5

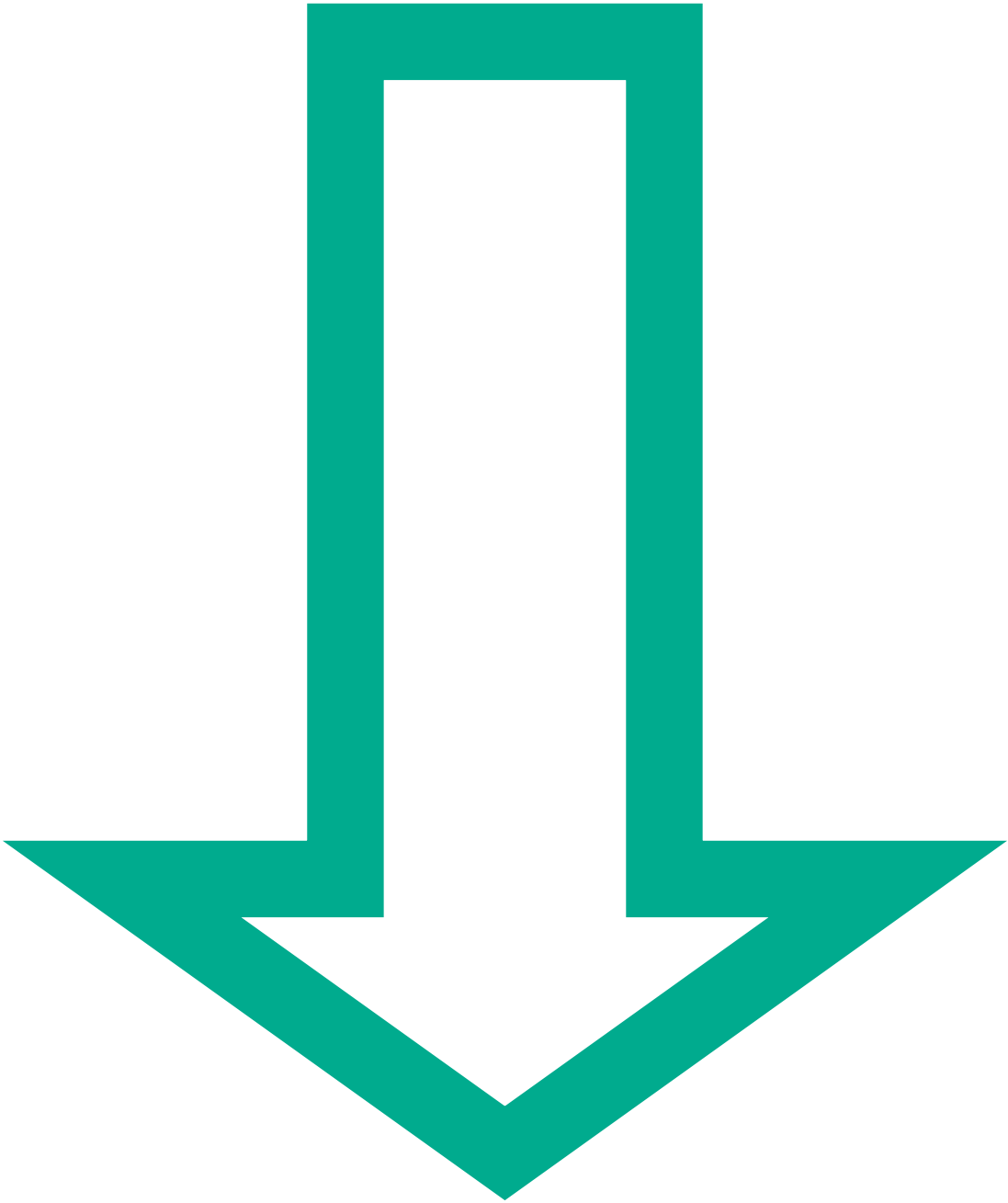
- Neighboring valves are brought closer to breaking: cascading interaction.

