of the module names shown here have changed with the release of GSFLOW version 1.1.5; see the file GSFLOW_1.1.5_Updates.pdf for the new names.]

Parameter name	Module or modules
snow_adj	precip_1sta~~, climate_hru~~
snow_cbh_adj	climate_hru
snow_intcp	intcp
snow_mon	precip_dist2
snow_sub_adj	climate_hru
snowinfil_max	srunoff_carea, srunoff_smidx
soil_moist_init	soilzone
soil_moist_max	soilzone, srunoff_carea, srunoff_smidx
soil_rechr_init	soilzone
soil_rechr_max	soilzone, srunoff_carea
soil_type	soilzone
soil2gw_max	soilzone
solrad_elev	xyz_dist
srain_intcp	intcp
ssr_gwres	gwflow
ssr2gw_exp	soilzone
ssr2gw_rate	soilzone
ssrmax_coef	~~soilzone~~
ssstor_init	soilzone
subbasin_down	subbasin
subbasin_obsid	subbasin
szconverge	gsflow_prms2mf
temp_units	potet_hamon, potet_jh, precip_dist2, precip_laps, precip_1sta, temp_1sta, temp_dist2, temp_laps, xyz_dist, climate_hru
tmax_add	xyz_dist
tmax_adj	temp_1sta, ~~temp_dist2~~, temp_laps, xyz_dist~~, climate_hru~~
tmax_cbh_adj	climate_hru
tmax_allrain	ddsolrad, ~~obs_adjust,~~ precip_dist2, precip_laps, precip_1sta, xyz_dist, climate_hru
tmax_allsnow	precip_dist2, precip_laps, precip_1sta, snowcomp, xyz_dist, climate_hru
tmax_div	xyz_dist
tmax_index	ddsolrad
tmax_lapse	temp_1sta
tmax_mo_adj	temp_dist2
tmin_add, tmin_div	xyz_dist
tmin_adj	temp_1sta, ~~temp_dist2~~, temp_laps, xyz_dist~~, climate_hru~~
tmin_cbh_adj	climate_hru
tmin_lapse	temp_1sta
tmin_mo_adj	temp_dist2
transp_beg	potet_hamon, potet_jh, potet_pan
transp_end	potet_hamon, potet_jh, potet_pan
transp_tmax	potet_hamon, potet_jh
tsta_elev	temp_1sta, temp_dist2, temp_laps, xyz_dist

Table A1–5. Parameters in the PRMS Parameter File listed alphabetically and their associated modules.—Continued

[Note: many of the module names shown here have changed with the release of GSFLOW version 1.1.5; see the file GSFLOW_1.1.5_Updates.pdf for the new names.]

Parameter name	Module or modules
tsta_month_max	xyz_dist
tsta_month_min	xyz_dist
tsta_nuse	xyz_dist
tsta_x	xyz_dist
tsta_xlong	temp_dist2
tsta_y	xyz_dist
tsta_ylat	temp_dist2
tstorm_mo	snowcomp
~~upst_res1~~	~~strmflow~~
~~upst_res2~~	~~strmflow~~
~~upst_res3~~	~~strmflow~~
wrain_intcp	intcp
x_add	xyz_dist
x_div	xyz_dist
y_add	xyz_dist
y_div	xyz_dist
z_add	xyz_dist
z_div	xyz_dist

Table A1–6. Input parameters specified in the PRMS Basin Module: basin.

[HRU, hydrologic response unit; nhru, number of HRUs]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value
basin_area	Total area of watershed (optional)	one	acres	real	0.1 to 1.0e9	1.0
~~elev_units~~	Units of altitude (0=feet; 1=meters)	one	dimensionless	integer	0 or 1	0
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0
hru_elev	Mean land-surface altitude of HRU	nhru	elev_units	real	-300.0 to 30,000.0	0.0
~~hru_gwres~~	Identifier of PRMS ground-water reservoir	nhru	dimensionless	integer	1 to ngw	1
hru_percent_imperv	Decimal fraction of HRU area that is impervious	nhru	dimensionless	real	0.0 to 1.0	0.0
~~hru_slope~~	Slope of HRU, specified as change in vertical length divided by change in horizontal length	nhru	dimensionless	real	0.0 to 10.0	0.0
hru_type	Type of HRU (0=inactive; 1=land; 2=lake; 3=swale)	nhru	dimensionless	integer	0 to 3	1

Table A1–7. Input parameters specified in the PRMS Cascade Module: cascade.

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU: hydrologic response unit; nhru, number of HRUs; ncascade, number of cascade paths associated with HRUs; ncascdgw, number of cascade paths associated with PRMS ground-water reservoirs; ngw, number of PRMS ground-water reservoirs ; one, a dimension of one]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0	22, 37
casacade_flg[1]	Type of cascade routing (0=allow many-to-many; 1=only allow one-to-one)	one	dimensionless	integer	0 or 1	0	
cascade_tol[1]	Minimum area of upslope HRU for computing cascading flow	one	acres	real	0.0 to 99.0	5.0	
circle_switch	Switch to turn on or off checking of HRU and PRMS ground-water reservoir cascades for circles (0=turn off; 1=check for circles	one	dimensionless	integer	0 or 1	1	
Parameters for routing surface runoff and interflow among HRUs and to stream segments							
hru_up_id	Identifier of HRU that contributes flow for each cascade link	ncascade	dimensionless	integer	1 to nhru	1	
hru_strmseg_down_id[1]	Identifier of stream segment that receives flow for each cascade link	ncascade	dimensionless	integer	0 to nsegment	0	
hru_down_id	Identifier of HRU that receives flow for each cascade link; if hru_strmseg_down_id is not 0 for a cascade link, hru_down_id is ignored	ncascade	dimensionless	integer	1 to nhru	1	
~~hru_type~~	Type of each HRU (0=inactive; 1=land; 2=lake)	nhru	dimensionless	integer	0 to 2	1	
hru_pct_up[1]	Decimal fraction of area in the upslope HRU that contributes Hortonian runoff to the downslope HRU	ncascade	dimensionless	real	0.0 to 1.0	1.0	36
Parameters for routing flow among ground-water reservoirs and to streams, used for PRMS-only simulations							
gw_pct_up[1]	Decimal fraction of source ground-water reservoir associated with each ground-water cascade link	ncascdgw	dimensionless	real	0.0 to 1.0	1.0	
~~hru_gwres~~	Identifier of ground-water reservoir associated with an HRU	nhru	dimensionless	integer	1 to ngw	1	
gw_strmseg_down_id[1]	Identifier of stream segment that receives flow for each ground-water cascade link	ncascdgw	dimensionless	integer	0 to nsegment	0	
gw_up_id	Identifier of HRU that contributes flow to each ground-water cascade link	ncascdgw	dimensionless	integer	1 to ngw	1	
gw_down_id	Identifier of ground-water reservoir that receives flow from each ground-water cascade link; gw_down_id is ignored if gw_strmseg_down_id is not 0 for a cascade link	ncascdgw	dimensionless	integer	1 to ngw	1	

[1]Additional description of parameter provided in TM 6-D1.

Table A1–8. Input parameters specified in the PRMS Observed Data Module: obs.

[nmonths, number of months in a year]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value
rain_code	Use of measured precipitation values, only required for the xyz_dist precipitation module (1=if psta_nuse stations have precipitation; 2=if any precipitation station has precipitation; 3=if xyz regression indicates precipitation; 4=if rain_day variable is set to 1 in a PRMS Data File; 5=if psta_freq_use stations have precipitation)	nmonths	dimensionless	integer	1 to 5	2

Table A1–9. This module was removed for version 1.1.5 of GSFLOW: Input parameters specified in the PRMS Adjusted Observed Data Module: obs_adjust (only required when PRMS temperature distribution modules temp_1sta or temp_laps are used in a simulation).

