

How plants are shaping landscapes

Predicting bio-geomorphic development
after tidal re-introduction in a former polder area

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Different colonization strategies...

Schwarz et al., *Nature Geoscience* (2018)

Fast colonizer
(*Salicornia*)



Bouma et al., *Geomorphology*, 180-181:57-65 (2013)

homogeneous friction

Slow colonizer
(*Spartina*)



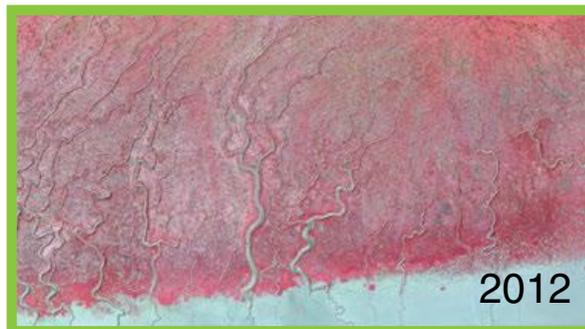
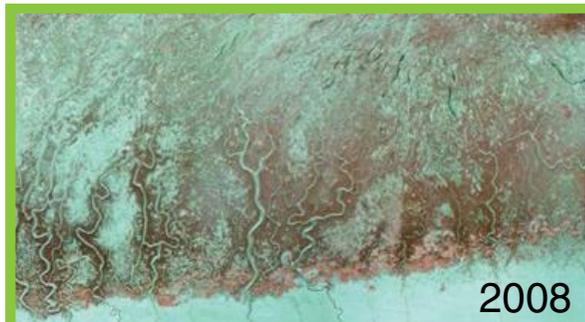
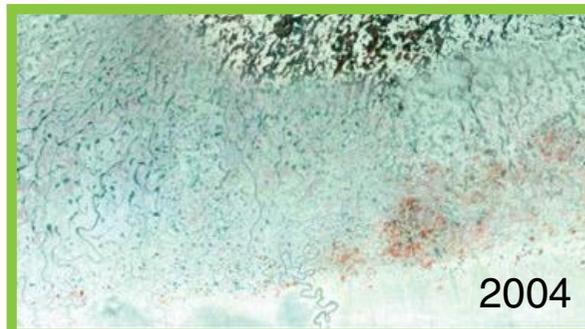
Vandenbruwaene et al., *Journal of Geophysical Research: Earth Surface*, 116:F01008 (2011)

heterogeneous friction

... different landscape developments

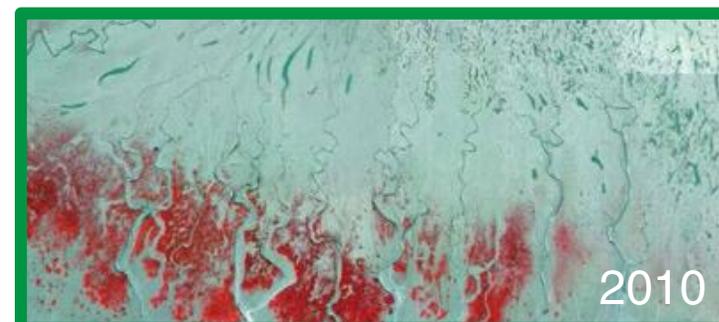
Schwarz et al., *Nature Geoscience* (2018)

