

VIII.3.3-XIN-SMA XINANJIANG SOIL MOISTURE ACCOUNTING OPERATION

Identifier: XIN-SMA

Operation Number: 36

Developed by: Qingping Zhu, Yellow River Conservancy Commission,
China

Parameter Array: The FORTRAN identifier used for the parameter array for this Operation is PL. The contents of the PL array are:

<u>Position</u>	<u>Contents</u>
1	Operation version number (integer value)
2	Computational data time interval (integer value; units of HR)
3	Number of sub-basins (integer value)
4-8	General name for area or point where the Operation is applied
9	Control for printing sums of water balance, runoff and channel inflow components: 0 = no sums printed 1 = sums printed
10	Control for printing detailed output: 0 = do not print If greater than zero: o Operational Forecast System programs - print detailed output o Calibration System programs - location in PL of information on when to print detailed output <u>1</u> /
11	Control for using PE data: 0 = no PE data used 1 = PE data used
12-13	PE time series identifier: blank = no PE data used
14	PE time series data type code
15	Location in the PL array of precipitation and channel inflow time series information <u>2</u> /
16	Number of words in the PL array of precipitation and channel inflow time series information for one sub- basin

<u>Position</u>	<u>Contents</u>
17	Number of values in the PL array
18	Location in the PL array of the seasonal ET curve <u>3/</u>
19	Location of parameters in the PL array <u>4/</u>
20	Daily ET distribution control: 0 = uniform daily ET variation is used 1 = fixed diurnal variation is used
21-25	Unused

Notes:

- 1/ The contents of the optional 15 array positions are months to print detail output in Calibration programs:
 - o location of current position to check
 - o month and year to print (maximum of 7 months - 14 values)
- 2/ The contents of the storage of precipitation and channel inflow time series information are:
 - o identifier for precipitation time series (2 values)
 - o data type code for precipitation time series
 - o identifier for channel inflow time series (2 values)
 - o data type code for channel inflow time series
- 3/ The contents of the seasonal ET curve information are:
 - o seasonal ET demand or PE adjustment curve for January to December (12 values)
 - o daily increments in seasonal ET-curve (first value is for mid-January to mid-February) (12 values)
- 4/ Order of parameter values is:
 1. K
 2. IMP
 3. WUM
 4. WLM
 5. WDM
 6. SM
 7. B
 8. EX
 9. C
 10. KSS
 11. KG
 12. CI
 13. CG

Carryover Array: The FORTRAN identifier used for the carryover array is CL. The contents of CL array are:

<u>Position</u>	<u>Contents</u>
1	WUC
2	WLC
3	WDC

4	SC
5	QIC
6	QGC
7	FRC

The carryover values are repeated for each sub-basin.

If sums are to be printed (PL(9) is 1) there are 10 additional values for each sub-basin. The values follow the state variables and are sums of the following quantities for the run period:

1. Precipitation
2. Actual-ET
3. Surface runoff
4. Interflow
5. Groundwater
6. Total runoff
7. Total channel inflow
8. Interflow inflow
9. Groundwater inflow
10. Water balance

Subroutines Names and Functions: Subroutines associated with this Operation are:

Subroutine Function

PIN36	Input cards and store values in PL and CL arrays
PRP36	Print information in PL array
PRC36	Print information in CL array
EX36	Execute the Operation
COX36	Perform carryover transfer
PUC36	Punch information in PL and CL array
TAB36	Make entry into the Operation Table
PM36	Retrieve parameters from PL array and pre-process some parameters
FSC036	Transfer carryover values into the array used to save carryover
MOD36	Make run-time modifications to carryover values
RO36	Perform soil moisture accounting computation for one time period

Subroutines PIN36, PRP36, COX36 and PUC36 have the standard argument lists for these subroutines as given in Section VIII.4.3.

SUBROUTINE EX36 (PL,CL,PE,LPXRO,D,CO,COI,CS,BADJ)

Function: This is the execution routine for Operation XIN-SMA.