Parameter name	Description	Dimension variable	Units	Type	Range	Default value
hru_tsta	Identifier of the measurement station used to compute HRU daily maximum and minimum air temperatures	nhru	dimensionless	integer	0 to ntemp	1
hru_tlaps	Identifier of lapse measurement station used for air-temperature lapse rate calculations	nhru	dimensionless	integer	1 to ntemp	1
max_missing	Maximum number of consecutive missing air-temperature values allowed for any measured air-temperature station until a GSFLOW simulation is terminated; the missing value is set to the last specified valid value in the PRMS Data File	one	dimensionless	integer	0 to 10	3
tmax_allrain	Monthly air temperature at which precipitation is rain when the maximum air temperature at an HRU is greater than or equal to this value, January to December	nmonths	temp_units	real	0.0 to 90.0	40.0

Table A1–10. Input parameters specified in the PRMS Potential Solar-Radiation Module: soltab.

[Equation number refers to equations listed in the main body of report—parameter name is defined following the equation. HRU, hydrologic response unit; nhru, number of HRUs]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
~~basin_lat~~	Latitude of watershed centroid	one	degrees latitude	real	-90.0 to 90.0	40.0	13a
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0	
hru_aspect	Aspect of HRU	nhru	degrees azimuth	real	0.0 to 360.0	0	
hru_lat	Latitude of HRU centroid	nhru	degrees latitude	real	-90.0 to 90.0	40.0	13a
hru_slope	HRU slope, specified as change in vertical length divided by change in horizontal length	nhru	dimensionless	real	0.0 to 10.0	0.0	15b

Table A1–11. Input parameters specified in the PRMS Temperature Distribution Modules: temp_1sta, temp_laps, and temp_dist2.

[Equation number refers to equations listed in the main body of report—parameter name is defined following the equation. HRU, hydrologic response unit; `nhru`, number of HRUs; `ntemp`, number of measurement stations that measure air temperature; `nmonths`, number of months in a year; `elev_units`, PRMS Basin Module parameter to define units of feet (`0`) or meters (`1`)]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
		Parameters common to three modules					
`basin_tsta`	Identifier of the measurement station used to compute basin air temperature	`one`	dimensionless	integer	1 to `ntemp`	1	
`hru_area`	Area of HRU	`nhru`	acres	real	0.1 to 1.0e9	1.0	
`hru_elev`	Mean land-surface altitude of HRU	`nhru`	`elev_units`	real	-300.0 to 30,000.0	0.0	1, 2, 5a
`tsta_elev`	Altitude of the air temperature measurement station	`ntemp`	`elev_units`	real	-300.0 to 30,000.0	0.0	1, 4, 5a
`temp_units`	Units of measured air temperature (0=degrees Fahrenheit; 1=degrees Celsius)	`one`	dimensionless	integer	0 or 1	0.0	
		Additional parameters for module temp_1sta					
`hru_tsta`	Identifier of the measurement station used to compute HRU daily maximum and minimum air temperatures	`nhru`	dimensionless	integer	0 to `ntemp`	1	
`max_missing`	Maximum number of consecutive missing air-temperature values allowed for any measured air-temperature station until a GSFLOW simulation is terminated; the missing value is set to the last specified valid value in the PRMS Data File	`one`	dimensionless	integer	0 to 10	3	
`tmax_adj`[1]	Maximum daily HRU temperature adjustment factor, which is estimated on the basis of slope and aspect	`nhru`	`temp_units`	real	-10.0 to 10.0	0.0	1, 2, 5a
`tmin_adj`[1]	Minimum daily HRU temperature adjustment factor, which is estimated on the basis of slope and aspect	`nhru`	`temp_units`	real	-10.0 to 10.0	0.0	1, 2, 5a
`tmax_lapse`[1]	Monthly maximum air temperature lapse rate, representing the change in maximum air temperature per 1,000 feet or meters of altitude change for each month, January to December	`nmonths`	`temp_units`	real	-10.0 to 10.0	3.0	1
`tmin_lapse`[1]	Monthly minimum air temperature lapse rate, representing change in minimum air temperature per 1,000 feet or meters of altitude change for each month, January to December	`nmonths`	`temp_units`	real	-10.0 to 10.0	3.0	1

Table A1–11. Input parameters specified in the PRMS Temperature Distribution Modules: temp_1sta, temp_laps, and temp_dist2.—Continued

[Equation number refers to equations listed in the main body of report—parameter name is defined following the equation. HRU, hydrologic response unit; nhru, number of HRUs; ntemp, number of measurement stations that measure air temperature; nmonths, number of months in a year; elev_units, PRMS Basin Module parameter to define units of feet (0) or meters (1)]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
			Additional parameters for module temp_laps				
hru_tlaps	Identifier of lapse measurement station used for air-temperature lapse rate calculations	nhru	dimensionless	integer	1 to ntemp	1	
hru_tsta	Identifier of base measurement station used for air temperature lapse rate calculations	nhru	dimensionless	integer	1 to ntemp	1	
max_missing	Maximum number of consecutive missing air-temperature values allowed for any measured air-temperature station until a GSFLOW simulation is terminated; the missing value is set to the last specified valid value in the PRMS Data File	one	dimensionless	integer	0 to 10	3	
tmax_adj[1]	Maximum daily HRU temperature adjustment factor, which is estimated on the basis of slope and aspect	nhru	temp_units	real	-10.0 to 10.0	0.0	1, 2, 5a
tmin_adj[1]	Minimum daily HRU temperature adjustment factor, which is estimated on the basis of slope and aspect	nhru	temp_units	real	-10.0 to 10.0	0.0	1, 2, 5a
			Additional parameters for module temp_ dist2				
hru_xlong	Longitude of HRU centroid	nhru	feet	real	-1e+09 to 1e+09	0.0	5b
hru_ylat	Latitude of HRU centroid	nhru	feet	real	-1e+09 to 1e+09	0.0	5b
dist_max	Maxinum distance from an HRU to a measurement station to include to distribute station temperature to that HRU	one	elev_units	real	0 to 1e+09	1e+09	
max_tsta	Maxinum number of measurement stations to distribute to an HRU	one	dimensionless	integer	2 to 50	50	
lapsemax_max	Monthly maximum lapse rate from historical data used to constrain highest daily maximum lapse rate	nmonths	temp_units	real	-2.0 to 4.0	3.0	
lapsemax_min	Monthly minimum lapse rate from historical data used to constrain lowest daily maximum lapse rate	nmonths	temp_units	real	-7.0 to -3.0	-6.5	
lapsemin_max	Monthly maximum lapse rate from historical data to constrain highest daily minimum lapse rate	nmonths	temp_units	real	-2.0 to 4.0	3.0	

Table A1–11. Input parameters specified in the PRMS Temperature Distribution Modules: temp_1sta, temp_laps, and temp_dist2.—Continued

[Equation number refers to equations listed in the main body of report—parameter name is defined following the equation. HRU, hydrologic response unit; `nhru`, number of HRUs; `ntemp`, number of measurement stations that measure air temperature; `nmonths`, number of months in a year; `elev_units`, PRMS Basin Module parameter to define units of feet (`0`) or meters (`1`)]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
Additional parameters for module temp_dist2—Continued							
`lapsemin_min`	Monthly minimum lapse rate from historical data used to constrain lowest daily minimum lapse rate	`nmonths`	`temp_units`	real	-7.0 to -3.0	-4.0	
`monmax`	Monthly maximum air temperature from historical data used to constrain lowest daily maximum air temperatures	`nmonths`	`temp_units`	real	45.0 to 115.0	100.0	
`monmin`	Monthly minimum air temperature from historical data used to constrain lowest daily minimum air temperatures	`nmonths`	`temp_units`	real	-35.0 to 45.0	-20.0	
`tmax_mo_adj`[1]	Maximum monthly HRU temperature adjustment factor, which is estimated on the basis of slope and aspect	`nhru by nmonths`	`temp_units`	real	-10.0 to 10.0	0.0	1, 2, 5a
`tmin_mo_adj`[1]	Minimum monthly HRU temperature adjustment factor, which is estimated on the basis of slope and aspect	`nhru by nmonths`	`temp_units`	real	-10.0 to 10.0	0.0	1, 2, 5a
`tsta_xlong`	Longitude of measurement station that measures air temperature	`ntemp`	feet	real	-1e+09 to 1e+09	0.0	5b
`tsta_ylat`	Latitude of measurement station that measures air temperature	`ntemp`	feet	real	-1e+09 to 1e+09	0.0	5b

[1]Additional description of parameter provided in TM 6-D1.