Fast colonizer



fixing the existing landscape

Slow colonizer



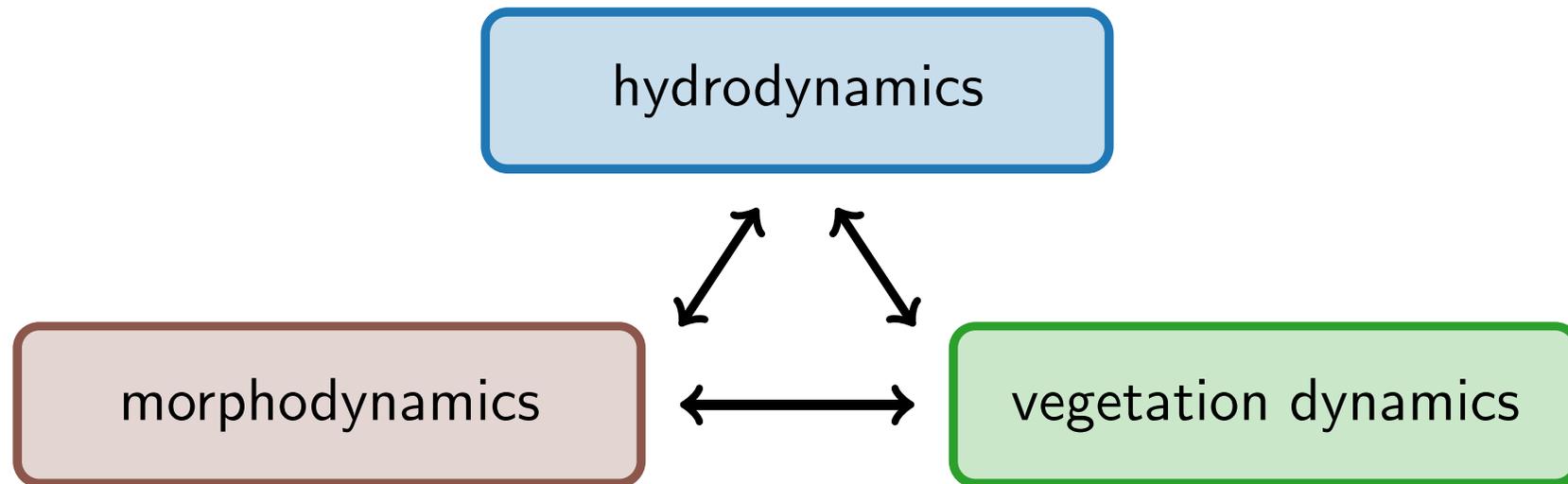
reshaping a new landscape

Predicting bio-geomorphic development of HPP



Bio-geomorphic model

Demeter



Different vegetation dynamics

instantaneous (fast) colonization



(classical approach)

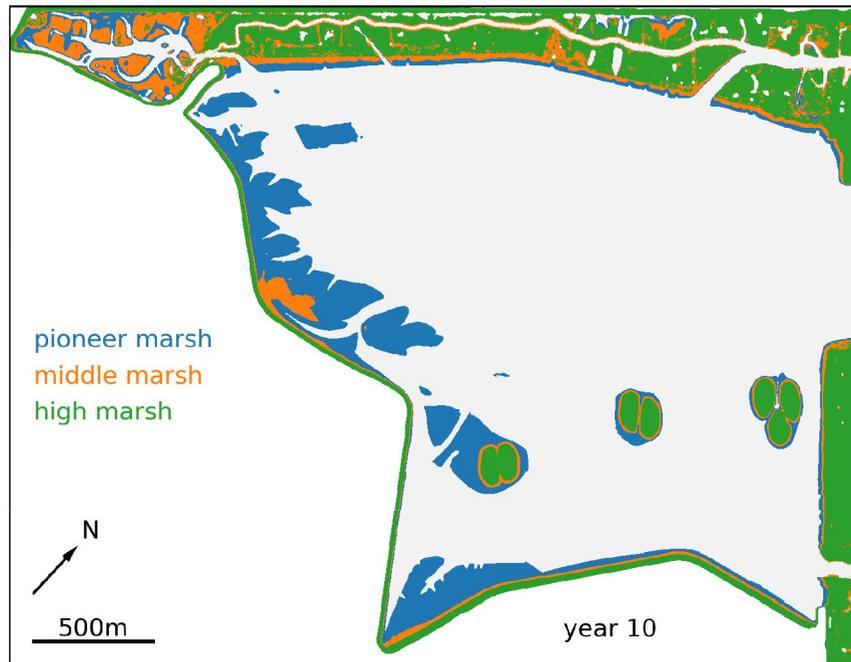
stochastic (slow) colonization



(our new model)

