A-5 Code

The following extra material reflects the structure of the code.

A-5-1 Variable names code and text

Names for variables in code and text

Code	Text	Name	Unit
phi_i	ϕ_i	Ice volume fraction	-
c	$\hat{c}$	Condensation rate	$\mathrm{kgm^{-3}s^{-1}}$
v_i	v_i	Settling velocity of the ice	$\mathrm{ms^{-1}}$
v_iso	v_{iso}	Isolated settling velocity of the ice	$\mathrm{ms^{-1}}$
v_dz	$\frac{dv_i}{dz}$	Derivative if settling velocity	$\mathrm{s^{-1}}$
rho_eff	ρ_{eff}	Snow density	$\mathrm{kgm^{-3}}$
rho_i	ρ_i	Ice density if ϕ_i=1	$\mathrm{kgm^{-3}}$
rho_a	ρ_a	Density of air	$\mathrm{kgm^{-3}}$
rho_T	ρ_v^{eq}	Water vapor saturation density	$\mathrm{kgm^{-3}}$
T	T	Temperature	K
T_prev	-	Temperature of previous iteration	K
T_ref	T_{ref}	Reference temperature	K
bc_1	T_{top}	Temperature at the top of the snowpack, fixed	K
bc_0	T_{bot}	Temperature at the bottom of the snowpack, fixed	K
T_fus	T_{fus}	Melting temperature of water	K
coord	z	Depth coordinates	$\mathrm{ms^{-1}}$
Z	Z	Total height of snowpack	$\mathrm{ms^{-1}}$
nz	nz	Total number of nodes	-
g	g	Gravitational acceleration	$\mathrm{ms^{-2}}$
L	L	Latent heat of sublimation of ice	$\mathrm{Jkg^{-1}}$
sigma	σ	Vertical stress	$\mathrm{kgm^{-1}s^{-2}}$
sigma0	σ_0	Vertical stress at the ground	$\mathrm{kgm^{-1}s^{-2}}$
sigma_Dz	$\sigma_{\Delta z_k}$	Contribution of respective layer to total vertical stress	$\mathrm{kgm^{-1}s^{-2}}$
sigmacum	σ_k	Vertical stress at height z=k	$\mathrm{kgm^{-1}s^{-2}}$
D_eff	D_{eff}	Effective water vapor diffusion constant in snow	$\mathrm{m^2s^{-1}}$
D0	D_0	Vapor diffusion constant in air	$\mathrm{m^2s^{-1}}$
rhoC_eff	$(\rho C)_{eff}$	Effective volumetric heat capacity in snow	$\mathrm{Jm^{-3}K^{-1}}$
C_a	C_a	Specific heat of air	$\mathrm{Jkg^{-1}K^{-1}}$
C_i	C_i	Specific heat of ice	$\mathrm{Jkg^{-1}K^{-1}}$

