Universiteit Utrecht
Faculty of Geosciences
River and delta morphodynamics

The effects of sea-level rise on estuary morphology in dredged and undredged systems

Rivers2Morrow
Researching the Future of our Rivers

EGU 2022

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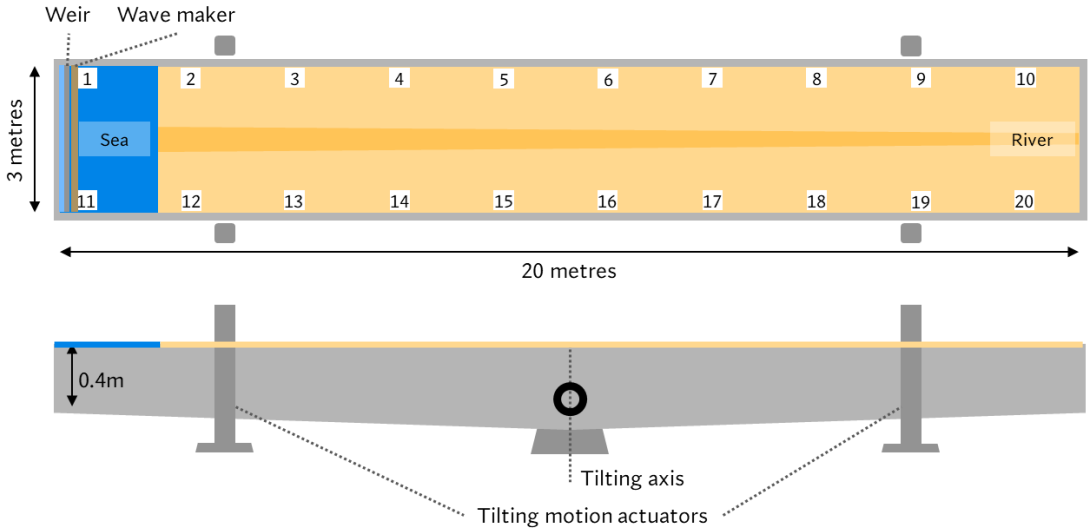
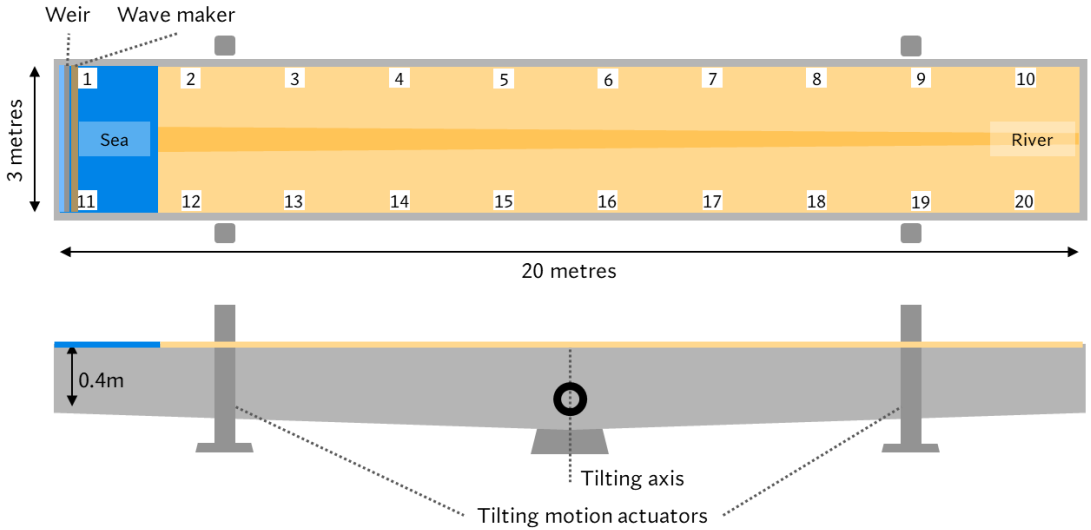
Experiments at the Metronome