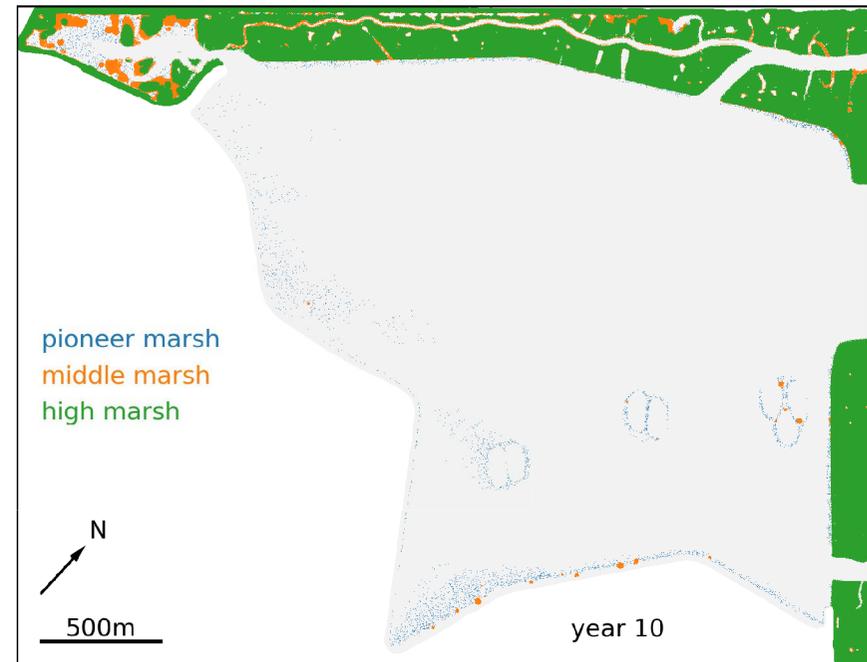
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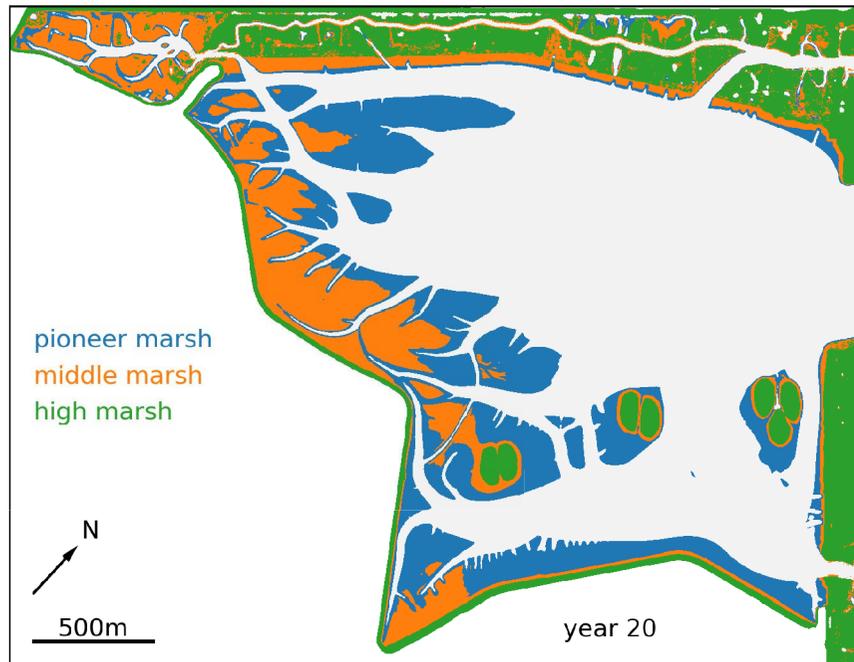
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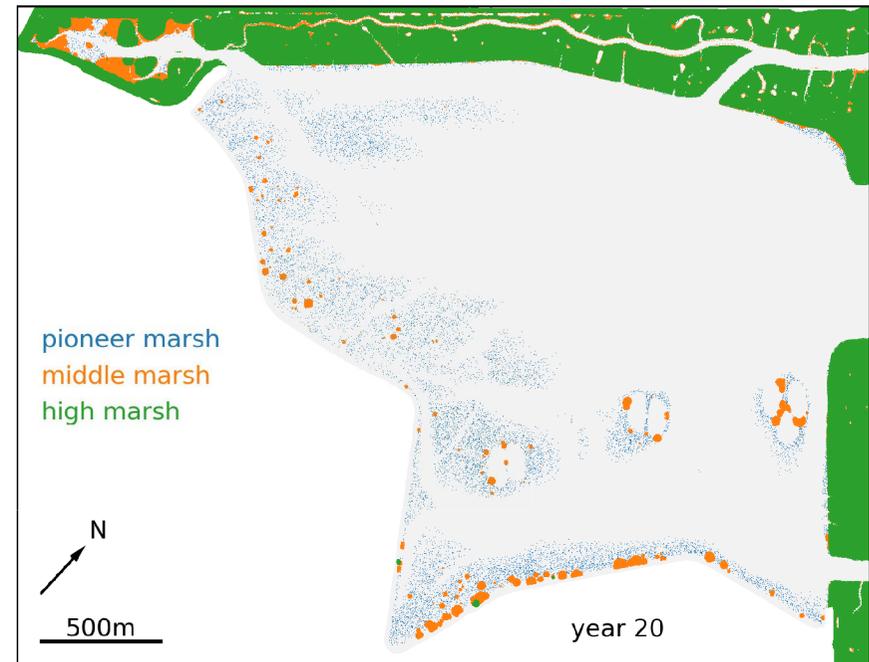
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