Continuation of: Names for variables in code and text

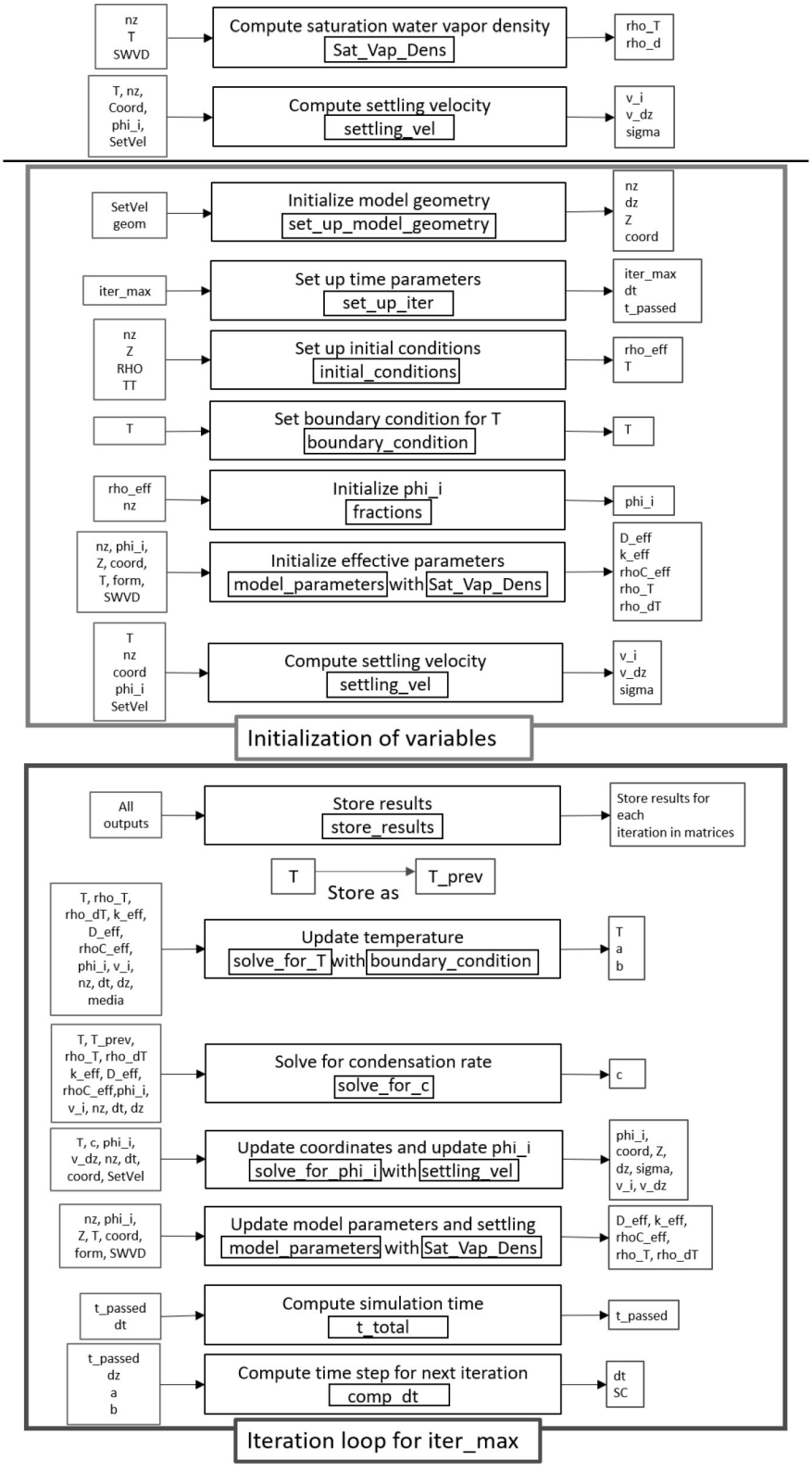
Code	**Text**	**Name**	**Unit**
k_eff	k_{eff}	Effective thermal conductivity of snow	$\mathrm{Wm^{-1}K^{-1}}$
k_a	k_a	Effective thermal conductivity of air at ϕ_i= 0	$\mathrm{Wm^{-1}K^{-1}}$
k_i	k_i	Effective thermal conductivity of ice atϕ_i = 1	$\mathrm{Wm^{-1}K^{-1}}$
mH2O	m_{H_2O}	Mass of a water molecule	kg
kB	k_B	Boltzmann's constant	$\mathrm{JK^{-1}}$
R_v	R	Water vapor gas constant	$\mathrm{Jkg^{-1}K^{-1}}$
eta	η	Snow viscosity	$\mathrm{kgs^{-1}m^{-1}}$
etatest1	-	Constant snow viscosity	$\mathrm{kgs^{-1}m^{-1}}$
dt	Δt	Time step	s
SC	MF	Mesh fourier number	-
iter_max	-	Maximum number of iterations	-

A-5-2 Important commands

Commands to set initial conditions, activate settling velocity, and choose equations for effective parameters and saturation water vapor density

Command	**Possible inputs**	**Name**	**Relevant function**
geom	1, 2, 3	Initial model geometry	set_up_model_geometry
TT	1, 2, 3, 4, 5	Initial temperature profile	initial_conditions
RHO	1, 2, 3, 4, 5	Initial effective snow density	initial_conditions
media	'hom'; 'het'	Media	model_parameters, solve_for_T
SWVD	'Loewe'; 'Hansen'; 'Calonne'	Saturation water vapor density equation	Sat_Vap_Dens
SetVel	'Y' ; 'N'	Incorporation of settling	settling_vel
form	'Loewe'; 'Hansen'	Define effective parameters	model_parameters

A-5-3 Overview of computational steps and respective functions in the code



Overview of computational steps associated with their respective functions (black boxes) in the code. The inputs are specified on the left hand side and the outputs are specified on the right hand side.