Table A1–12. Input parameters specified in the PRMS Temperature and Precipitation Module: xyz_dist.

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; nhru, number of HRUs; ntemp, number of measurement stations that measure air temperature; nrain, number of measurement stations that measure precipitation; nlapse, number of lapse rates in the X, Y, and Z directions; nmonths, number of months in a year]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
adjmix_rain[1]	Monthly adjustment factor for a mixed precipitation event as a decimal fraction	nmonths	dimensionless	real	0.0 to 3.0	1.0	6
adjust_rain[1]	Monthly factor as a decimal fraction used to adjust rain values	nmonths	dimensionless	real	0.0 to 1.0	0.01	9a
adjust_snow[1]	Monthly factor as a decimal fraction used to adjust snow values	nmonths	dimensionless	real	0.0 to 1.0	0.01	9a
~~basin_tsta_hru~~	Identifier of HRU used to compute watershed air temperatures	one	dimensionless	integer	0 to nhru	1	
conv_flag	Conversion of altitude (0=no conversion; 1=feet to meters; 2=meters to feet)	one	dimensionless	integer	0 to 2	0	
~~elev_units~~	Units of altitude (0=feet; 1=meters)	one	dimensionless	integer	0 or 1	0	
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0	
~~precip_units~~	Specify units of precipitation (0=inches; 1=millimeters)	one	dimensionless	integer	0 or 1	0	
rain_code	Indicates use of XYZ distribution technique for each time step (1=if psta_nuse stations have precipitation; 2=if any precipitation station has precipitation; 3=always; 4=if rain_ day variable is set to 1 in a PRMS Data File; 5=if psta_freq_use stations have precipitation)	nmonths	dimensionless	integer	1 to 5	2	
solrad_elev	Altitiude of each measurement station that measures solar radiation and used in calculating degree-day curves	one	meters	real	1000.0 to 10,000.0	0.0	
temp_units	Units of air temperature (0=degrees Fahrenheit; 1=degrees Celsius)	one	dimensionless	integer	0 or 1	0	
tmax_adj	Adjustment to maximum air temperature for HRU, estimated on basis of slope and aspect	nhru	temp_units	real	-10.0 to 10.0	0.0	1,3a
tmax_allrain	Monthly air temperature at which precipitation is rain when the maximum air temperature at an HRU is greater than or equal to this value, January to December	nmonths	temp_units	real	0.0 to 90.0	40.0	
tmax_allsnow	Monthly maximum air temperature at which precipitation is all snow for the HRU	one	temp_units	real	-10.0 to 40.0	32.0	6
tmin_adj	Minimum daily temperature adjustment factor	nhru	temp_units	real	-100.0 to 100.0	0.0	1,3a

Table A1–12. Input parameters specified in the PRMS Temperature and Precipitation Module: xyz_dist.—Continued

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; nhru, number of HRUs; ntemp, number of measurement stations that measure air temperature; nrain, number of measurement stations that measure precipitation; nlapse, number of lapse rates in the X, Y, and Z directions; nmonths, number of months in a year]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
			Location and altitude parameters (x, y, and z)				
hru_elev[1]	Mean land-surface altitude of HRU	nhru	elev_units	real	-300.0 to 30,000.0	0.0	
hru_x[1]	Longitude (X) for HRU in albers projection	nhru	meters	real	-1.e-7 to 1.e7	0.0	
hru_y[1]	Latitude (Y) for HRU in albers projection	nhru	meters	real	-1.e-7 to 1.e7	0.0	
psta_elev[1]	Altitude of each measurement station that measures precipitation	nrain	elev_units	real	-300.0 to 30,000.0	0.0	
psta_x[1]	Longitude (X) for each measurement station that measures precipitation in albers projection	nrain	meters	real	-1.e-7 to 1.e7	0.0	
psta_y[1]	Latitude (Y) for each measurement station that measures precipitation in albers projection	nrain	meters	real	-1.e-7 to 1.e7	0.0	
tsta_elev[1]	Altitude of each measurement station that measures air temperature	ntemp	elev_units	real	-300.0 to 30,000.0	0.0	
tsta_x[1]	Longitude (X) for each measurement station that measures air temperature in albers projection	ntemp	meters	real	-1.e-7 to 1.e7	0.0	
tsta_y[1]	Latitude (Y) for each measurement station that measures air temperature in albers projection	ntemp	meters	real	-1.e-7 to 1.e7	0.0	
			Multiple linear regression parameters				
max_lapse[1]	Maximum air temperature regression coefficient for longitude, latitude, and altitude, respectively by month, starting with January	nlapse by nmonths	temp_units	real	-100.0 to 100.0	0.0	3b
min_lapse[1]	Minimum air temperature regression coefficient for longitude, latitude, and altitude, respectively by month starting with January	nlapse by nmonths	temp_units	real	-100.0 to 100.0	0.0	3b
ppt_lapse[1]	Precipitation regression coefficient for longitude, latitude, and altitude, respectively by month, starting with January	nlapse by nmonths	inches	real	-10.0 to 10.0	0.0	9b, 9c

Table A1–12. Input parameters specified in the PRMS Temperature and Precipitation Module: xyz_dist.—Continued

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; nhru, number of HRUs; ntemp, number of measurement stations that measure air temperature; nrain, number of measurement stations that measure precipitation; nlapse, number of lapse rates in the X, Y, and Z directions; nmonths, number of months in a year]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
		Designated station parameters					
psta_freq_nuse[1]	Defines measurement stations used to determine if precipitation is occurring in watershed (0=no; 1=yes)	nrain	dimensionless	integer	0 or 1	1	
psta_nuse	Defines which measurement stations will be used in the distribution regression of precipitation (0=no; 1=yes)	nrain	dimensionless	integer	0 or 1	1	
tsta_nuse	Defines which measurement stations will be used in distribution regression of air temperatures (0=no; 1=yes)	ntemp	dimensionless	integer	0 or 1	1	
psta_month_ppt[1]	Monthly average precipitation at each measurement station	nrain by nmonths	precip_units	real	0.0 to 200.0	0.0	
tsta_month_max[1]	Monthly average maximum air temperature at measurement station	ntemp by nmonths	temp_units	real	-100.0 to 200.0	0.0	
tsta_month_min[1]	Monthly average minimum air temperature at each measurement station	ntemp by nmonths	temp_units	real	-100.0 to 200.0	0.0	
		Transformation parameters for dependent variables					
ppt_add[1]	Calculated mean of precipitation for watershed	one	precip_units	real	-10.0 to 10.0	0.0	
ppt_div[1]	Calculated standard deviation of precipitation for watershed	one	precip_units	real	-10.0 to 10.0	0.0	
tmax_add[1]	Calculated mean of maximum air temperature for watershed	one	temp_units	real	-100.0 to 100.0	0.0	
tmax_div[1]	Calculated standard deviation of maximum air temperature for watershed	one	temp_units	real	-100.0 to 100.0	0.0	
tmin_add[1]	Calculated mean of minimum air temperature for watershed	one	temp_units	real	-100.0 to 100.0	0.0	
tmin_div[1]	Calculated standard deviation of minimum air temperature for watershed	one	temp_units	real	-100.0 to 100.0	0.0	

Table A1–12. Input parameters specified in the PRMS Temperature and Precipitation Module: xyz_dist.—Continued

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; `nhru`, number of HRUs; `ntemp`, number of measurement stations that measure air temperature; `nrain`, number of measurement stations that measure precipitation; `nlapse`, number of lapse rates in the X, Y, and Z directions; `nmonths`, number of months in a year]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
		Transformation parameters for independent variables					
`x_add`[1]	Calculated mean of measurement station longitude (X) coordinates for watershed	one	meters	real	-1.e-7 to 1.e70.0		
`x_div`[1]	Calculated standard deviation of measurement station longitude (X) coordinates for watershed	one	meters	real	-1.e-7 to 1.e70.0		
`y_add`[1]	Calculated mean of measurement station latitude (Y) coordinates for watershed	one	meters	real	-1.e-7 to 1.e70.0		
`y_div`[1]	Calculated standard deviation of measurement station latitude (Y) coordinates for watershed	one	meters	real	-1.e-7 to 1.e70.0		
`z_add`[1]	Calculated mean of measurement station altitude (Z) coordinates for watershed	one	meters	real	-1.e-7 to 1.e70.0		
`z_div`[1]	Calculated standard deviation of measurement station altitude (Z) coordinates for watershed	one	meters	real	-1.e-7 to 1.e70.0		

[1]Additional description of parameter provided in TM 6-D1.