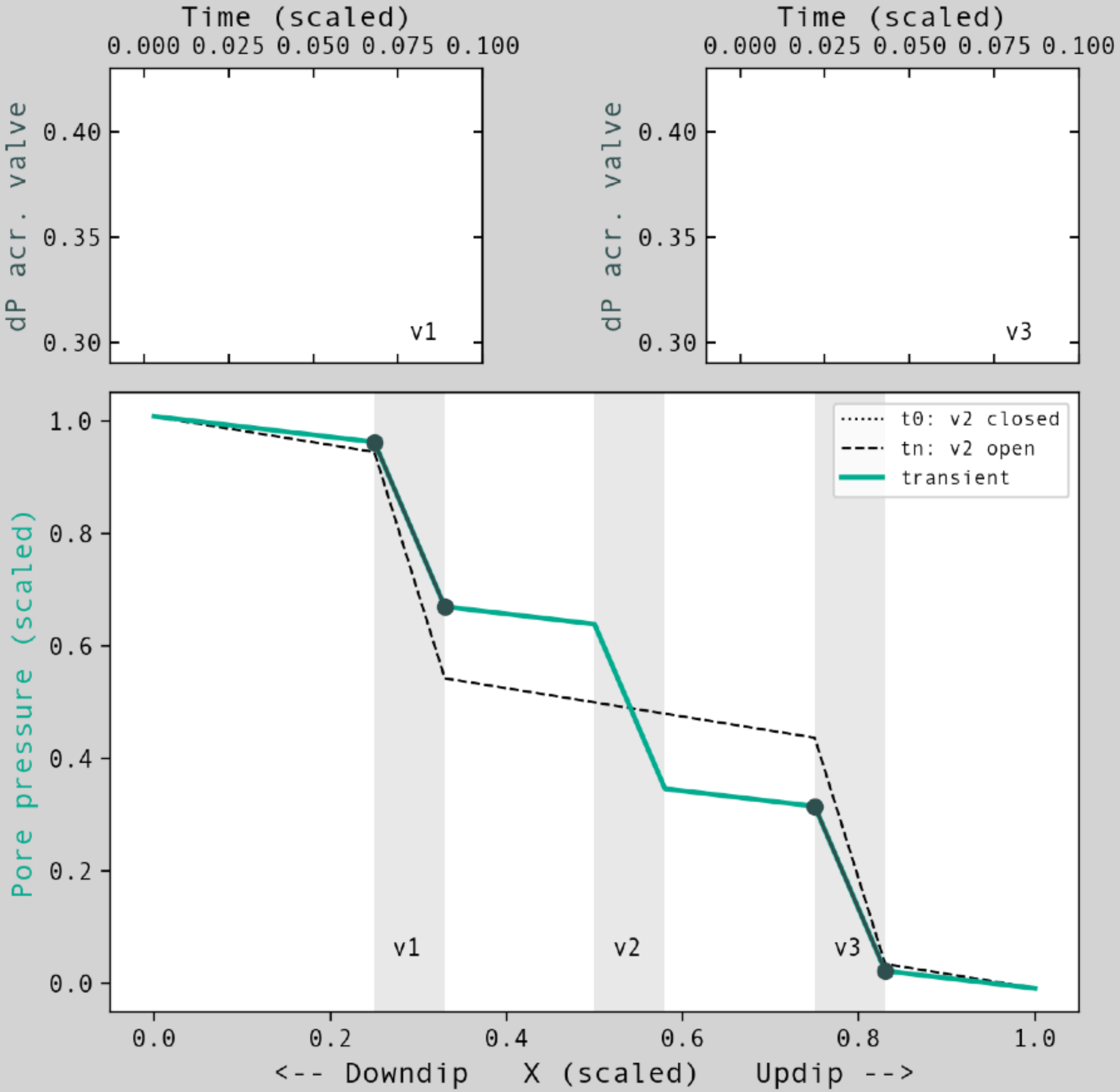
In our 1D, fluid-saturated, permeable fault zone, pore-pressure diffuses.