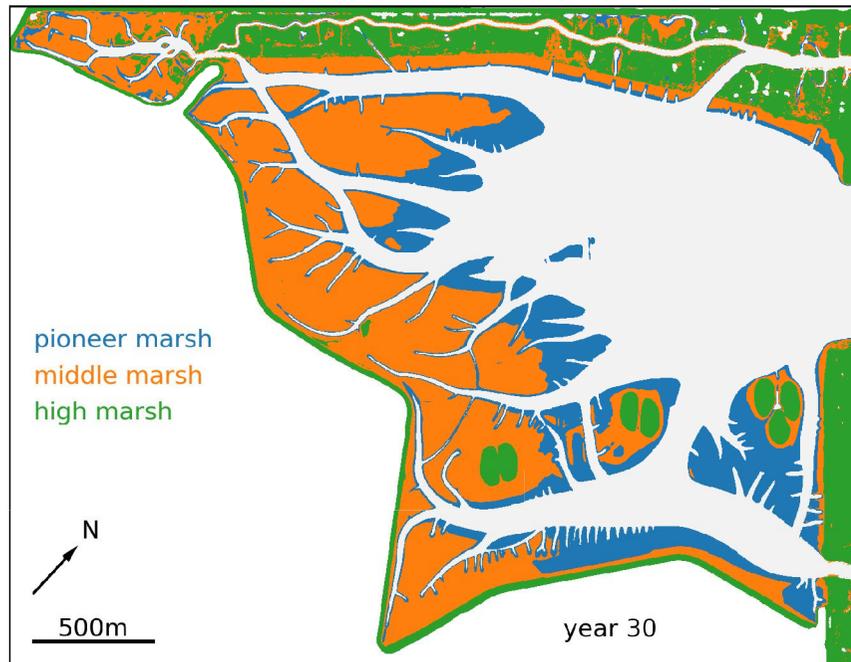
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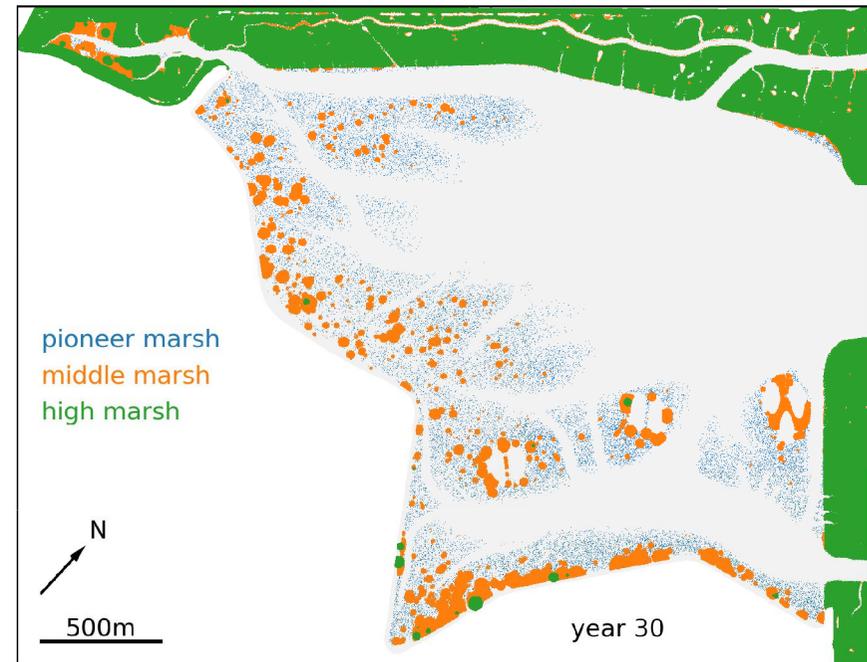
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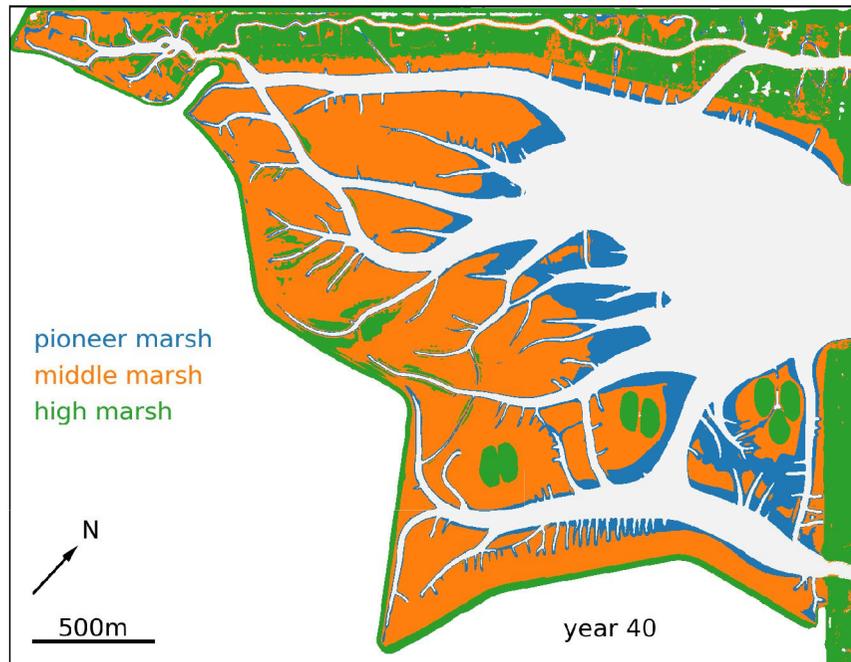
stochastic (slow) colonization



