Global Simulation Period

ts 1	ts 2	ts 3	ts 4	ts 5	ts 6	ts 7	ts 8	ts 9	ts 10	ts 11	ts 12	ts 13	ts 14	...	ts n

Local Simulation Period

	elem 1	elem 2	elem 3	elem 4	elem 5	elem 6	elem 7	elem 8	elem 9	elem 10	elem 11	elem 12	elem 13	elem 14		elem n
ts 1																
ts 2																
ts 3																
ts 4																
ts 5																
ts 6																
ts 7																
ts 8																
ts 9																
ts 10																
ts 11																
ts 12																
ts 13																
ts 14																
...																
ts n																

GW Model Run (ts n-1)

SW Model Run (ts n-1)

GW heads

SW levels

P   E T   G H D

GWSWEX Model

GW discharges

SW discharges

GW Model
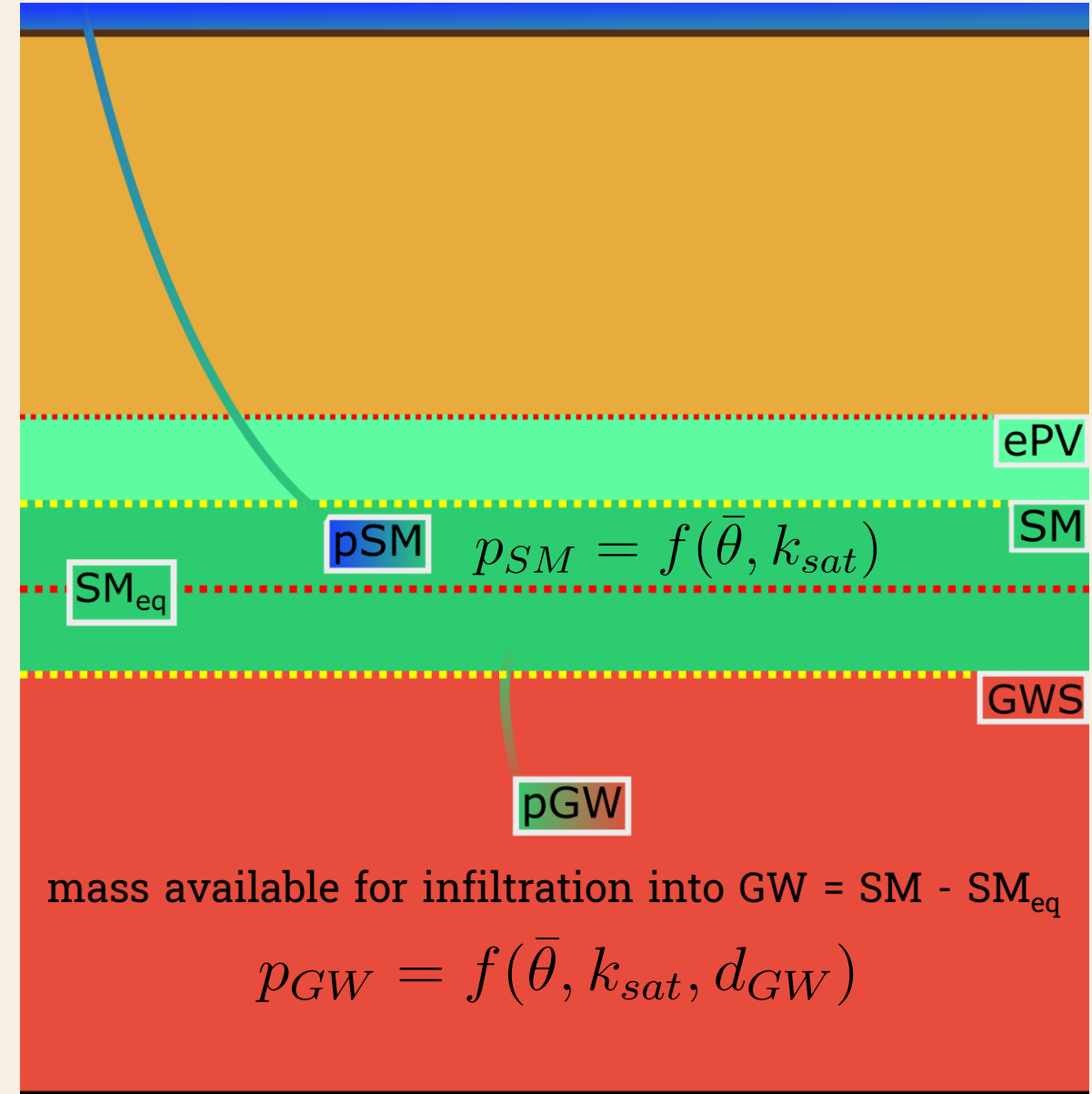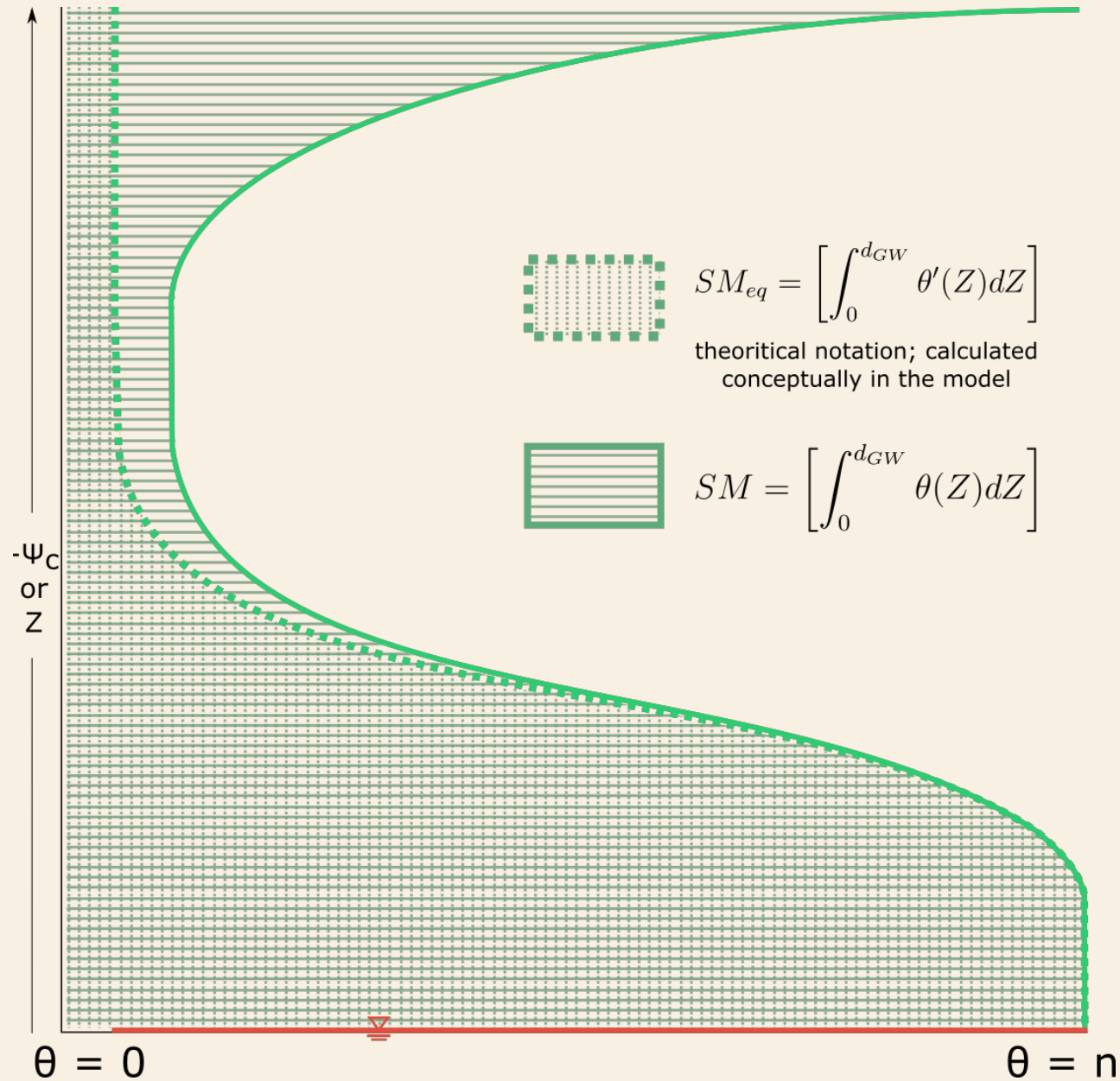
SW Model