Valves interact through pore-pressure transients

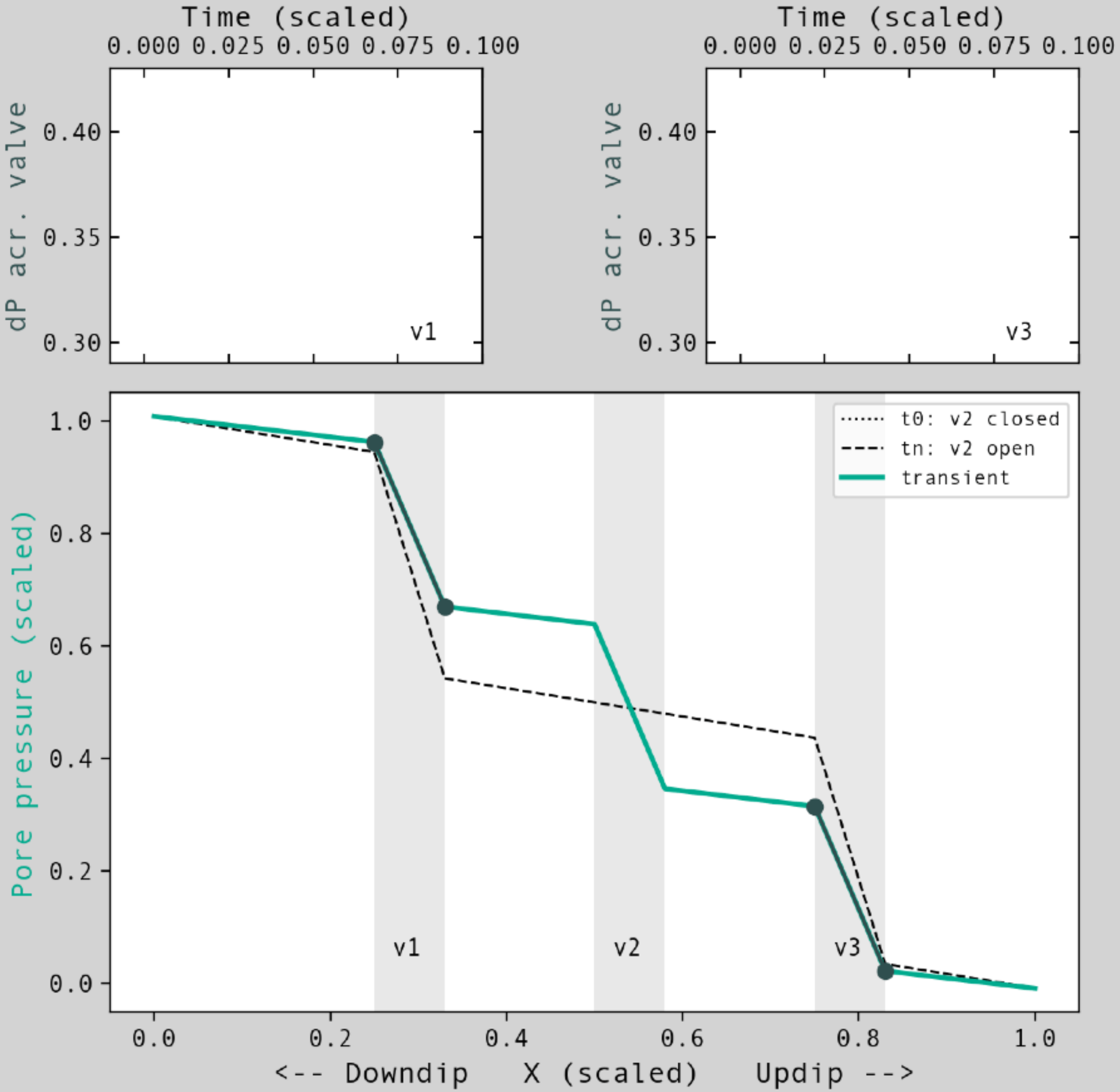
When a valve breaks open:

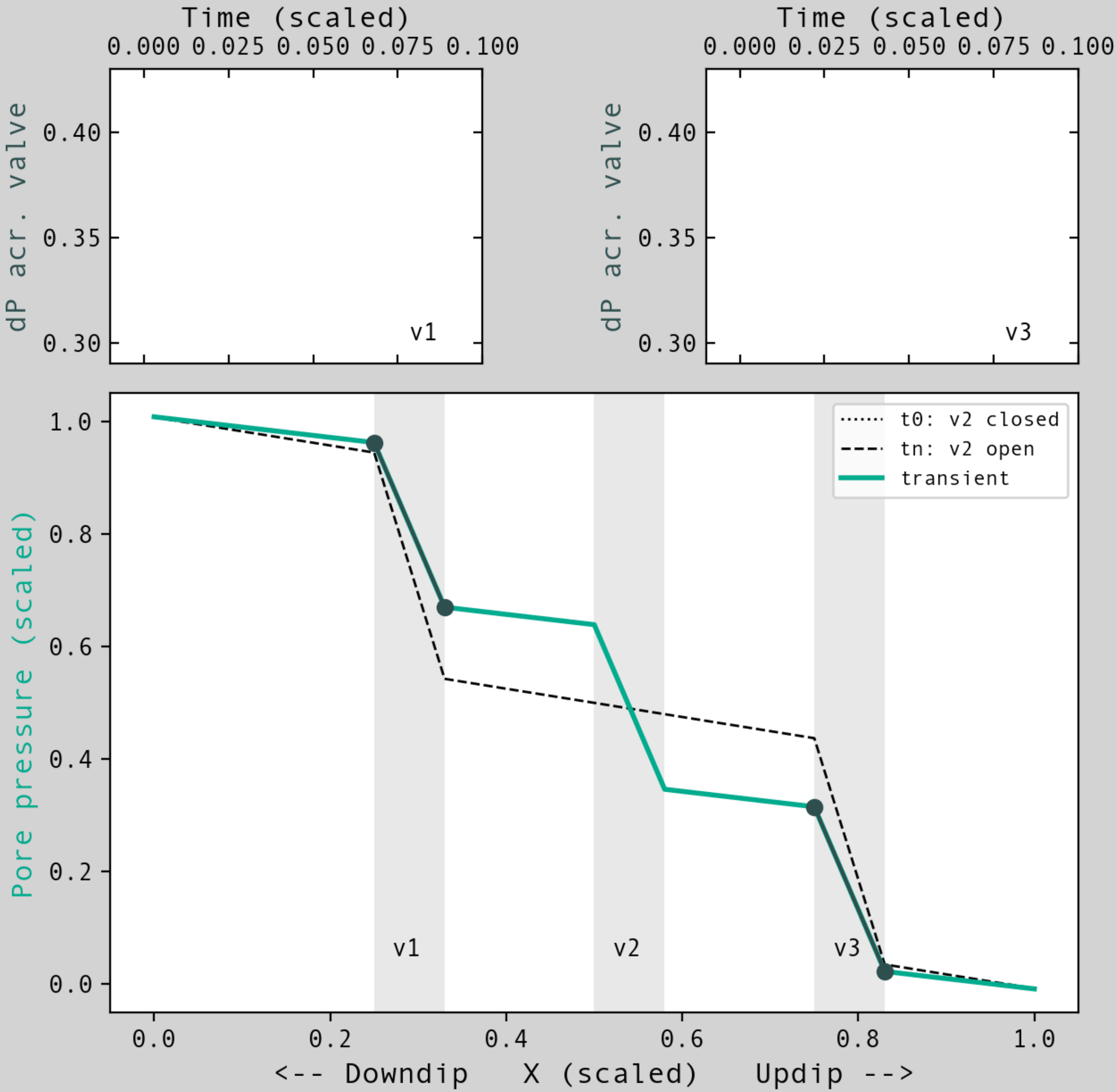
- A pore-pressure transient propagates to neighboring valves




Time (scaled)
0.000 0.025 0.050 0.075 0.100
dP acr. valve
0.40
0.35
0.30
v1
Time (scaled)
0.000 0.025 0.050 0.075 0.100
dP acr. valve
0.40
0.35
0.30
v3
t0: v2 closed
tn: v2 open
transient
Pore pressure (scaled)
1.0
0.8
0.6
0.4
0.2
0.0
v1
v2
v3
0.0
0.2
0.4
0.6
0.8
1.0
<-- Downdip X (scaled) Updip -->

^ Click on the animation to run it! ^


Time (scaled)
0.000 0.025 0.050 0.075 0.100
dP acr. valve
0.40
0.35
0.30
v1
Time (scaled)
0.000 0.025 0.050 0.075 0.100
dP acr. valve
0.40
0.35
0.30
v3
t0: v2 closed
tn: v2 open
transient
Pore pressure (scaled)
1.0
0.8
0.6
0.4
0.2
0.0
v1
v2
v3
0.0
0.2
0.4
0.6
0.8
1.0
<-- Downdip X (scaled) Updip -->