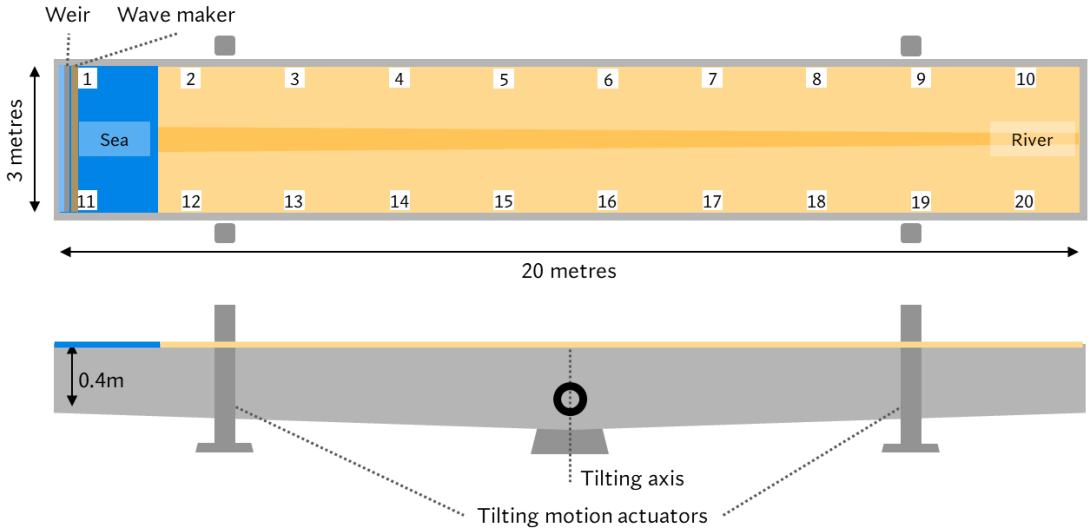
Experiments at the Metronome

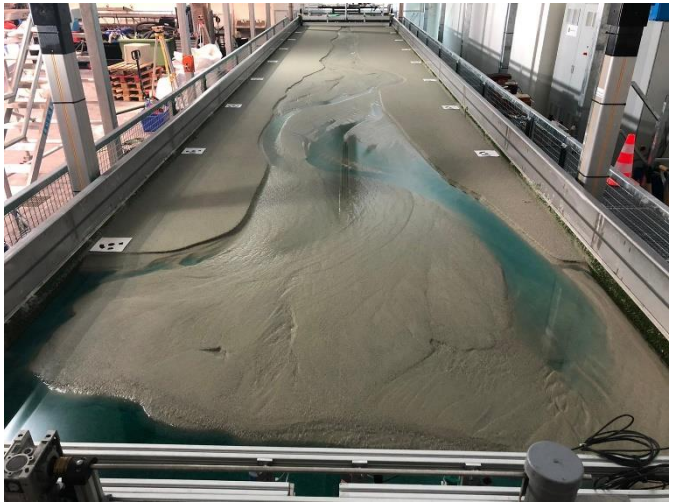


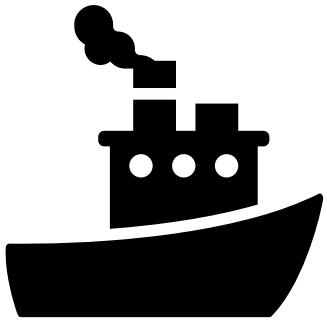
4 experiments:

1. *Natural sandy estuary*
2. *+ dredging*
3. **+ sea-level rise (SLR)**
4. **+ dredging + SLR**