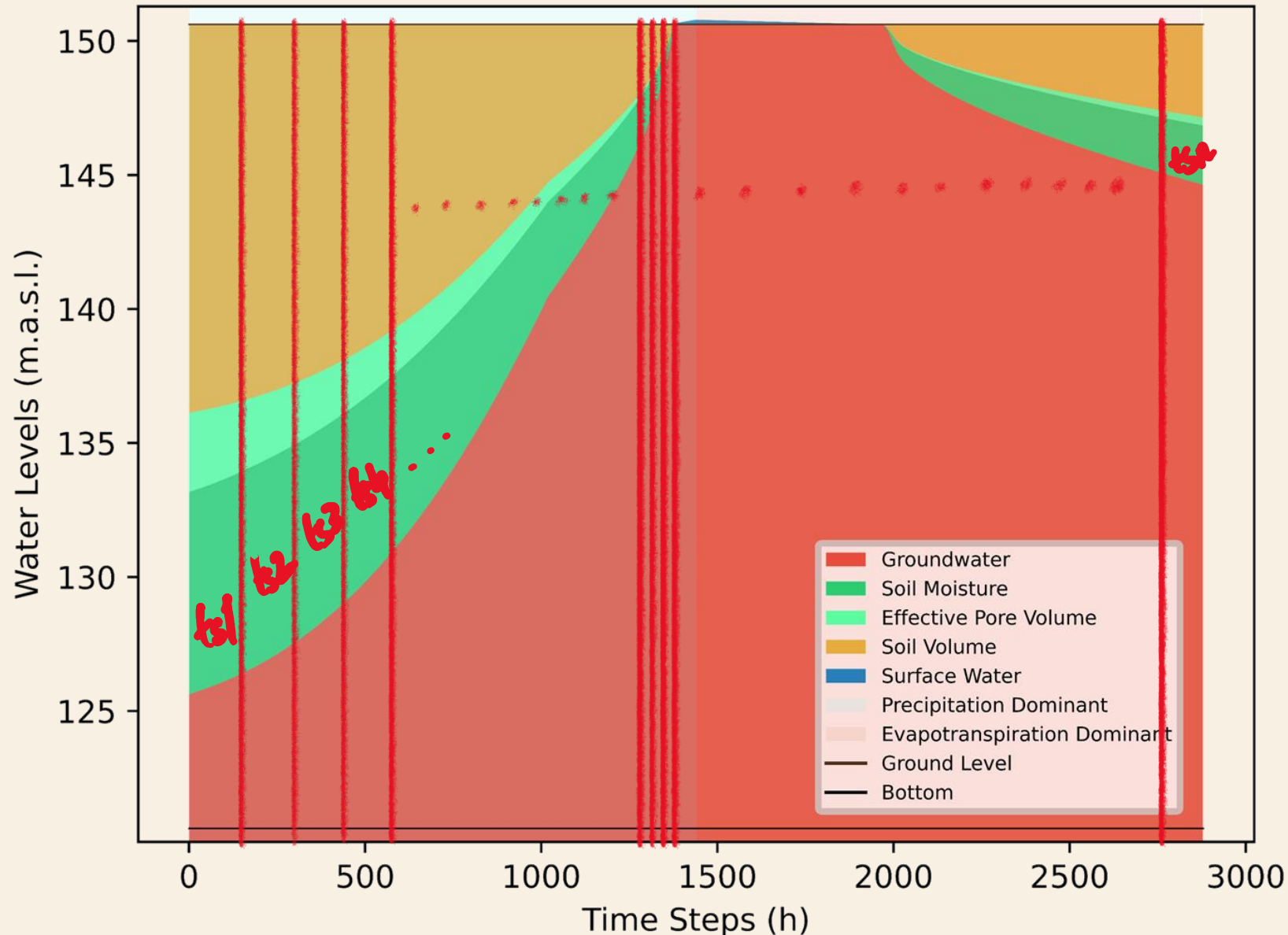# Illustration of the exchange processes per model element: GWSWEX
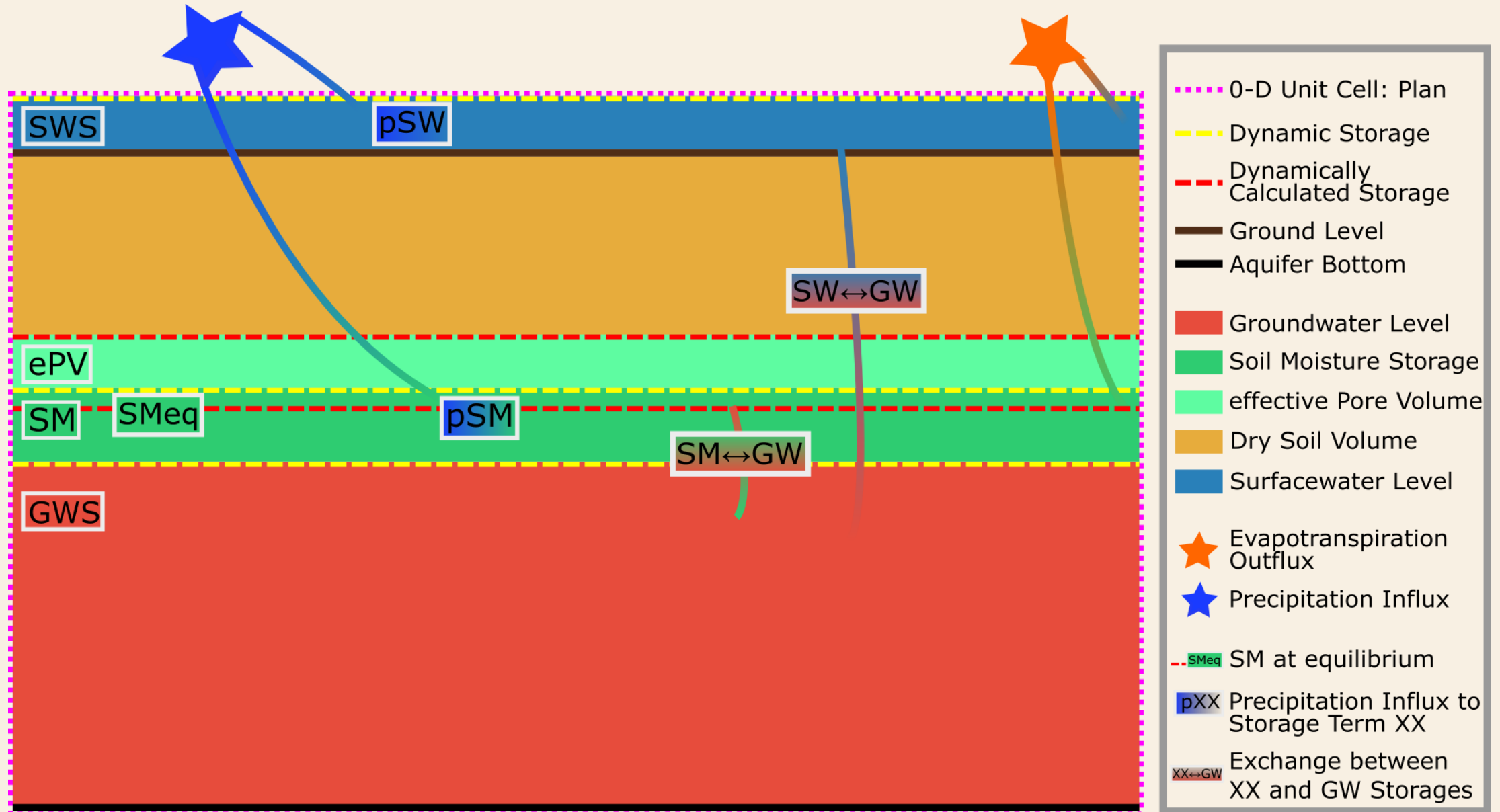
Model Physics: conceptualizing the Van Genuchten[10] – Mualem Model[11]

$$SM_{eq} = \left[\int_0^{d_{GW}} \theta'(Z)dZ \right]$$

theoritical notation; calculated conceptually in the model

$$SM = \left[\int_0^{d_{GW}} \theta(Z)dZ \right]$$

$-\Psi_C$ or Z

$\theta = 0$ $\theta = n$

ePV

pSM $p_{SM} = f(\bar{\theta}, k_{sat})$ SM

SM_{eq}

GWS

pGW

mass available for infiltration into GW = SM - SM_{eq}

$$p_{GW} = f(\bar{\theta}, k_{sat}, d_{GW})$$

4

Model Behaviour: Sample model element

- Buildable as a standalone Fortran 90 program or as a python importable Fortran module (f2py)

- Average **execution time** for a model with *10,000 model elements, and 3000 time-steps* is **~90 min** with no parallelization

- Parallelization can drastically reduce runtimes