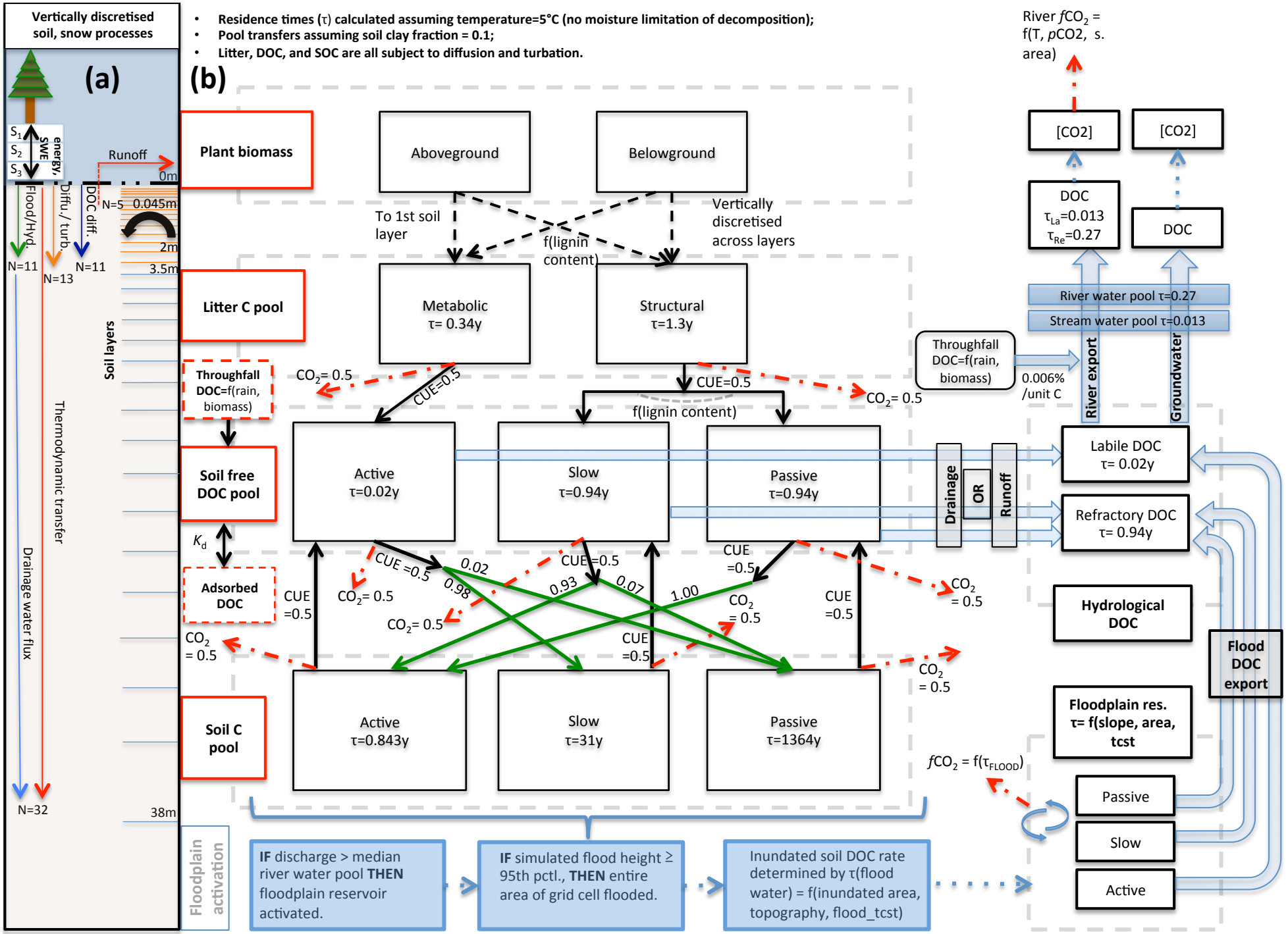
Vertically discretised soil, snow processes
(a)
S1
S2
S3
energy, SWE
Runoff
0m
N=5
0.045m
2m
3.5m
Flood/Hyd.
Diffu./ turb.
DOC diff.
N=11
N=13
N=11
Soil layers
Thermodynamic transfer
Drainage water flux
N=32
38m
Residence times (τ) calculated assuming temperature=5°C (no moisture limitation of decomposition);
Pool transfers assuming soil clay fraction = 0.1;
Litter, DOC, and SOC are all subject to diffusion and turbation.
(b)
Plant biomass
Aboveground
Belowground
To 1st soil layer
f(lignin content)
Vertically discretised across layers
Litter C pool
Metabolic τ= 0.34y
Structural τ=1.3y
Throughfall DOC=f(rain, biomass)
CO2= 0.5
CUE=0.5
CUE=0.5
f(lignin content)
CO2= 0.5
Soil free DOC pool
Active τ=0.02y
Slow τ=0.94y
Passive τ=0.94y
Kd
Adsorbed DOC
CUE =0.5
CO2= 0.5
CUE =0.5
0.02
0.98
CO2= 0.5
CUE =0.5
0.93
0.07
1.00
CUE =0.5
CO2 = 0.5
CUE =0.5
CO2 = 0.5
CO2 = 0.5
CO2 = 0.5
Soil C pool
Active τ=0.843y
Slow τ=31y
Passive τ=1364y
Drainage
OR
Runoff
River fCO2 = f(T, pCO2, s. area)
[CO2]
[CO2]
DOC τLa=0.013 τRe=0.27
DOC
River water pool τ=0.27
Stream water pool τ=0.013
Throughfall DOC=f(rain, biomass)
0.006% /unit C
River export
Groundwater
Labile DOC τ= 0.02y
Refractory DOC τ= 0.94y
Hydrological DOC
Flood DOC export
Floodplain res. τ= f(slope, area, tcst
fCO2 = f(τFLOOD)
Passive
Slow
Active
Floodplain activation
IF discharge > median river water pool THEN floodplain reservoir activated.
IF simulated flood height ≥ 95th pctl., THEN entire area of grid cell flooded.
Inundated soil DOC rate determined by τ(flood water) = f(inundated area, topography, flood_tcst)