Experiments at the Metronome

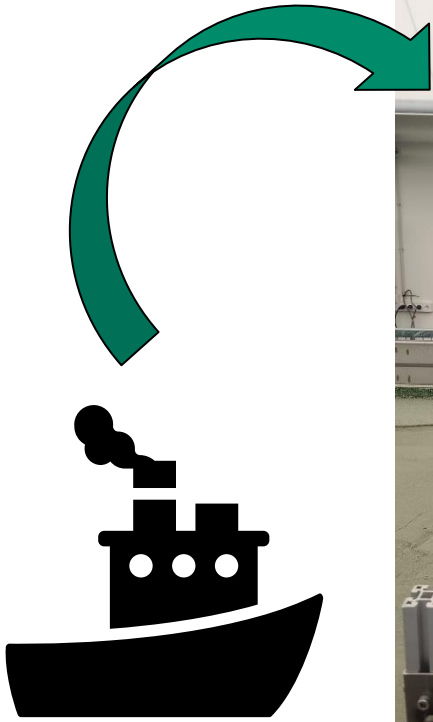






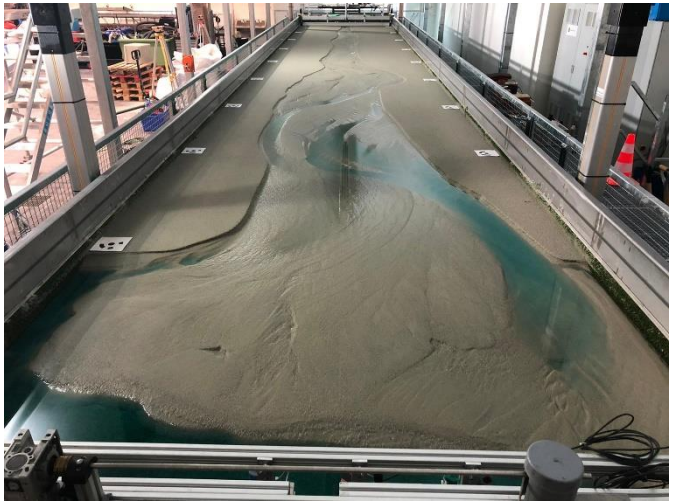
+ dredging

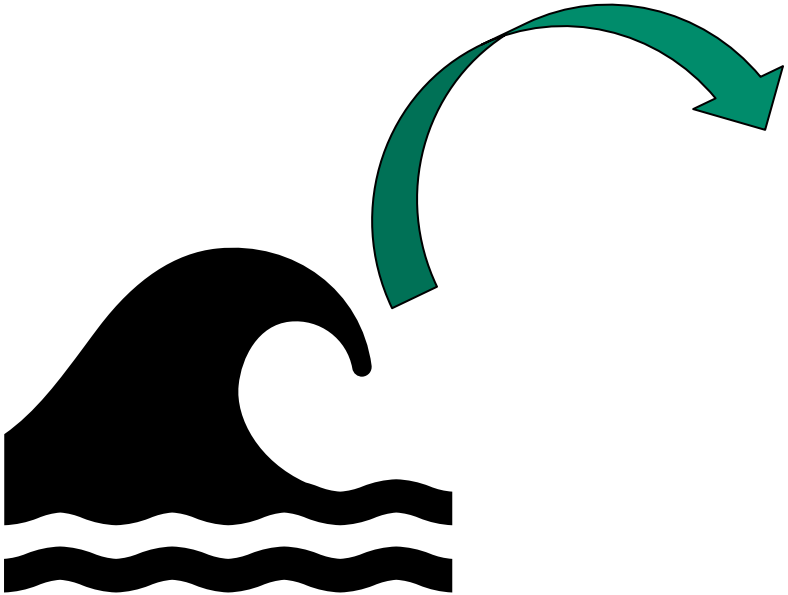
Experiments at the Metronome



+ dredging