Table A1–13. Input parameters specified in the PRMS Precipitation Distribution Modules: precip_1sta, precip_laps, and precip_dist2.

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; nhru, number of HRUs; ntemp, number of measurement stations that measure air temperature; nrain, number of measurement stations that measure precipitation; nlapse, number of lapse rates in the X, Y, and Z directions; nmonths, number of months in a year; elev_units, PRMS Basin Module parameter to define units of feet (0) or meters (1)]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
		Parameters common to all three modules					
adjmix_rain	Monthly rain adjustment factor for a mixed precipitation event (usually 1.0)	nmonths	dimensionless	real	0.0 to 3.0	1.0	6
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0	
precip_units	Units of precipitation (0=inches; 1=millimeters)	one	dimensionless	integer	0 or 1	0	
temp_units	Units of air temperature (0=degrees Fahrenheit; 1=degrees Celsius)	one	dimensionless	integer	0 or 1	0	
tmax_allrain	Monthly air temperature at which precipitation is rain when the maximum air temperature at an HRU is greater than or equal to this value, January to December	nmonths	temp_units	real	0.0 to 90.0	40.0	
tmax_allsnow	Monthly maximum air temperature at which precipitation is all snow for the HRU	one	temp_units	real	-10.0 to 40.0	32.0	6
		Additional parameters for module precip_1sta					
hru_psta	Identifier of measurement station used as base in calculating precipitation lapse rate	nhru	dimensionless	integer	1 to nrain	1	
rain_adj[1]	Monthly factor as a decimal fraction used to adjust rain at the HRU	nhru by nmonths	dimensionless	real	0.2 to 5.0	1.0	7
snow_adj[1]	Monthly factor as a decimal fraction used to adjust snow at the HRU	nhru by nmonths	dimensionless	real	0.2 to 5.0	1.0	7
		Additional parameters for module precip_laps					
hru_elev	Mean land-surface altitude of HRU	nhru	elev_units	real	-300.0 to 30,000.0	0.0	1, 8
hru_plaps	Identifier of lapse measurement station used in calculating precipitation lapse rate	nhru	dimensionless	integer	1 to nrain	1	
hru_psta	Identifier of measurement station used as base in calculating precipitation lapse rate	nhru	dimensionless	integer	1 to nrain	1	

Table A1–13. Input parameters specified in the PRMS Precipitation Distribution Modules: precip_1sta, precip_laps, and precip_dist2.—Continued

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; `nhru`, number of HRUs; `ntemp`, number of measurement stations that measure air temperature; `nrain`, number of measurement stations that measure precipitation; `nlapse`, number of lapse rates in the X, Y, and Z directions; `nmonths`, number of months in a year; `elev_units`, PRMS Basin Module parameter to define units of feet (`0`) or meters (`1`)]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
			Additional parameters for module precip_laps—Continued				
`padj_rn`[1]	Mean monthly factor to adjust rain lapse rate computed between `station_psta` and `station_ plaps` when precipitation is rain (positive factors are used as multipliers and negative factors are made positive and substituted for the computed lapse rate)	`nrain` by `nmonths`	inches per day	real	-2.0 to 10.0	1.0	8
`padj_sn`[1]	Mean monthly factor to adjust snow lapse rate computed between `station_psta` and `station_ plaps` (positive factors are used as multipliers and negative factors are made positive and substituted for the computed lapse rate)	`nrain` by `nmonths`	inches per day	real	-2.0 to 10.0	1.0	8
`pmn_mo`	Mean monthly precipitation at base and lapse stations	`nrain` by `nmonths`	inches	real	0.0 to 100.0	1.0	8
`psta_elev`	Land surface altitude of base and lapse stations	`nrain`	`elev_units`	real	-300.0 to 30,000.0	0.0	8
			Additional parameters for module precip_dist2				
`hru_xlong`	Longitude of HRU centroid	`nhru`	feet	real	-1e+09 to 1e+09	0.0	10b
`hru_ylat`	Latitude of HRU centroid	`nhru`	feet	real	-1e+09 to 1e+09	0.0	10b
`dist_max`	Maxinum distance from an HRU to a measurement station to include to distribute station precipitation to that HRU	`one`	`elev_units`	real	0 to 1e+09	1e+09	
`max_psta`	Maximum number of measurement stations to distribute to an HRU	`one`	dimensionless	integer	2 to 50	50	
~~`maxmon_prec`~~[1]	Maximum monthly precipitation at all measurement stations	`nmonths`	inches	real	0.0 to 15.0	5.0	
`maxday_prec`	Maximum daily precipitation at any measurement station	`one`	inches	real	0.0 to 15.0	15.0	
`psta_mon`	Mean monthly precipitation at each measurement station	`nrain` by `nmonths`	inches	real	0.0 to 50.0	1.0	10c, d
`psta_xlong`	Longitude of each measurement station that measures precipitation	`nrain`	feet	real	-1e+09 to 1e+09	0.0	10b

Table A1–13. Input parameters specified in the PRMS Precipitation Distribution Modules: precip_1sta, precip_laps, and precip_dist2.—Continued

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; `nhru`, number of HRUs; `ntemp`, number of measurement stations that measure air temperature; `nrain`, number of measurement stations that measure precipitation; `nlapse`, number of lapse rates in the X, Y, and Z directions; `nmonths`, number of months in a year; `elev_units`, PRMS Basin Module parameter to define units of feet (`0`) or meters (`1`)]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
		Additional parameters for module precip_dist2—Continued					
`psta_ylat`	Latitude of each measurement station that measures precipitation	`nrain`	feet	real	-1e+09 to 1e+09	0.0	10b
`rain_mon`	Mean monthly rain on each HRU that can be obtained from National Weather Service's spatial distribution of mean annual precipitation for the 1971-2000 climate normal period	`nhru` by `nmonths`	inches	real	0.0 to 50.0	1.0	10c
`snow_mon`	Mean monthly snow on each HRU that can be obtained from National Weather Service's spatial distribution of mean annual precipitation for the 1971–2000 climate normal period	`nhru` by `nmonths`	inches	real	0.0 to 50.0	1.0	10d

[1]Additional description of parameter provided in TM 6-D1.

Table A1–14. Input parameters specified in the PRMS Solar-Radiation Modules: ccsolrad and ddsolrad.