Time (scaled)
0.000 0.025 0.050 0.075 0.100
dP acr. valve
0.40
0.35
0.30
v1
Time (scaled)
0.000 0.025 0.050 0.075 0.100
dP acr. valve
0.40
0.35
0.30
v3
Pore pressure (scaled)
1.0
0.8
0.6
0.4
0.2
0.0
t0: v2 closed
tn: v2 open
transient
v1
v2
v3
0.0
0.2
0.4
0.6
0.8
1.0
<-- Downdip X (scaled) Updip -->

Valves interact through pore-pressure transients

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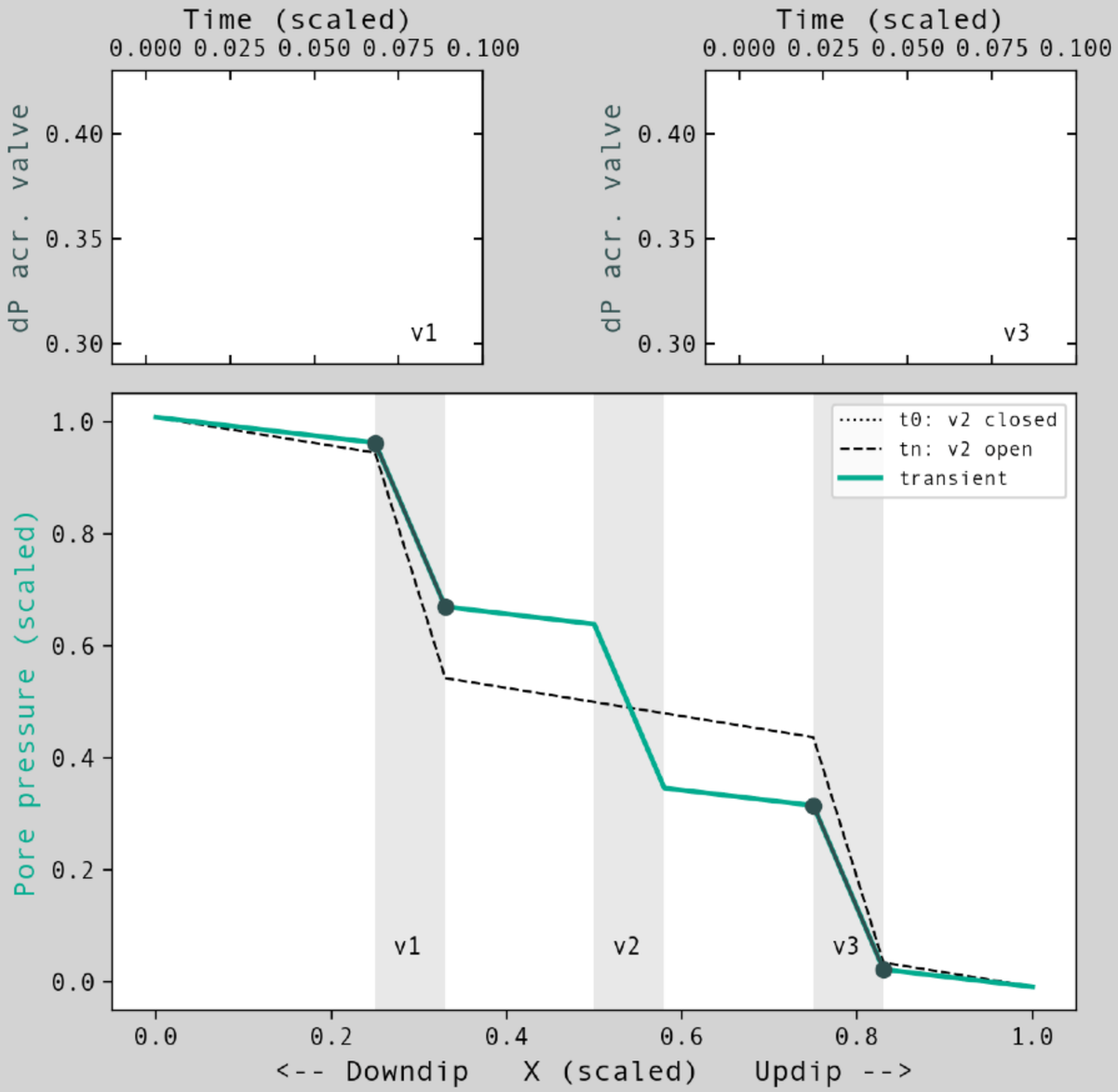