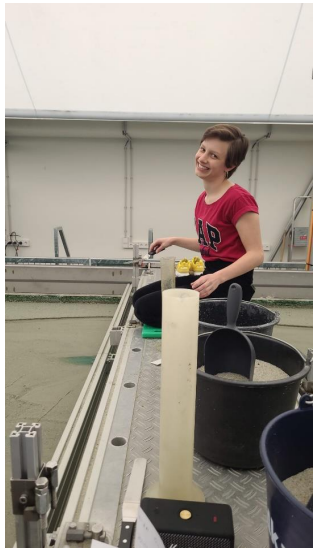
Experiments at the Metronome

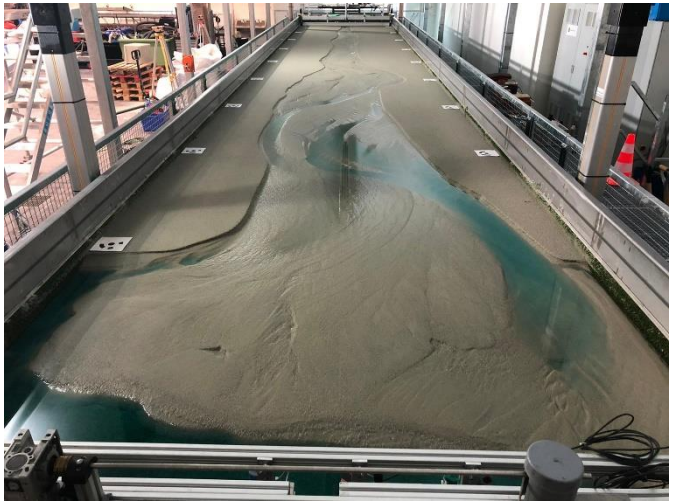


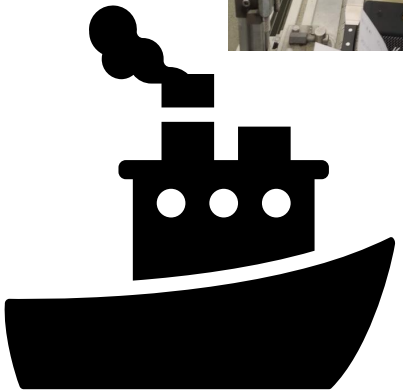


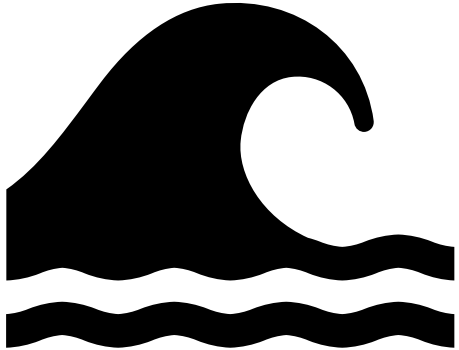