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; `nhru`, number of HRUs; `ntemp`, number of measurement stations that measure air temperature; `nsol`, number of measurement stations that measure solar radiation; `nmonths`, number of months in a year; `temp_units`, PRMS Temperature Distribution Modules parameter to define units of degrees Fahrenheit (`0`) or Celsius (`1`)]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
			Parameters common to both modules				
`basin_solsta`	Identifier of measurement station used in computing solar radiation	`one`	dimensionless	integer	1 to `nsol`	1	
`hru_area`	Area of HRU	`nhru`	acres	real	0.1 to 1.0e9	1.0	
`hru_solsta`	Identifier of measurement station associated with each HRU	`nhru`	dimensionless	integer	1 to nsol	0	
`ppt_rad_adj`	Precipitation threshold used to determine if solar radiation is adjusted for cloud cover.	`Nmonths`	inches	real	0.0 to 0.5	0.02	
`rad_conv`[1]	Factor to convert measured solar radiation to langleys	`one`	Converts measured solar radiation to langleys	real	0.1 to 100.0	1.0	
`radj_sppt`	Precipitation-day adjustment factor to solar radiation for a summer day with precipitation greater than `ppt_rad_adj` as a decimal fraction	`one`	dimensionless	real	0.0 to 1.0	0.44	15b
`radj_wppt`	Precipitation-day adjustment factor to solar radiation for a winter day with precipitation greater than `ppt_rad_adj` as a decimal fraction	`one`	dimensionless	real	0.0 to 1.0	0.5	15b
`radmax`	Maximum fraction of potential solar radiation that reaches land surface as a decimal fraction	`one`	dimensionless	real	0.0 to 1.0	0.8	
			Additional parameters for module ccsolrad				
~~`basin_tsta`~~	Identifier of measurement station used in computing air temperature	`one`	dimensionless	integer	1 to `ntemp`	1	
`ccov_intcp`[1]	Intercept in the regression equation that relates cloud cover to daily minimum and maximum air temperature by month, starting with January	`nmonths`	dimensionless	real	0.0 to 5.0	1.83	16a
`ccov_slope`[1]	Slope in the regression equation that relates cloud cover to daily minimum and maximum air temperature by month, starting with January	`nmonths`	dimensionless	real	-0.5 to -0.01	-0.13	16a
`crad_coef`[1]	Constant used in the cloud-cover to solar-radiation relation, a value can be obtained from Thompson (1976, fig. 1)	`one`	dimensionless	real	0.1 to 0.7	0.4	16b
`crad_exp`[1]	Exponent used in the cloud-cover to solar-radiation relation, a value of 0.61 is suggested by Thompson (1976)	`one`	dimensionless	real	0.2 to 0.8	0.61	16b

Table A1–14. Input parameters specified in the PRMS Solar-Radiation Modules: ccsolrad and ddsolrad.—Continued

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; `nhru`, number of HRUs; `ntemp`, number of measurement stations that measure air temperature; `nsol`, number of measurement stations that measure solar radiation; `nmonths`, number of months in a year; `temp_units`, PRMS Temperature Distribution Modules parameter to define units of degrees Fahrenheit (`0`) or Celsius (`1`)]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
Additional parameters for module ddsolrad							
`dday_slope`[1]	Slope of monthly degree-day to temperature relation	`nmonths`	degree-day per temp_units	real	0.2 to 0.7	0.4	
`dday_intcp`[1]	Intercept of monthly degree-day to temperature relation	`nmonths`	degree-day	real	-60.0 to 4.0	-10.0	
`radadj_intcp`[1]	Intercept of solar radiation adjustment to temperature	`one`	degree-day	real	0.0 to 1.0	0.0	
`radadj_slope`[1]	Slope of solar radiation adjustment to temperature	`one`	degree-day per `temp_units`	real	0.0 to 1.0	0.0	
`tmax_allrain`	Monthly air temperature at which precipitation is rain when the maximum air temperature at an HRU is greater than or equal to this value, January to December	`nmonths`	`temp_units`	real	0.0 to 90.0	40.0	
`tmax_index`	Maximum monthly air temperature used to adjust solar radiation for precipitation	`nmonths`	`temp_units`	real	-10.0 to 110.0	50.0	

[1]Additional description of parameter provided in TM 6-D1.

Table A1–15. Input parameters specified in the PRMS Potential-Evapotranspiration Modules: potet_hamon, potet_jh, and potet_pan.

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; `nhru`, number of HRUs; `nevap`, number of measurement stations that measure air temperature; `nmonths`, number of months in a year;
`temp_units`, PRMS Temperature Distribution Modules parameter to define units of degrees Fahrenheit (`0`) or Celsius (`1`)].

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
			Parameters common to all three modules				
`hru_area`	Area of HRU	`nhru`	acres	real	0.1 to 1.0e9	1.0	
`transp_beg`	Begin month for transpiration computations at HRU	`nhru`	month	integer	1 to 12	4	
`transp_end`	Last month for transpiration computations at HRU	`nhru`	month	integer	1 to 12	10	
			Additional parameters for module potet_hamon				
`hamon_coef`	Monthly air temperature coefficient used in the Hamon potential evapotranspiration equation	`nmonths`	inch-cubic meter per gram	real	0.004 to 0.008	0.0055	18
`temp_units`	Units of measured air temperature (`0`=degrees Fahrenheit; `1`=degrees Celsius)	`one`	dimensionless	integer	0 or 1	0	
`transp_tmax`	Maximum temperature used to determine when transpiration begins in an HRU	`nhru`	degree-day	real	0.0 to 1000.0	500.0	
			Additional parameters for module potet_jh				
`jh_coef`	Monthly air temperature coefficient used in Jensen-Haise potential evapotranspiration equation	`nmonths`	`temp_units`	real	0.005 to 0.06	0.014	20a
`jh_coef_hru`	Air temperature coefficient used in Jensen-Haise potential evapotranspiration equation for each HRU	`nhru`	`temp_units`	real	5.0 to 20.0	13.0	20a
`temp_units`	Units of measured air temperature (`0`=degrees Fahrenheit; `1`=degrees Celsius)	`one`	dimensionless	integer	0 or 1	0	
`transp_tmax`	Maximum temperature used to determine when transpiration begins in each HRU	`nhru`	degree-day	real	0.0 to 1000.0	500.0	
			Additional parameters for module potet_pan				
`hru_pansta`	Identifier of measurement station that measures pan evaporation	`nhru`	dimensionless	integer	1 to `nevap`	1	
`epan_coef`	Monthly pan evaporation coefficient used to convert value to potential evapotranspiration	`nmonths`	dimensionless	real	0.2 to 3.0	1.0	21

Table A1–16. Input parameters specified in the PRMS Climate by HRU Distribution Module: climate_hru.

[HRU: hydrologic response unit; **one**: a constant (1); **nhru**: number of HRUs; **nmonths**: a constant for number of months in a year (12); **nsub**: number of subbasins; **ntemp**: number of measured air temperature stations input in the Data File]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
		Parameters common to all three modules					
adj_by_hru	Flag to indicate whether to adjust precipitation and air temperature by HRU or subbasin (0=subbasin; 1=HRU)	one	dimensionless	integer	0 or 1	1	
adjmix_rain	Monthly rain adjustment factor for a mixed precipitation event (usually 1.0)	nmonths	dimensionless	real	0.0 to 3.0	1.0	6
basin_tsta	Index of temperature station used to compute solrad_tmax and solrad_tmin when ntemp>0	one	dimensionless	integer	1 to ntemp	1	
hru_subbasin	Index of subbasin assigned to each HRU	nhru	dimensionless	integer	0 to nsub	0	
precip_units	Units of precipitation (0=inches; 1=millimeters)	one	dimensionless	integer	0 or 1	0	
rain_cbh_adj	Monthly (January to December) adjustment factor to measured precipitation determined to be rain on each HRU to account for differences in eleveation and so forth	nhru by nmonths	decimal fraction	real	0.2 to 5.0	1.0	7
rain_sub_adj	Monthly (January to December) adjustment factor to measured precipitation determined to be rain for each subbasin	nhru by nmonths	decimal fraction	real	0.0 to 1.0	1.0	
snow_cbh_adj	Monthly (January to December) adjustment factor to measured precipitation determined to be snow on each HRU to account for differences in eleveation and so forth	nhru by nmonths	decimal fraction	real	0.2 to 5.0	1.0	7
snow_sub_adj	Monthly (January to December) adjustment factor to measured precipitation determined to be snow for each subbasin	nhru by nmonths	decimal fraction	real	0.0 to 1.0	1.0	
temp_units	Units of air temperature (0=degrees Fahrenheit; 1=degrees Celsius)	one	dimensionless	integer	0 or 1	0	
tmax_cbh_adj	Adjustment to maximum air temperature for each HRU, estimated based on slope and aspect	nhru	temp_units	real	-10.0 to 10.0	0.0	
tmax_allrain	Monthly air temperature at which precipitation is rain when the maximum air temperature at an HRU is greater than or equal to this value, January to December	nmonths	temp_units	real	0.0 to 90.0	40.0	
tmax_allsnow	Monthly maximum air temperature at which precipitation is all snow for the HRU	one	temp_units	real	-10.0 to 40.0	32.0	
tmin_cbh_adj	Adjustment to minimum air temperature for each HRU, estimated based on slope and aspect	nhru	temp_units	real	-10.0 to 10.0	0.0	

[1]Additional description of parameter provided in TM 6-D1.

