SWORD of Science (SoS) Results v1.0

The following details the structure (attributes, dimensions, groups, and variables) that make up the global SoS. Please see file labelled 'changelog.md' for a description of changes with each release of the SoS.

Data organization

The SoS is organized by continent following the conventions set in SWORD for the NetCDF file format.

Reach identifiers can be found in the "reaches" group and node identifiers can be found in the "nodes" group.

There are two types of the SoS, one for the WBM (unconstrained) data product and the other for GRADES and gauge (constrained) data product. The types are indicated by the directories they are nested in and are labelled 'constrained' and 'unconstrained'. The various versions of the SoS will be stored in either the 'constrained' or 'unconstrained' directories. Each run of Confluence produces a new version of the SoS which are numbered incrementally. The first version is labelled '0000' because it does not contain any result data.

This document describes the results files which are gathered from each stage and module in the Confluence workflow and stored in NetCDF groups.

Global Attributes

Name	Description	Value (if applicable)
name	Name of file (continent)	
version	Current version of the SoS	xxxx
production_date	Date the SoS file was created or modified	Date (Day-Month-Year) Time (HH:MM:SS)
run_type	Indication of constrained or unconstrained data product	"constrained" or "unconstrained"

Dimensions

Name	Description	Value (if applicable)
num_reaches	The number of reaches	
num_nodes	The number of nodes	

time_steps	The number of observations	

Variables

time		
	dimensions	time_steps
	type	int64

Groups

reaches		
nodes		
geobam	geobam/logQ geobam/logWc geobam/logQc geobam/logn_man geobam/logn_amhg	geobam/A0 geobam/b geobam/logr geobam/logWb geobam/logDB
momma		
hivdi		
metroman		
sad		
sic4dvar		
moi	moi/geobam moi/hivdi moi/metroman	moi/momma moi/sad moi/sic4dvar
postdiagnostics	postdiagnostics/basin	postdiagnostics/reach
offline		
validation		

reaches

reach_id		
	dimensions	num_reaches
	type	int64
	long_name	reach ID from prior river database
	comment	Unique reach identifier from the prior river database. The format of the identifier CBBBBBRRRRT where C = continent, B = basin, R = reach, and T = type).

nodes

reach_id		
	dimensions	None
	type	int64

	long_name	reach ID from prior river database
	comment	Unique reach identifier from the prior river database. The format of the identifier is CBBBBBRRRRT, where C=continent, B=basin, R=reach, T=type.

node_id		
	dimensions	nx
	type	int64
	long_name	node ID of the node in the prior river database
	comment	Unique node identifier from the prior river database. The format of the identifier is CBBBBBRRRRNNNT, where C=continent, B=basin, R=reach, N=node, T=type.

geobam

The geoBAM group is composed of subgroups that hold variables for each processing chain. There are three mean processing chain and three standard deviation processing chain variables per group.

The chains are labelled by numbers 1 though 3. For brevity, the three chain variables description are represented by one with an 'x' as a placeholder for the number identifier.

logQ

mean_chainx		
	dimensions	num_reaches, time_steps
	type	float
	fill_value	- 999999999999

sd_chainx		
	dimensions	num_reaches, time_steps
	type	float
	fill_value	- 999999999999

logWc

mean_chainx		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

sd_chainx

	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

logQc

mean_chainx		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

sd_chainx		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

logn_man

mean_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

sd_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

logn_amhg

mean_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

sd_chainx		
	dimensions	num_nodes
	type	float

	fill_value	- 999999999999

A0

mean_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

sd_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

b

mean_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

sd_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

logr

mean_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

sd_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

logWb

mean_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

sd_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

logDb

mean_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

sd_chainx		
	dimensions	num_nodes
	type	float
	fill_value	- 999999999999

hivdi

Q		
	dimensions	num_reaches (by num_timesteps)
	type	vlen_float
	fill_value	- 999999999999

A0		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

beta		
	dimensions	num_reaches
	type	float

	fill_value	- 999999999999

alpha		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

metroman

allq		
	dimensions	num_reaches (by num_timesteps)
	type	vlen_float
	fill_value	- 999999999999

A0hat		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

x1hat		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

q_u		
	dimensions	num_reaches (by num_timesteps)
	type	vlen_float
	fill_value	- 999999999999

momma

stage		
	dimensions	num_reaches by time_steps
	type	vlen_float
	fill_value	- 999999999999

width		
	dimensions	num_reaches by time_steps
	type	vlen_float

	fill_value	- 999999999999

slope		
	dimensions	num_reaches by time_steps
	type	vlen_float
	fill_value	- 999999999999