+ sea level rise

Experiments at the Metronome





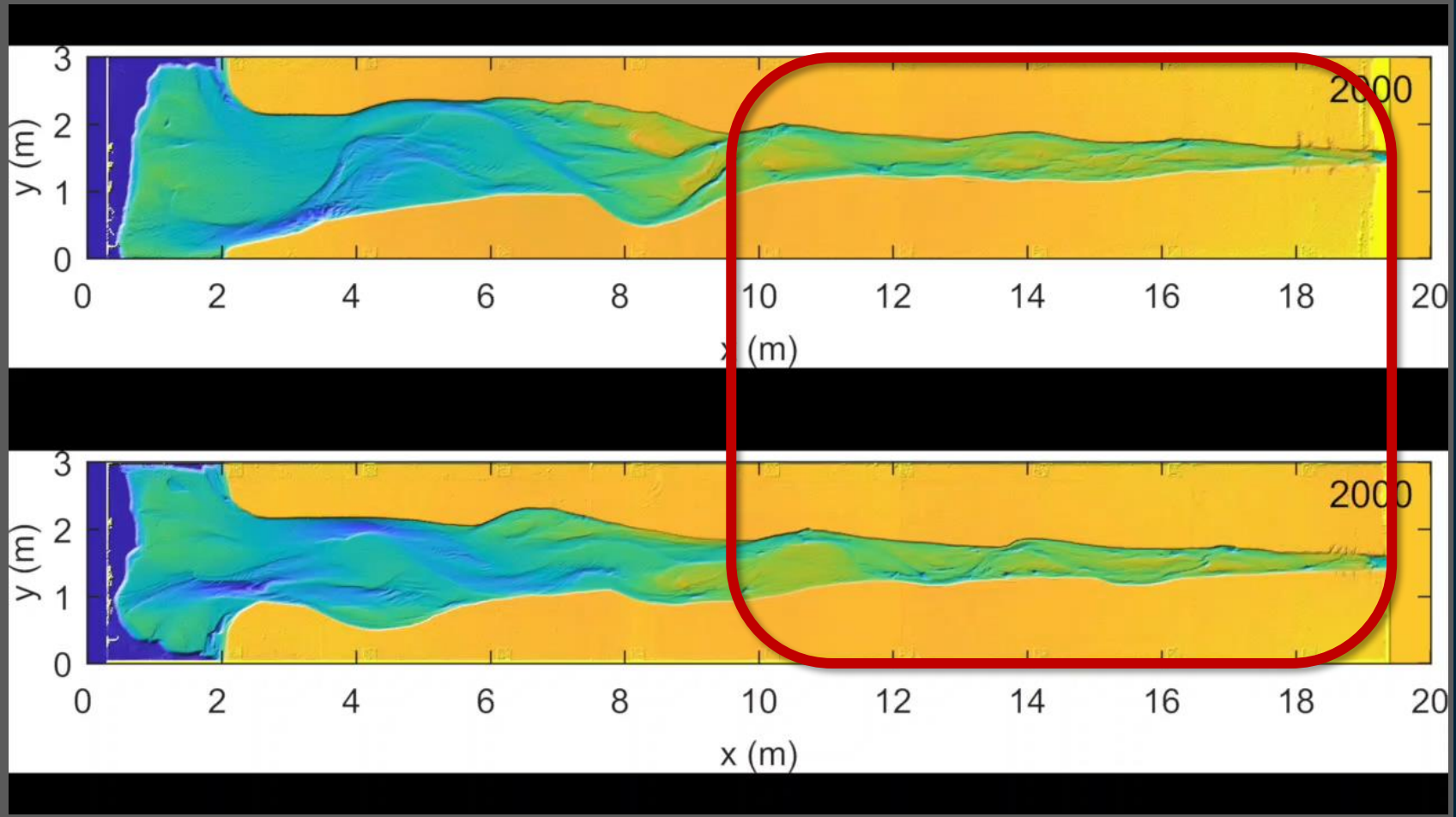


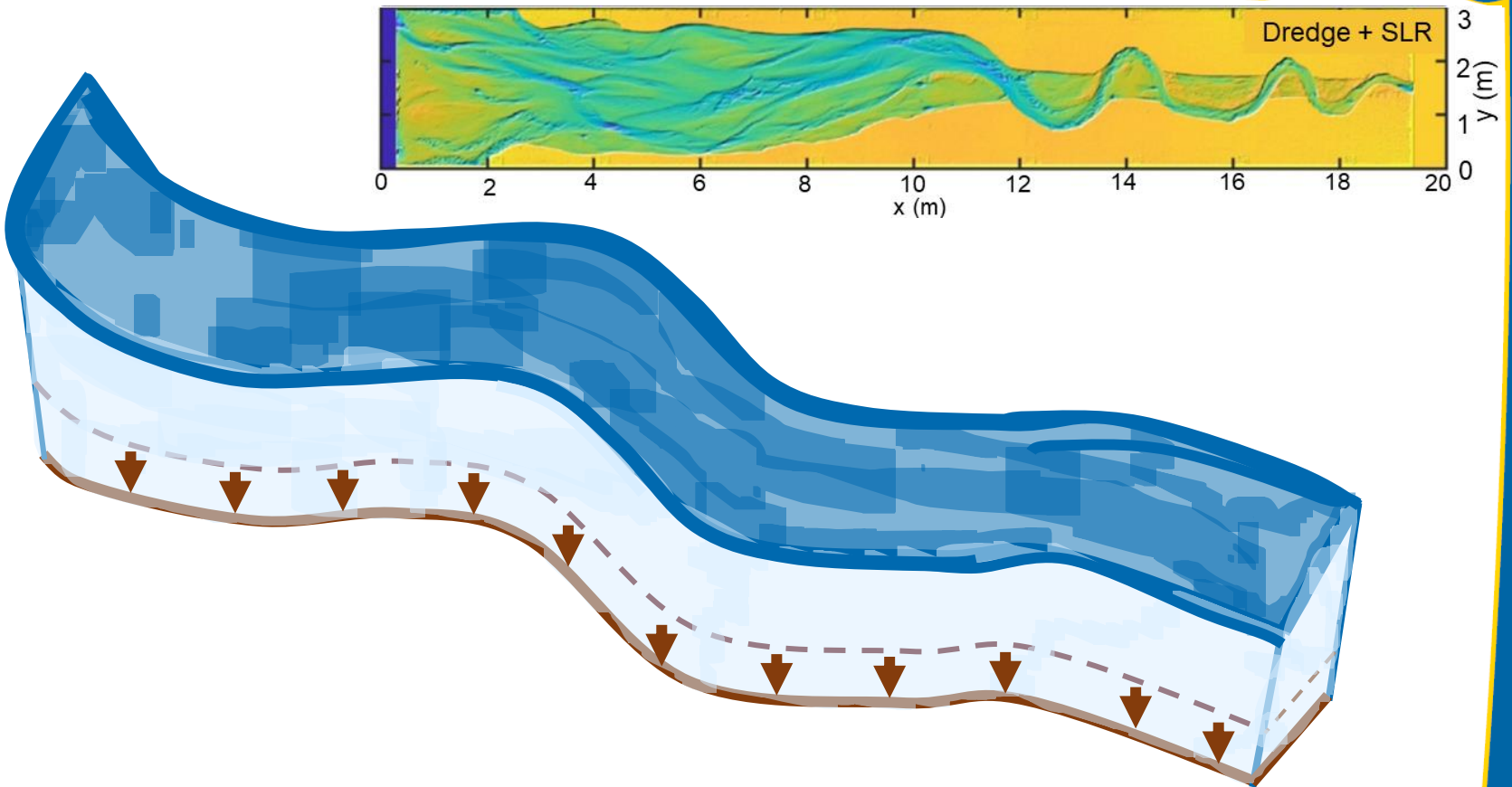


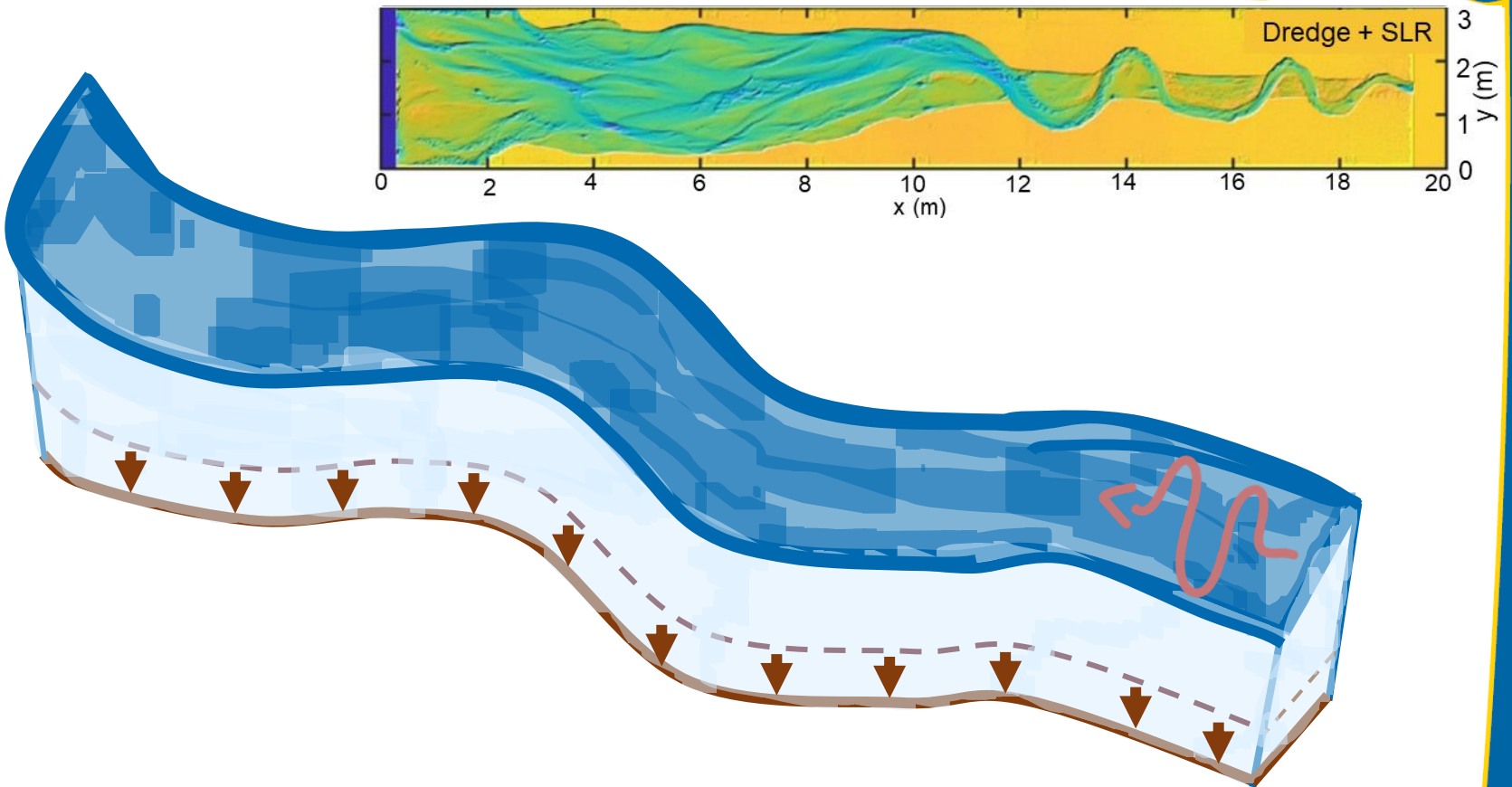
+ dredging **+ sea level rise**