Table A1–17. Input parameters specified in the PRMS Canopy Interception Module: intcp.

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; nhru, number of HRUs; nmonths, number of months in a year]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
cov_type	Plant type on HRU (0=bare soil; 1=grasses; 2=shrubs; 3=trees)	nhru	dimensionless	integer	0 to 3	3	
covden_sum	Summer plant canopy density as a decimal fraction of the HRU area	nhru	dimensionless	real	0.0 to 1.0	0.5	22, 23
covden_win	Winter plant canopy density as a decimal fraction of the HRU area	nhru	dimensionless	real	0.0 to 1.0	0.5	22, 23
epan_coef	Monthly evaporation pan coefficient	nmonths	dimensionless	real	0.2 to 3.0	1.0	
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0	22
~~hru_type~~	Type of HRU (0=inactive; 1=land; 2=lake)	nhru	dimensionless	integer	0 to 2	1	
potet_sublim	Fraction of potential evapotranspiration sublimated from snow surface as a decimal fraction	one	dimensionless	real	0.1 to 0.75	0.5	
snow_intcp	Maximum snow storage in the plant canopy for plant type on HRU	nhru	inches	real	0.0 to 5.0	0.1	22
srain_intcp	Maximum summer rain storage in the plant canopy for plant type on HRU	nhru	inches	real	0.0 to 5.0	1	22
wrain_intcp	Maximum winter rain storage in the plant canopy for plant type on HRU	nhru	inches	real	0.0 to 5.0	0.1	22

Table A1–18. Input parameters specified in the PRMS Snow-Computation Module: snowcomp.

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; `nhru`, number of HRUs; `nmonths`, number of months in a year; `ndepl`, number of snow depletion curves; `temp_units`, PRMS Temperature Distribution Modules parameter to define units of degrees Fahrenheit (`0`) or Celsius (`1`)]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
albset_rna	Decimal fraction of rain in a mixed rain and snow event above which snow albedo is not reset (applied when snowpack is accumulating)	one	dimensionless	real	0.0 to 1.0	0.8	
albset_rnm	Decimal fraction of rain in a mixed rain and snow event above which snow albedo is not reset (applied when snowpack is melting)	one	dimensionless	real	0.0 to 1.0	0.6	
albset_sna	Minimum snow fall, in water equivalent, needed to reset snow albedo when snowpack is accumulating as a decimal fraction	one	dimensionless	real	0.001 to 1.0	0.05	
albset_snm	Minimum snow fall, in water equivalent, needed to reset snow albedo when snowpack is melting as a decimal fraction	one	dimensionless	real	0.001 to 1.0	0.2	
cecn_coef	Monthly convection-condensation energy coefficient	nmonths	calories per degree Celsius above 0	real	0.0 to 20.0	5.0	
cov_type	Plant cover type for HRU (0=bare soil; 1=grasses; 2=shrubs; 3=trees)	nhru	dimensionless	integer	0 to 3	3	
~~covden_sum~~	Summer plant cover density for plant type on HRU as a decimal fraction	nhru	dimensionless	real	0.0 to 1.0	0.5	
covden_win	Winter plant cover density for plant type on HRU as a decimal fraction	nhru	dimensionless	real	0.0 to 1.0	0.5	
den_init	Density of new-fallen snow as a decimal fraction	one	dimensionless	real	0.01 to 0.5	0.10	24
den_max	Average maximum snowpack density as a decimal fraction of the liquid water equivalent	one	dimensionless	real	0.1 to 0.8	0.6	24
emis_noppt	Emissivity of air on days without precipitation	one	dimensionless	real	0.757 to 1.0	0.757	
freeh2o_cap	Free-water holding capacity of snowpack expressed as decimal fraction of total snowpack water equivalent	one	dimensionless	real	0.01 to 0.2	0.05	
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0	
hru_deplcrv	Identifier of snowpack areal-depletion curve for HRU	nhru	dimensionless	integer	1 to ndepl	1	
~~hru_type~~	Type of HRU (0=inactive; 1=land; 2=lake)	nhru	dimensionless	integer	0 to 2	1	
melt_force[1]	Julian date to force snowmelt	one	Julian day	integer	1 to 366	90	
melt_look[1]	Julian date to start looking for when snowmelt begins	one	Julian day	integer	1 to 366	90	

Table A1–18. Input parameters specified in the PRMS Snow-Computation Module: snowcomp.—Continued

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; nhru, number of HRUs; nmonths, number of months in a year; ndepl, number of snow depletion curves; temp_units, PRMS Temperature Distribution Modules parameter to define units of degrees Fahrenheit (0) or Celsius (1)]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
potet_sublim	Decimal fraction of potential evapotranspiration that is sublimated from snow surface	one	dimensionless	real	0.1 to 0.75	0.5	30
rad_trncf	Transmission coefficient for short-wave radiation through winter plant canopy on an HRU as a decimal fraction	nhru	dimensionless	real	0.0 to 1.0	0.5	
settle_const	Snowpack settlement-time constant	one	per day	real	0.01 to 0.5	0.10	24
snarea_curve	Snow area-depletion curve values, 11 for each curve as a decimal fraction	11 by ndepl	dimensionless	real	0.0 to 1.0	1.0	
snarea_thresh	Maximum water equivalent threshold, water equivalent in an HRU less than threshold results in use of snow-covered-area curve	nhru	inches	real	0.0 to 200.0	50.0	
tmax_allsnow	Monthly maximum air temperature at which precipitation is all snow for the HRU	one	temp_units	real	-10.0 to 40.0	32.0	
tstorm_mo	Monthly storm prevalence (0=frontal storms prevalent; 1=convective storms prevalent)	nmonths	dimensionless	integer	0 or 1	0	

[1]Additional description of parameter provided in TM 6-D1.

Table A1–19. Input parameters specified in the PRMS Surface Runoff and Infiltration Modules: srunoff_carea and srunoff_smidx.

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; nhru, number of HRUs]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
		Parameters common to both modules					
carea_max	Maximum possible area contributing to surface runoff, expressed as a decimal fraction of HRU area	nhru	dimensionless	real	0.0 to 1.0	0.6	34
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0	22, 31,32, 33, 36, 37
~~hru_percent_imperv~~	Decimal fraction of HRU area that is impervious	nhru	dimensionless	real	0.0 to 1.0	0.0	
~~hru_type~~	Type of HRU (0=inactive; 1=land; 2=lake)	nhru	dimensionless	integer	0 to 2	1	
imperv_stor_max	Maximum retention storage for HRU impervious area	nhru	inches	real	0.0 to 10.0	0.0	31
snowinfil_max	Daily maximum snowmelt infiltration for the HRU	nhru	inches	real	0.0 to 20.0	2.0	37
soil_moist_max	Maximum available capillary water-holding capacity of soil zone in an HRU	nhru	inches	real	0.0 to 20.0	6.0	
		Additional parameters for module srunoff_carea					
carea_min	Minimum possible area contributing to surface runoff, as a decimal fraction of HRU area	nhru	dimensionless	real	0.0 to 1.0	0.2	34
soil_rechr_max	Maximum quantity of water in the capillary reservoir (value must be less than or equal to soil_moist_max)	nhru	inches	real	0.0 to 10.0	2.0	34a
		Additional parameters for module srunoff_smidx					
smidx_coef[1]	Coefficient in non-linear contributing area algorithm	nhru	dimensionless	real	0.0001 to 1.0	0.01	34b
smidx_exp[1]	Exponent in non-linear contributing area algorithm	nhru	per inch	real	0.2 to 0.8	0.3	34b

[1]Additional description of parameter provided in TM 6-D1.

Table A1–20. Input parameters specified in the PRMS Soil-Zone Module: soilzone.