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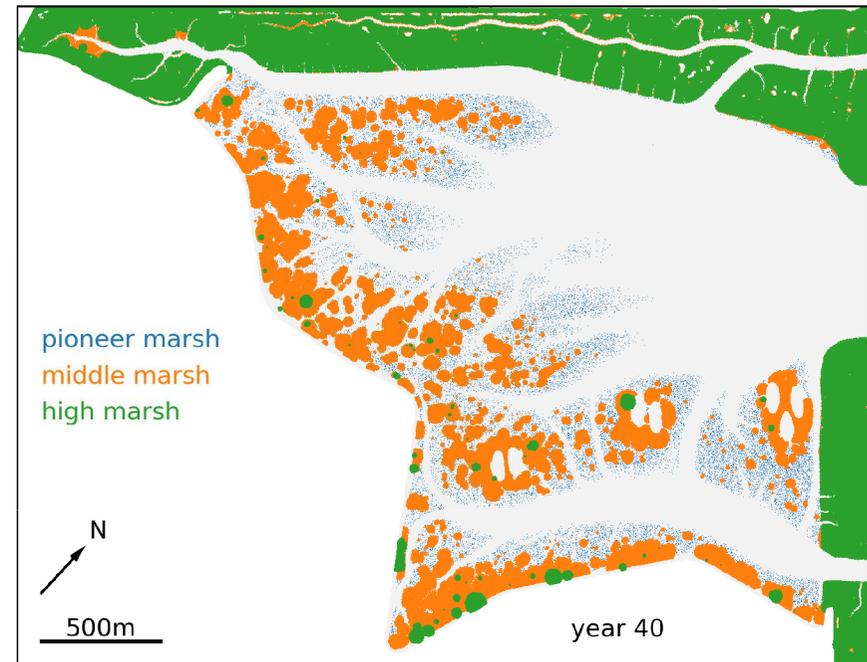
Different vegetation dynamics