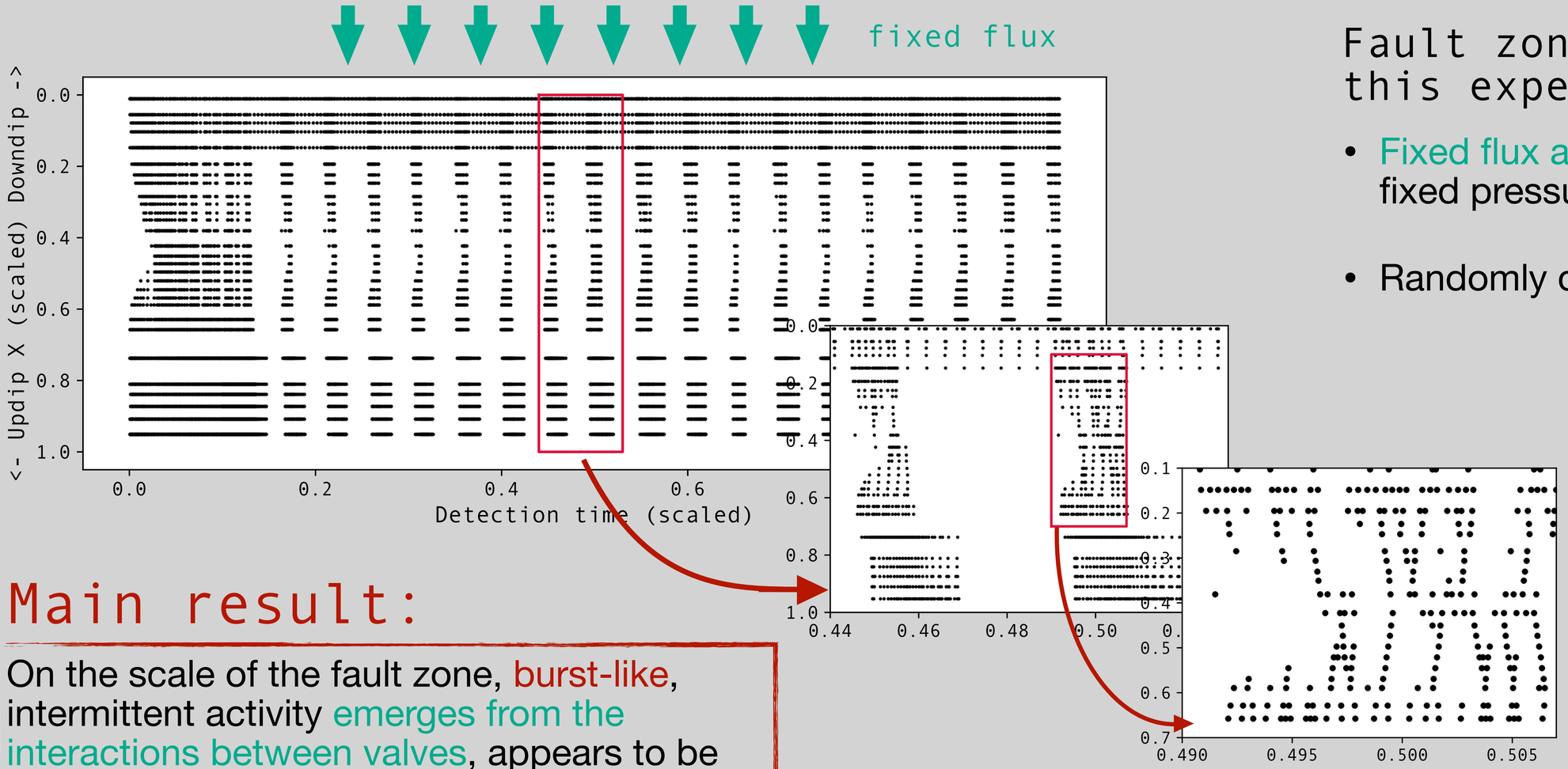


^ Click on the animation to run it! ^

Burst-like patterns of activity emerge from interactions



Fault zone in this experiment:

- Fixed flux at the downdip end, fixed pressure at the updip end
- Randomly distributed valves

Main result:

On the scale of the fault zone, burst-like, intermittent activity emerges from the interactions between valves, appears to be quasi-periodic.