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; nhru, number of HRUs; nhrucell, number of unique intersections between gravity reservoirs in PRMS soil zone and MODFLOW finite-difference cells; nssr, number of PRMS subsurface reservoirs]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
cov_type	Plant cover type (0=bare soil; 1=grasses; 2=shrubs; 3=trees)	nhru	dimensionless	integer	0 to 3	3	
~~covden_sum~~	Summer plant cover density for plant type as a decimal fraction	nhru	dimensionless	real	0.0 to 1.0	0.5	
~~covden_win~~	Winter plant cover density for plant type as a decimal fraction	nhru	dimensionless	real	0.0 to 1.0	0.5	
fastcoef_lin	Linear flow-routing coefficient for fast interflow	nhru	per day	real	0.0 to 1.0	0.1	67a
fastcoef_sq	Non-linear flow-routing coefficient for fast interflow	nhru	per inch-day	real	0.0 to 1.0	0.8	67a
gvr_hru_id	Index of the HRU associated with each gravity reservoir	nhrucell	dimensionless	integer	1 to nhrucell	1	
~~gvr_hru_pct~~	Decimal fraction of HRU area associated with gravity reservoir	nhrucell	dimensionless	real	0.0 to 1.0	0.0	
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0	22, 39, 45, 46, 58
hru_type	Type of HRU (0=inactive; 1=land; 2=lake)	nhru	dimensionless	integer	0 to 2	1	
pref_flow_den	Decimal fraction of the soil zone available for preferential flow	nhru	dimensionless	real	0.0 to 1.0	0.2	38, 47
sat_threshold	Maximum volume of water per unit area in the soil zone (set to 999.0 for infinite volume)	nhru	inches	real	1.0 to 999.0	999.0	47, 65
slowcoef_lin	Linear flow-routing coefficient for slow interflow	nhru	per day	real	0.0 to 1.0	0.015	50, 56
slowcoef_sq	Non-linear flow-routing coefficient for slow interflow	nhru	per inch-day	real	0.0 to 1.0	0.1	50, 56
soil_moist_init	Initial value of available water in the capillary reservoir	nhru	inches	real	0.0 to 20.0	3.0	
soil_moist_max	Maximum volume of water per unit area in the capillary reservoir	nhru	inches	real	0.0 to 20.0	6.0	44, 46, 63a
soil_rechr_init	Initial value in capillary reservoir where evaporation and transpiration can occur simultaneously (value must be less than or equal to soil_ moist_max)	nhru	inches	real	0.0 to 10.0	1.0	
soil_rechr_max	Maximum value in capillary reservoir where evaporation and transpiration can occur simultaneously (value must be less than or equal to soil_ moist_max)	nhru	inches	real	0.0 to 10.0	2.0	
soil_type	Soil type in HRU (1=sand; 2=loam; 3=clay)	nhru	dimensionless	integer	1 to 3	2	

Table A1–20. Input parameters specified in the PRMS Soil-Zone Module: soilzone.—Continued

[Equation number refers to equations listed in the main body of report—equation variable of parameter name is defined in first listed equation. HRU, hydrologic response unit; nhru, number of HRUs; nhrucell, number of unique intersections between gravity reservoirs in PRMS soil zone and MODFLOW finite-difference cells; nssr, number of PRMS subsurface reservoirs]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value	Equation number
soil2gw_max	Maximum value of soil-water excess routed directly to PRMS ground-water reservoir	nhru	inches	real	0.0 to 5.0	0.0	
ssr2gw_exp	Exponent in the equation used to compute gravity drainage to PRMS ground-water reservoir or MODFLOW finite-difference cell	nssr ~~or nhrucell~~	dimensionless	real	0.0 to 3.0	1.0	59
ssr2gw_rate	Linear coefficient in the equation used to compute gravity drainage to PRMS ground-water reservoir or MODFLOW finite-difference cell	nssr ~~or nhrucell~~	inches per day	real	0.0 to 1.0	0.1	59
~~ssrmax_coef~~	Parameter no longer used. Old: Maximum amount of gravity drainage to PRMS ground-water reservoir or MODFLOW finite-difference cell	nssr or nhrucell	inches	real	1.0 to 20.0	1.0	59
ssstor_init	Initial storage in PRMS subsurface reservoir or gravity reservoir	nssr ~~or nhrucell~~	inches	real	0.0 to 20.0	0.0	

Table A1–21 Input parameters specified in the PRMS Ground-Water Flow Module: gwflow, included with PRMS-only simulations.

[HRU, hydrologic response unit; nhru, number of HRUs; nssr, number of PRMS subsurface reservoirs; ngw, number of PRMS ground-water reservoirs]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0
hru_gwres	Identifier of PRMS ground-water reservoir associated with HRU	nhru	dimensionless	integer	1 to ngw	1
gwstor_init	Initial storage in ground-water reservoir	ngw	inches	real	0.0 to 20.0	0.1
gwflow_coef[1]	Linear coefficient to route water in ground-water reservoir to streams	ngw	per day	real	0.0 to 1.0	.015
gwsink_coef[1]	Linear coefficient to route water in ground-water reservoir to ground-water sink	ngw	per day	real	0.0 to 1.0	0.0
gwstor_min	Minimum storage in each GWR to ensure storage is greater than specified value to account for inflow from deep aquifers or injection wells with the water source outside the basin	ngw	inches	real	0.0 to 5.0	0.0
~~ssr_gwres~~	Identifier of ground-water reservoir associated with subsurface or gravity reservoir	nssr	dimensionless	integer	1 to nssr	1

[1]Additional description of parameter provided in TM 6-D1.

Table A1-22. Input parameters specified in the PRMS Subbasin Computation Module: subbasin.

[HRU, hydrologic response unit; nhru, number of HRUs; nssr, number of PRMS subsurface reservoirs; ngw, number of PRMS ground-water reservoirs; cfs, cubic feet per second]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0
hru_subbasin	Identifier of the subbasin for each HRU	nhru	dimensionless	integer	0 to nsub	0
subbasin_down	Identifier for the downstream basin that receives outflow from this subbasin	nsub	dimensionless	integer	0 to nsub	0
subbasin_obsid	Index of measured streamflow at outlet of each subbasin	nobs	dimensionless	integer	0 to nobs	0

Table A1–23. Input parameters specified in the PRMS Basin Summary Module: basin_sum.

[HRU, hydrologic response unit; nhru, number of HRUs; ntemp, number of measurement stations that measure air temperature; nobs, number of streamflow-gaging stations]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value
~~basin_tsta~~	Identifier of measurement station used in computing air temperature	one	dimensionless	integer	0 to ntemp	1
~~basin_tsta_hru~~	Identifier of HRU used in computing watershed temperatures	one	dimensionless	integer	0 to nhru	1
~~objfunc_q~~	Streamflow-gaging station used in objective function calculations	one	dimensionless	integer	0 to nobs	1
outlet_sta	Identifier of measurement station to use for the basin outlet	one	dimensionless	integer	1 to nobs	1
print_freq	Frequency of output written in PRMS Water-Budget File (0=none; 1=simulation totals; 2=yearly; 4=monthly; 8=daily; or additive combinations—for example, use 3 for output of yearly and simulation totals)	one	dimensionless	integer	0 to 15	1
~~print_objfunc~~	Objective function output in PRMS Water-Budget File (0=no; 1=yes)	one	dimensionless	integer	0 to 1	0
print_type	Type of output written in PRMS Water-Budget File (0=measured and predicted flow only; 1=water balance table; 2=detailed output)	one	dimensionless	integer	0 to 2	1
~~runoff_units~~	Units of measured streamflows written in PRMS Water-Budget File (0=cubic feet per second; 1=cubic meters per second)	one	dimensionless	integer	0 or 1	0

Table A1-24. Input parameters specified in the PRMS Map Results Module: map_results, included with PRMS-only simulations.