Qgage		
	dimensions	num_reaches by time_steps
	type	vlen_float
	fill_value	- 999999999999

seg		
	dimensions	num_reaches by time_steps
	type	vlen_float
	fill_value	- 999999999999

n		
	dimensions	num_reaches by time_steps
	type	vlen_float
	fill_value	- 999999999999
Y		
	dimensions	num_reaches by time_steps
	type	vlen_float
	fill_value	- 999999999999

v		
	dimensions	num_reaches by time_steps
	type	vlen_float
	fill_value	- 999999999999

Q		
	dimensions	num_reaches by time_steps
	type	vlen_float
	fill_value	- 999999999999

Q_constrained

	dimensions	num_reaches by time_steps
	type	vlen_float
	fill_value	- 999999999999

gage_constrained		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

input_MBL_prior		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

input_Qm_prior		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

input_Qb_prior		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

input_Yb_prior		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

input_known_ezf		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

input_known_bkfl_stage		
	dimensions	num_reaches
	type	float

	fill_value	- 999999999999

input_known_nb_seg1		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

input_known_x_seg1		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

Qgage_constrained_nb_seg1		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

Qgage_constrained_x_seg1		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

input_known_nb_seg2		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

input_known_x_seg2		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

Qgage_constrained_nb_seg2		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

Qgage_constrained_x_seg2		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

n_bkfl_QB_prior		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

n_bkfl_final_used		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

vel_bkfl_Qb_prior		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

vel_bkfl_diag_MBL		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

Froude_bkfl_diag_Smean		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

width_bkfl_empirical		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

width_bkfl_solved_obs		
	dimensions	num_reaches

	type	float
	fill_value	- 999999999999

depth_bkfl_solved_obs		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

depth_bkfl_diag_MBL		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

depth_bkfl_diag_Wb_Smean		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

zero_flow_stage		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

bankfull_stage		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

Qmean_prior		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

Qmean_momma		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

Qmean_momma.constrained		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

sad

A0		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

n		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

Qa		
	dimensions	num_reaches (by time_steps)
	type	vlen_float

Q_u		
	dimensions	num_reaches (by time_steps)
	type	vlen_float

sic4dvar

A0		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

n		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

Qalgo31		
	dimensions	num_reaches (by time_steps)
	type	vlen_float

Qalgo5		
	dimensions	num_reaches (by time_steps)
	type	vlen_float

elevation		
	dimensions	num_nodes
	type	vlen_float

half_width		
	dimensions	num_nodes
	type	vlen_float

moi

The moi group is made up of several subgroups (one for each reach-level FLPE algorithm).

geobam

q		
	dimensions	num_reaches (by num_timesteps)
	type	vlen_float
	fill_value	- 999999999999

a0		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

n		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

qbar_reachScale		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

qbar_basinScale		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

hivdi

q		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

Abar		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

alpha		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

beta		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

qbar_reachScale		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

qbar_basinScale		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

metroman

q		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

Abar		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

na		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

x1		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

qbar_reachScale		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

qbar_basinScale		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

momma

q		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

B		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

H		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

Save		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

qbar_reachScale		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

qbar_basinScale		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

sad

q		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

a0		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

n		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

qbar_reachScale		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

qbar_basinScale		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

sic4dvar

q		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

a0		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

n		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

qbar_reachScale		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

qbar_basinScale		
	dimensions	num_reaches
	type	float
	fill_value	- 999999999999

offline

d_x_area		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

d_x_area_u		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

metro_q_c		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

bam_q_c		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

hivdi_q_c		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

momma_q_c		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

sads_q_c		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

consensus_q_c		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

metro_q_uc		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

bam_q_uc		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

hivdi_q_uc		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

momma_q_uc		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

sads_q_uc

	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

consensus_q_uc		
	dimensions	num_reaches (by time_steps)
	type	vlen_float
	fill_value	- 999999999999

prediagnostics

The postdiagnostics group is made up of two subgroups, one for reach-level diagnostic data and one for node-level diagnostics data

