

CVPM

Version 1 Modeling System User's Guide

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1 Overview

2 The CVPM Portal

Configuration File

<u>Variable Names</u>	<u>Sample Values</u>	<u>Description</u>
wdir	'~/CVPM'	working directory
coordinate_system	'Z'	1-D vertical
	'XZ'	2-D cartesian
	'YZ'	2-D cartesian
	'XYZ'	3-D cartesian
	'R'	1-D radial
	'RZ'	2-D cylindrical
Gopt	1	Zlayers file is located in 'wdir/geo/' (text format)
	2	Zlayers file is located in 'wdir/geo/' (matlab format)
	3	Zlayers file is located in 'wdir/tmp/' (matlab format)
Ropt	1	run CPS on one or more files
	2	run CVPM on one or more files
	3	run CPS and CVPM on one or more files
experiment	'TLK_qb40_m2p1'	namelist file for simulation #1
	'TLK_qb50_m2p7'	namelist file for simulation #2
	'TLK_qb52_m2p5'	namelist file for simulation #3

3 CVPM Preprocessing (CPS)

Namelist File, 1-D Vertical Case

<u>Variable Names</u>	<u>Sample Values</u>	<u>Description</u>
planet	'earth', 'mars',	planet
site	'ESN',	simulation site
coordinate_system	'Z',	coordinate system
min_Z, max_Z	0, 1000,	model domain limits (unit: m)
time_units	'years' 'months' 'weeks' 'days' 'seconds'	time units
start_time, end_time	1970, 2015,	simulation start and end times (unit: time_units)
computational_time_step	0.01,	computational time step (unit: time_units)
output_interval	1,	output interval (unit: time_units)
initT_opt	1, 2, 3,	input initial temperature field from a file calculate initial temperature field assuming a steady-state use an analytic solution for the initial temperature field
initial_condition_file	'ESN_1970',	name of initial temperature file (initT_opt = 1)
upperBC_type, upperBC_file	'T', 'Ts_ESN.mat',	upper boundary condition type and file name BCtype = 'T': prescribed temperature BCtype = 'q': prescribed heat flux
lowerBC_type, lowerBC_file	'q', 'qb_60.txt',	lower boundary condition type and file name BCtype = 'T': prescribed temperature BCtype = 'q': prescribed heat flux
source_function_opt	'zero', 'linear', 'exponential',	heat-source function: $S(z) = 0$ heat-source function: $S(z) = S_0 (1 - z/h_s)$ heat-source function: $S(z) = S_0 \exp(-z/h_s)$
compaction_function_opt	'off', 'linear', 'exponential',	compaction function: $\phi(z) = \phi_0$ compaction function: $\phi(z) = \phi_0 (1 - z/h_c)$ compaction function: $\phi(z) = \phi_0 \exp(-z/h_c)$
pressure_opt	'off' 'hydrostatic' 'lithostatic'	turn freezing-point pressure effects off freezing-point pressure effects = hydrostatic freezing-point pressure effects = lithostatic
solute	'NaCl'	chemical formula of pore-water solute
implicit_factor	0.8,	implicit/explicit factor 0: fully explicit 1: fully implicit

4 CVPM Model

5 Post-Processing Programs

6 Utilities and Tools

7 Appendix

Solute molality and mole fraction: The molality of a solute is the number of moles of solute per kilogram of water. Suppose we have 4.9 g of NaCl dissolved in one kilogram of water (4.9 ppt, parts-per-thousand). Since NaCl has a molecular weight of 58.44 g/mol, 4.9 g of NaCl is equivalent to 0.0838 moles of solute per kg of water. Thus, the molality of the solute is 0.0838.

Since NaCl breaks into two solutes (Na and Cl), the total moles of solutes is 2 times the number of moles of NaCl, or 0.1676. Thus, the mole fraction of solutes in 4.9 g of NaCl dissolved in one kg of water is,

$$x_s = \frac{0.1676}{0.1676 + 55.508} \approx 0.0030 \quad (1)$$

where the number of moles of water in a kilo of water is 55.508.