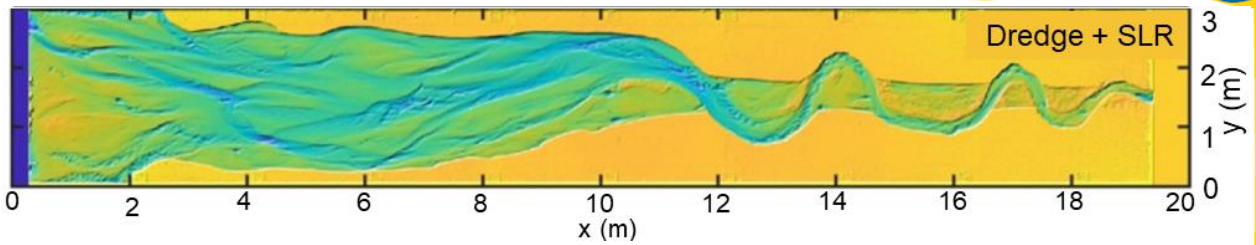
Natural + SLR

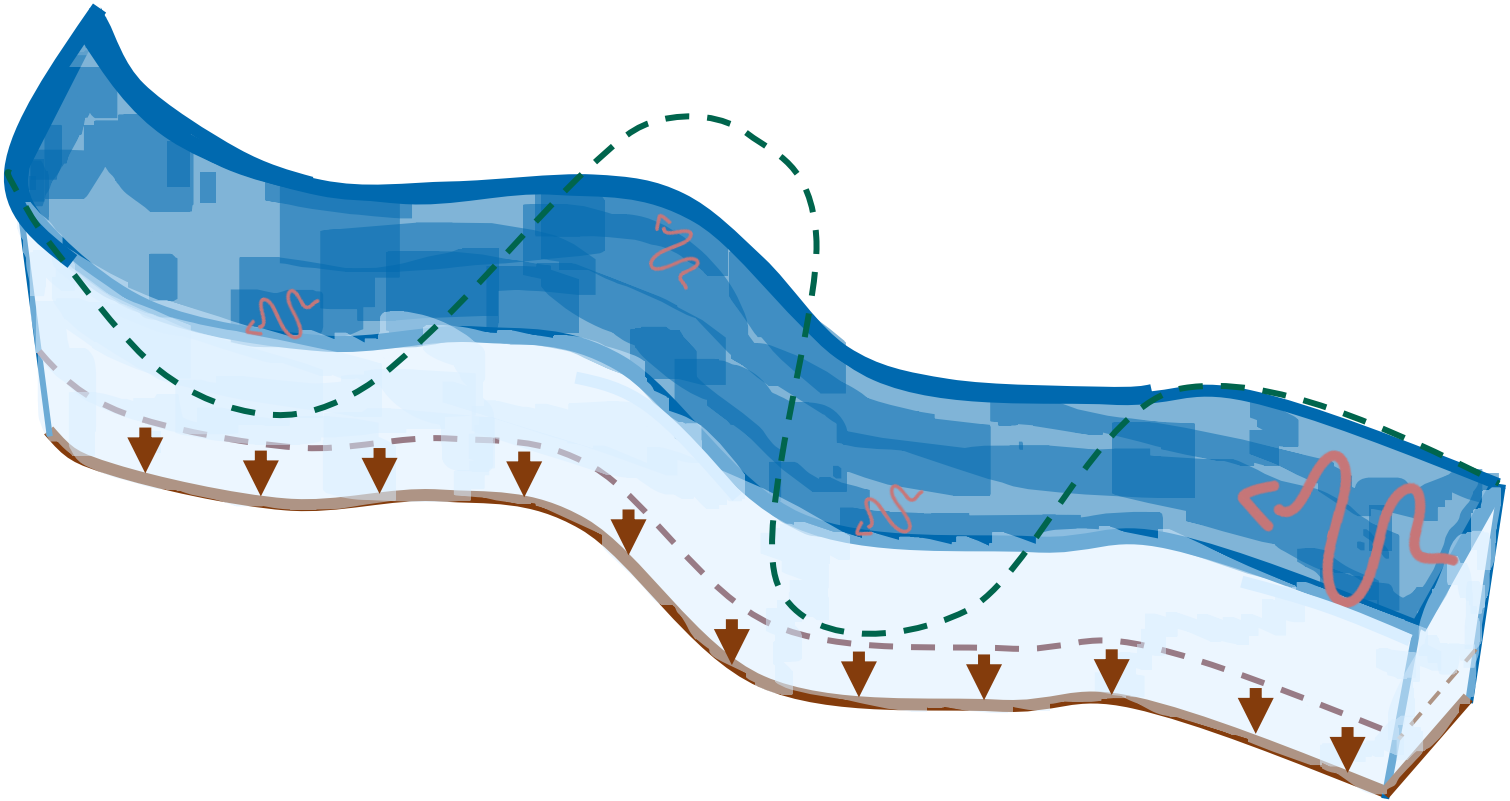
Dredged + SLR

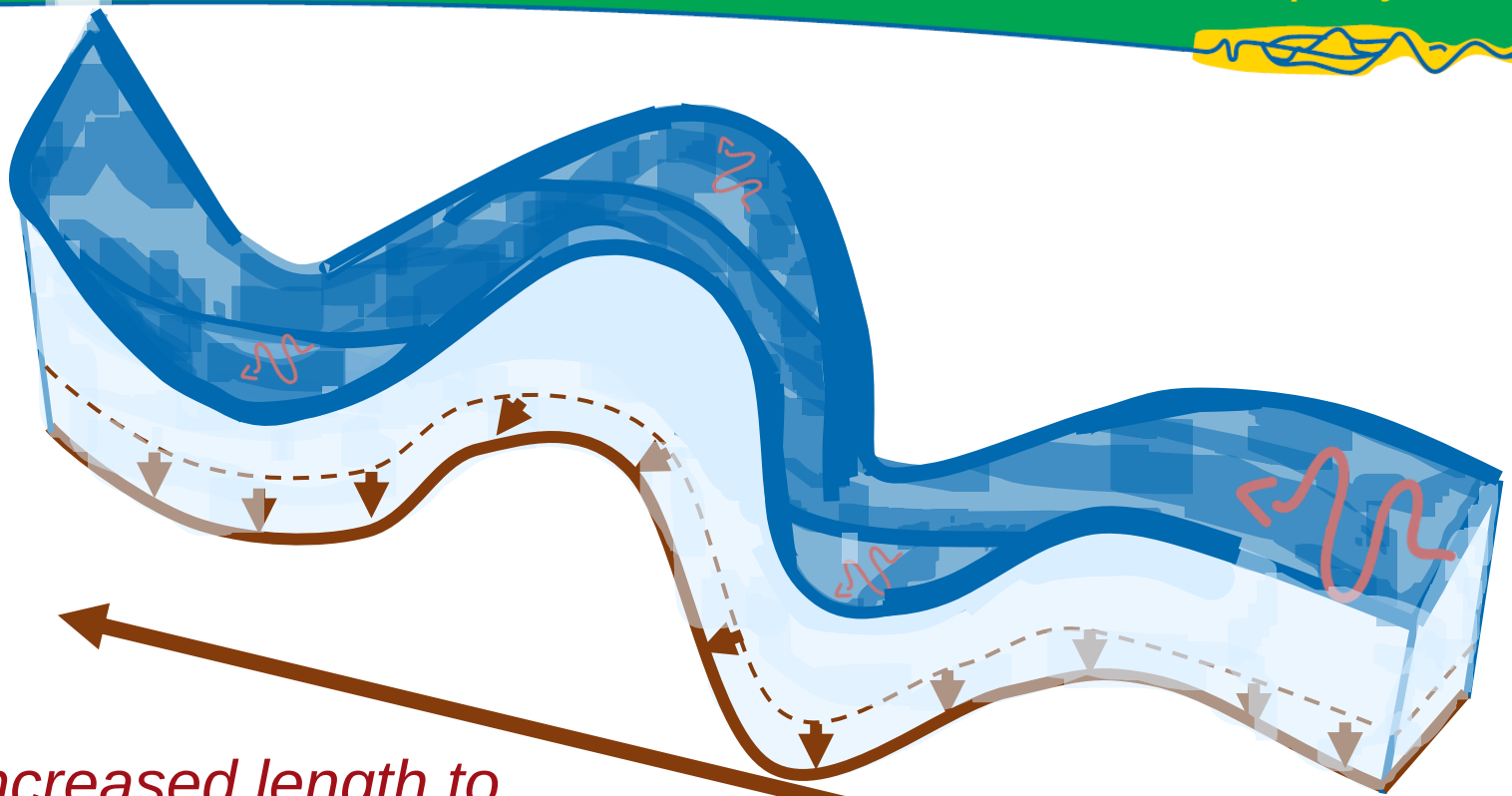



Dredge + SLR
0
2
4
6
8
10
12
14
16
18
20
x (m)
3
2
1
0
y (m)