reach

ice_clim_f		
	dimensions	num_reaches
	type	vlen_int
	fill_value	-999

ice_dyn_f		
	dimensions	num_reaches
	type	vlen_int
	fill_value	-999

dark_frac		
	dimensions	num_reaches
	type	vlen_int
	fill_value	-999

n_good_nod		
	dimensions	num_reaches
	type	vlen_int
	fill_value	-999

obs_frac_n		
	dimensions	num_reaches
	type	vlen_int

	fill_value	-999

width_outliers		
	dimensions	num_reaches
	type	vlen_int
	fill_value	-999

wse_outliers		
	dimensions	num_reaches
	type	vlen_int
	fill_value	-999

slope2_outliers		
	dimensions	num_reaches
	type	vlen_int
	fill_value	-999

node

ice_clim_f		
	dimensions	num_reaches
	type	vlen_int
	fill_value	-999

ice_dyn_f		
	dimensions	num_reaches
	type	vlen_int
	fill_value	-999

dark_frac		
	dimensions	num_reaches
	type	vlen_int
	fill_value	-999

width_outliers		
	dimensions	num_reaches
	type	vlen_int

	fill_value	-999

wse_outliers		
	dimensions	num_reaches
	type	vlen_int
	fill_value	-999

slope2_outliers		
	dimensions	num_reaches
	type	vlen_int
	fill_value	-999

priors

The priors group records the results of the priors module which overwrites GRADES data with gage data for the constrained data product run.

Dimensions

Name	Description	Value (if applicable)
num_months	Number of months	
probability	Number of probability values	
num_overwritten	Number of GRADES priors that have been overwritten	
nchar	Number of characters	

Variables

num_months		
	dimensions	num_months
	type	int
	units	month

probability		
	dimensions	scalar
	type	int
	long_name	flow_Duration_curve_probability

	units	percentage
	comment	probability values from the flow duration curve for this cell
	fill_value	- 999

flow_duration_q		
	dimensions	num_reaches by probability
	type	float
	long_name	flow_Duration_curve_discharge
	units	m^3/s
	comment	discharge values from the flow duration curve for this cell
	fill_value	- 999999999999

max_q		
	dimensions	num_reaches
	type	float
	long_name	maximum_discharge
	units	m^3/s
	comment	highest discharge value in this cell
	fill_value	- 999999999999

monthly_q		
	dimensions	num_reaches by num_months
	type	float
	long_name	mean_monthly_discharge
	units	m^3/s
	comment	monthly mean discharge time series in this cell
	fill_value	- 999999999999

mean_q		
	dimensions	num_reaches
	type	float
	long_name	mean_discharge
	units	m^3/s
	comment	mean discharge value in this cell
	fill_value	- 999999999999

min_q		
	dimensions	num_reaches
	type	float
	long_name	minimum_discharge
	units	m^3/s
	comment	lowest discharge value in this cell
	fill_value	- 999999999999

two_year_return_q		
	dimensions	num_reaches
	type	float
	long_name	two_Year_Return
	units	m^3/s
	comment	two-year return interval discharge value in this cell
	fill_value	- 999999999999

comid (GRADES ONLY)		
	dimensions	num_reaches
	type	int64
	long_name	COMID

	fill_value	-999

overwritten_indexes		
	dimensions	num_overwritten
	comment	Indexes of GRADES priors that were overwritten

overwritten_source		
	dimensions	num_overwritten by nchar
	comment	Source of gage data that overwrote GRADES priors

postdiagnostics

The postdiagnostics group is made up of two subgroups, one for reach-level diagnostic data and one for basin-level diagnostics data.

Dimensions

Name	Description	Value (if applicable)
num_algos	Number of algorithms postdiagnostics was run for	
nchar	Maximum length of algorithm name	

Variables

num_algos		
	dimensions	num_algos
	type	int

algo_names		
	dimensions	num_algos by nchar
	type	char

basin

realism_flags		
	dimensions	num_reaches by num_algos

	type	int
	fill_value	-999

stability_flags		
	dimensions	num_reaches by num_algos
	type	int
	fill_value	-999

prepost_flags		
	dimensions	num_reaches by num_algos
	type	int
	fill_value	-999

reach

realism_flags		
	dimensions	num_reaches by num_algos
	type	int
	fill_value	-999

stability_flags		
	dimensions	num_reaches by num_algos
	type	int
	fill_value	-999

validation

Dimensions

Name	Description	Value (if applicable)
num_algos	Number of algorithms validated	
nchar	Maximum length of algorithm name	

Variables

algo_names		
	dimensions	num_reaches, num_algos, nchar
	type	char

has_validation		
	dimensions	num_reaches
	type	int
	fill_value	-999

nse		
	dimensions	num_reaches, num_algos
	type	float
	fill_value	- 999999999999

rsq		
	dimensions	num_reaches, num_algos
	type	float
	fill_value	- 999999999999

kge		
	dimensions	num_reaches, num_algos
	type	float
	fill_value	- 999999999999

rmse		
	dimensions	num_reaches, num_algos
	type	float
	fill_value	- 999999999999

testn		
	dimensions	num_reaches, num_algos
	type	float
	fill_value	- 999999999999