Parameter name	Description	Dimension variable	Units	Type	Range	Default value
gvr_cell_id	Index of the spatial unit of target map associated with each gravity reservoir	nhrucell	dimensionless	integer	0 to number of mapped spatial units	0
gvr_cell_pct	Fraction of the spatial area unit of target map associated with each gravity reservoir	nhrucell	decimal fraction	real	0.0 to 1.0	0.0
gvr_hru_id	Index of the HRU associated with each gravity reservoir	nhrucell	dimensionless	integer	1 to nhrucell	1
mapvars_freq	Flag to specify the frequency of output: 0, none; 1, monthly; 2, yearly; 3, total; 4, monthly and yearly; 5, monthly, yearly, and total; 6, weekly	one	dimensionless	integer	0 to 6	1
mapvars_units	Flag to specify the output units of mapped results: 0, no units conversion; 1, converts inches/day to feet/day; 2, converts inches/day to centimeters/day; 3, converts inches per day to meters/day	one	dimensionless	integer	0 to 3	0
ncol	Number of columns of for each row of the mapped results	one	dimensionless	integer	1 to user determined	1
prms_warmup	Number of years to simulate before writing mapped results	one	years	integer	0 to user determined	1

Note: this module replaces the Grid Report module beginning with GSFLOW version 1.1.5

Table A1-25. Input parameters specified in the GSFLOW Computation-Control Modules: gsflow_prms and gsflow_modflow.

Parameter name	Description	Dimension variable	Units	Type	Range	Default value
Parameter for gsflow_prms						
model_mode[1]	Model to run	one	dimensionless	integer	GSFLOW, PRMS, or MODFLOW	GSFLOW
Parameters for gsflow_modflow						
~~model_mode~~[1]	Model to run	one	dimensionless	integer	GSFLOW, PRMS, or MODFLOW	GSFLOW
modflow_name[1]	Pathname of MODFLOW Name File	one	dimensionless	character	1 to 256	modflow.nam
mnsziter[2]	Minimum iterations for computing soil-zone flow to finite-difference cells during a time step	one	dimensionless	integer	3 to user determined	MODFLOW convergence criterion[3]
mxsziter[2]	Maximum iterations for computing soil-zone flow to finite-difference cells during a time step	one	dimensionless	integer	mnsziter to user determined	MODFLOW convergence criterion[3]

[1]Parameter specified in GSFLOW Control File.

[2]Parameter is not required in MODFLOW-only simulations.

[3]MXITER, ITMX, or MAXITEROUT

Table A1–26. Input parameters specified in the GSFLOW Conversion Factors Module: gsflow_setconv.

[HRU, hydrologic response unit; nhru, number of HRUs; nhrucell, number of unique intersections between gravity reservoirs in PRMS soil zone and MODFLOW finite-difference cells]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value
gvr_cell_id	Index of the spatial unit of target map associated with each gravity reservoir	nhrucell	dimensionless	integer	0 to number of mapped spatial units	0
gvr_cell_pct	Fraction of the spatial area unit of target map associated with each gravity reservoir	nhrucell	decimal fraction	real	0.0 to 1.0	0.0

Table A1–27. Input parameters specified in the GSFLOW Integration Modules: gsflow_prms2mf and gsflow_mf2prms.

[HRU, hydrologic response unit; nhru, number of HRUs; nhrucell, number of unique intersections between gravity reservoirs in PRMS soil zone and MODFLOW finite-difference cells; ngwcell, number of MODFLOW finite-difference cells in a layer (includes active and inactive cells; nreach, number of MODFLOW stream reaches; nsegment, number of MODFLOW stream segments]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value
		Parameters common to both modules				
gvr_cell_id	Index of the spatial unit of target map associated with each gravity reservoir	nhrucell	dimensionless	integer	0 to number of mapped spatial units	0
gvr_hru_id	Index of the HRU associated with each gravity reservoir	nhrucell	dimensionless	integer	1 to nhrucell	1
~~gvr_hru_pct~~	Decimal fraction of HRU area associated with a gravity reservoir	nhrucell	dimensionless	real	0.0 to 1.0	0.0
lake_hru_id	MODFLOW lake number associated with an HRU	nhru	dimensionless	integer	0 to nhru	0
		Additional parameters for gsflow_prms2mf				
~~gvr_cell_pct~~	Decimal fraction of HRU area associated with a finite-difference cell	nhrucell	dimensionless	real	0.0 to 1.0	0.0
gvr_hru_pct	Decimal fraction of HRU area associated with a gravity reservoir	nhrucell	dimensionless	real	0.0 to 1.0	0.0
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0
hru_type	Type of HRU (0=inactive; 1=land; 2=lake)	nhru	dimensionless	integer	0 to 2	1
~~hru_segment~~	HRU associated with a stream segment	nhru	dimensionless	integer	0 to nsegment	
~~local_reachid~~	Stream reach within a stream segment	nreach	dimensionless	integer	0 to nreach	0
mnsziter[2]	Minimum iterations for computing soil-zone flow to finite-difference cells during a time step	one	dimensionless	integer	3 to user determined	MODFLOW convergence criterion[3]
mxsziter[2]	Maximum iterations for computing soil-zone flow to finite-difference cells during a time step	one	dimensionless	integer	mnsziter to user determined	MODFLOW convergence criterion[3]
~~numreach_segment~~	Number of stream reaches in a stream segment	nsegment	dimensionless	integer	0 to nreach	1
~~reach_segment~~	Stream segment associated with a stream reach	nreach	dimensionless	integer	0 to nsegment	0
~~segment_pct_area~~	Decimal fraction of HRU area that contributes flow to a stream reach	nreach	dimensionless	real	0.0 to 1.0	0.0
szconverge[1]	Convergence criterion for checking soil-zone flows	one	inches	real	1.e-15 to 1.e-1	1.e-8

[1]Additional description of parameter provided in TM 6-D1.

[2]Parameter is not required in MODFLOW-only simulations.

[3]MXITER, ITMX, or MAXITEROUT

Table A1–28. Input parameters specified in the GSFLOW Budget Module: gsflow_budget.

[HRU, hydrologic response unit; nhru, number of HRUs; nhrucell, number of unique intersections between gravity reservoirs in PRMS soil zone and MODFLOW finite-difference cells; ngwcell, number of MODFLOW finite-difference cells in a layer (includes active and inactive cells); cfs, cubic foot per second]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value
~~basin_cfs_init~~	Initial streamflow at outlet	one	cfs	real	0.0 to 1e+09	0.0
gvr_cell_id	Identifier of finite-difference cell associated with a gravity reservoir	nhrucell	dimensionless	integer	0 to ngwcell	0
gvr_hru_id	Index of the HRU associated with each gravity reservoir	nhrucell	dimensionless	integer	1 to nhrucell	1
~~gvr_hru_pct~~	Decimal fraction of HRU area associated with a gravity reservoir	nhrucell	dimensionless	real	0.0 to 1.0	.0
hru_type	Type of HRU (0=inactive; 1=land; 2=lake)	nhru	dimensionless	integer	0 to 2	1
lake_hru_id	MODFLOW lake number associated with an HRU	nhru	dimensionless	integer	0 to nhru	0
hru_area	Area of HRU	nhru	acres	real	0.1 to 1.0e9	1.0

Table A1–29. Input parameters specified in the GSFLOW Summary Module: gsflow_sum.

[HRU, hydrologic response unit; nhru, number of HRUs; ntemp, number of measurement stations that measure air temperature; nobs, number of streamflow gaging stations]

Parameter name	Description	Dimension variable	Units	Type	Range	Default value
csv_output_file[1]	Pathname for GSFLOW Comma-Separated-Values (CSV) File	one	dimensionless	character	1 to 256	gsflow.csv
gsf_rpt[1]	Switch to specify whether or not the GSFLOW Comma-Separated-Values (CSV) File is generated (0=no, 1=yes)	one	dimensionless	integer	Dor1	1
gsflow_output_file[1]	Pathname for GSFLOW Water Budget File	one	dimensionless	character	1 to 256	gsflow.out
id_obsrunoff	Identifier for streamflow-gaging station at outlet	one	dimensionless	integer	0 to nobs	0
model_output_file[1]	Pathname for PRMS Water Budget File	one	dimensionless	character	1 to 256	prms.out
rpt_days[1]	Frequency that summary tables are written to GSFLOW Water-Budget File (0=none, >0 frequency in days, e.g., 1=daily, 7=every 7th day)	one	days	integer	1 to 365	7
runoff_units	Units of measured streamflow (0=cubic feet per second; 1=cubic meters per second)	one	dimensionless	integer	0 or 1	0

[1]Parameter specified in GSFLOW Control File.