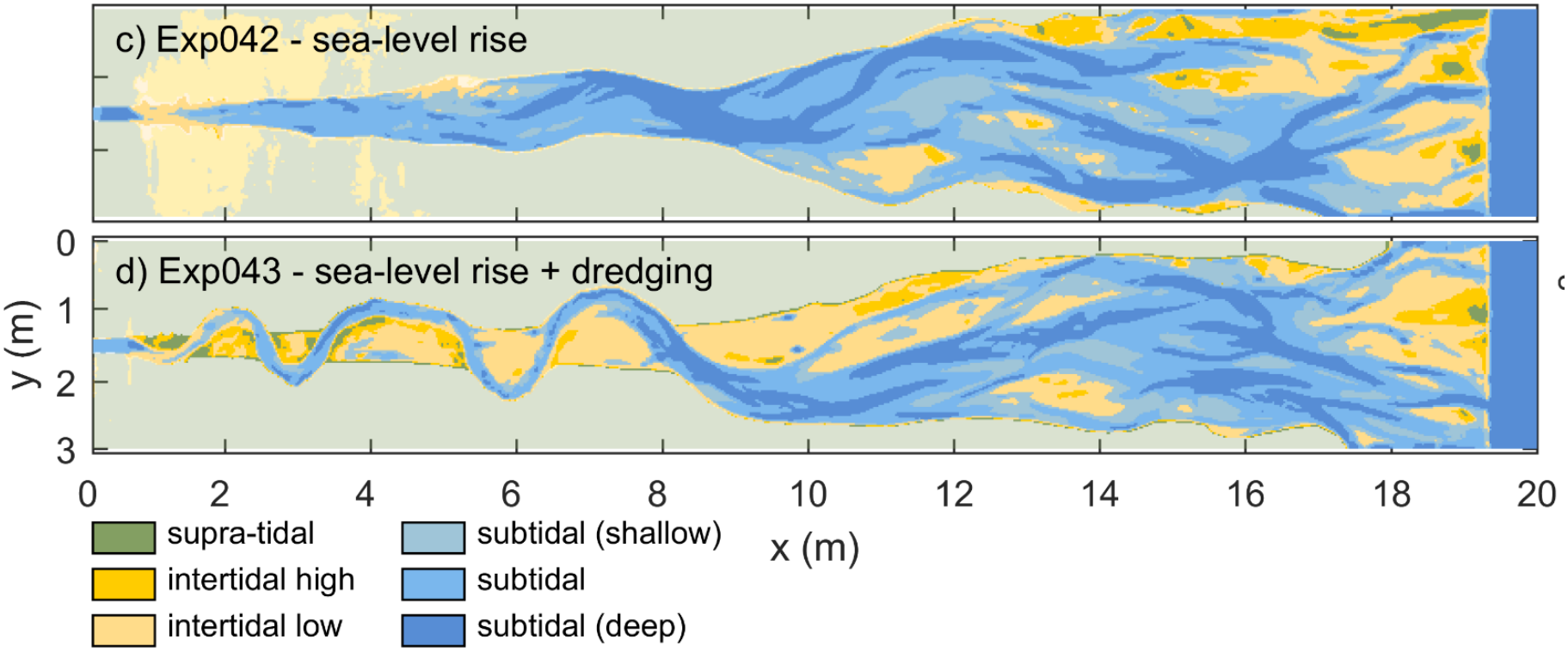

Dredge + SLR
0
2
4
6
8
10
12
14
16
18
20
x (m)
3
2
1
0
y (m)