Argument List:

<u>Variable</u>	<u>Input/ Output</u>	<u>Type</u>	<u>Dimension</u>	<u>Description</u>
PL	Input	R*4	Variable	Contains parameters and other information
CL	Both	R*4	Variable	Contains carryover values
PE	Input	R*4	Variable	Daily PE time series data
LPXRO	Input	I*4	Variable	Contains locations of precipitation and channel inflow time series data for each sub-basin in D array
D	Both	R*4	Variable	Precipitation and channel inflow data for all sub-basins
CO	-	R*4	Variable	Carryover work space
COI	-	R*4	Variable	Initial carryover work space
CS	-	R*4	Variable	Work space to store sums of water balance, runoff and channel inflow components for a month
BADJ	-	R*4	Variable	Work space to store water balance adjustments

SUBROUTINE EX36 (PL,CL,PE,LPXRO,D,CO,COI,CS,BADJ)

Function: This is the execution routine for Operation XIN-SMA.

Argument List:

<u>Variable</u>	<u>Input/ Output</u>	<u>Type</u>	<u>Dimension</u>	<u>Description</u>
PL	Input	R*4	Variable	Contains parameters and other information
CL	Both	R*4	Variable	Contains carryover values
PE	Input	R*4	Variable	Daily PE time series data
LPXRO	Input	I*4	Variable	Contains locations of precipitation and channel inflow time series data for each sub-basin in D array
D	Both	R*4	Variable	Precipitation and channel inflow data for all sub-basins
CO	-	R*4	Variable	Carryover work space
COI	-	R*4	Variable	Initial carryover work space
CS	-	R*4	Variable	Work space to store sums of water balance, runoff and channel inflow components for a month
BADJ	-	R*4	Variable	Work space to store water balance adjustments

SUBROUTINE RO36 (PXV,EM,E,R,RS,RI,RG,CIN,W,WU,WL,WD,S,QI,QG,FR)

Function: This routine performs the XIN-SMA Operation calculations for one time period.

Argument List:

<u>Variable</u>	<u>Input/ Output</u>	<u>Type</u>	<u>Dimension</u>	<u>Description</u>
PXV	Input	R*4	1	Precipitation
EM	Input	R*4	1	ET demand
E	Output	R*4	1	Actual ET
R	Output	R*4	1	Total runoff in this interval
RS	Output	R*4	1	Surface runoff
RI	Output	R*4	1	Interflow runoff
RG	Output	R*4	1	Groundwater runoff
CIN	Output	R*4	1	Total channel inflow
W	Both	R*4	1	Total tension water content
WU	Both	R*4	1	Upper zone tension water content
WL	Both	R*4	1	Lower zone tension water content
WD	Both	R*4	1	Deep zone tension water content
S	Both	R*4	1	Free water content
QI	Both	R*4	1	Interflow inflow
QG	Both	R*4	1	Groundwater inflow
FR	Both	R*4	1	Runoff area-percentage

SUBROUTINE TAB36
(TL,LEFT,IUSET,NXT,LPL,PL,LCL,TS,MTS,NWORK,LWORK,JDT)

Function: This is the Operation Table entry routine for Operation XIN-SMA.

Argument List: The arguments for this subroutine are similar to the arguments for the Operation Table entry subroutines for other Operations. A description of the arguments is contained in Section VIII.4.2-TAB.

Operation Table Array: The contents of the TL array are:

<u>Position</u>	<u>Contents</u>
1	Operation number
2	Location of the T array of the next Operation to be executed
3	Location of the parameter array for this Operation in the P array
4	Location of the carryover array for this Operation in the C array
5	Location of PE data in the D array: 0 = none used
6	Location of carryover working space in the D array
7	Location of initial carryover working space in the D array
8	Location of working space to store the sums for a month of water balance, runoff and channel inflow components in the D array
9	Location of working space to store the water balance adjustments in the D array
10+	For each sub-basin, the following two values are stored: <ul style="list-style-type: none">o location of precipitation time series data in the D arrayo location of channel inflow time series data in the D array