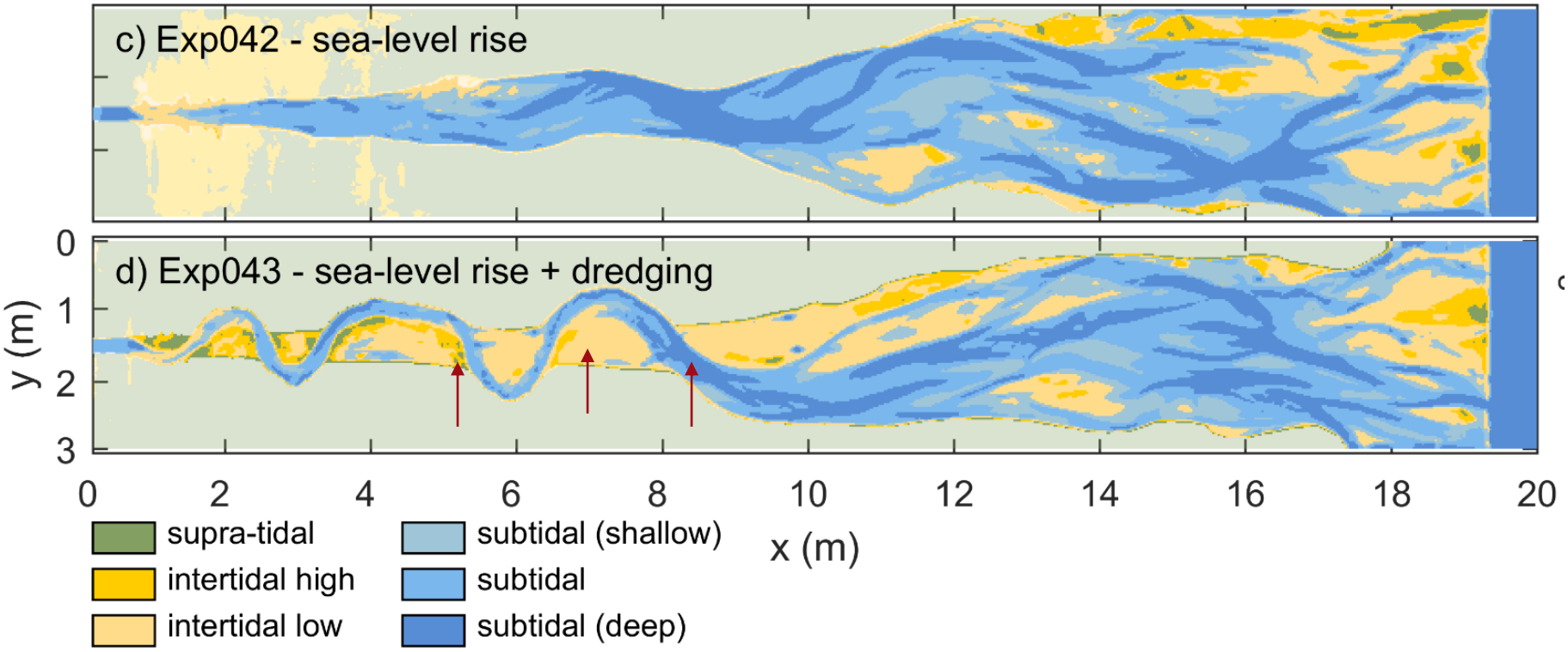

Dredge + SLR
0
2
4
6
8
10
12
14
16
18
20
x (m)
3
2
1
0
y (m)



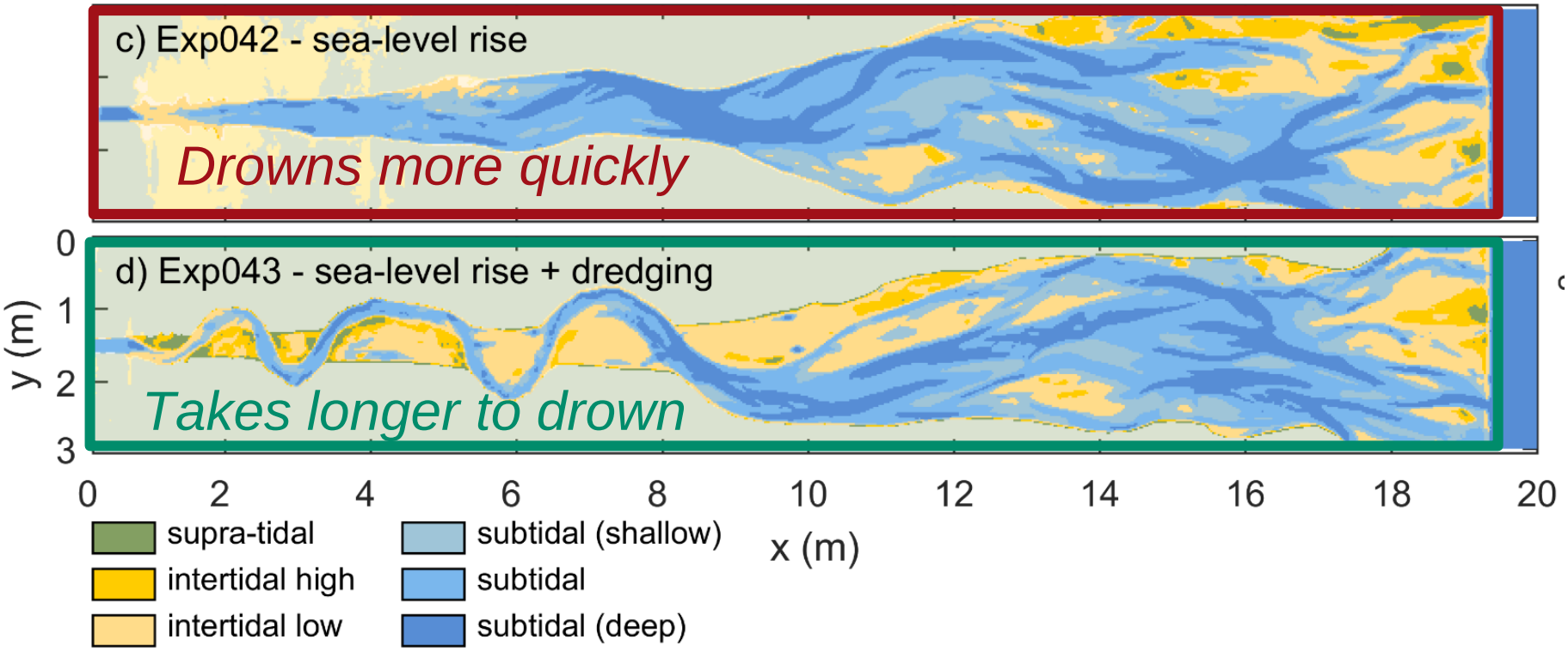


Increased length to navigate and dredge


c) Exp042 - sea-level rise
d) Exp043 - sea-level rise + dredging
y (m)
0
1
2
3
0
2
4
6
8
10
12
14
16
18
20
x (m)
supra-tidal
intertidal high
intertidal low
subtidal (shallow)
subtidal
subtidal (deep)



Single channel with high shoals + intertidal area → big differences in elevation → increased friction


c) Exp042 - sea-level rise
Drowns more quickly
d) Exp043 - sea-level rise + dredging
Takes longer to drown
y (m)
0
1
2
3
0
2
4
6
8
10
12
14
16
18
20
x (m)
supra-tidal
intertidal high
intertidal low
subtidal (shallow)
subtidal
subtidal (deep)

Conclusions

- SLR + dredging = meander expansion
- SLR → increases channel area that needs to be dredged
- Natural systems drown more quickly than dredged systems