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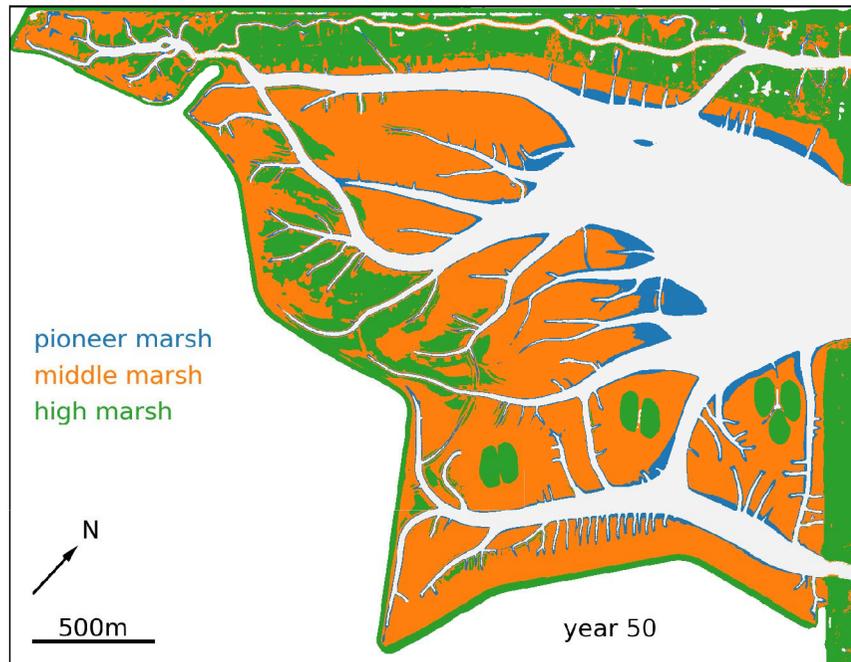
stochastic (slow) colonization



(our new model)

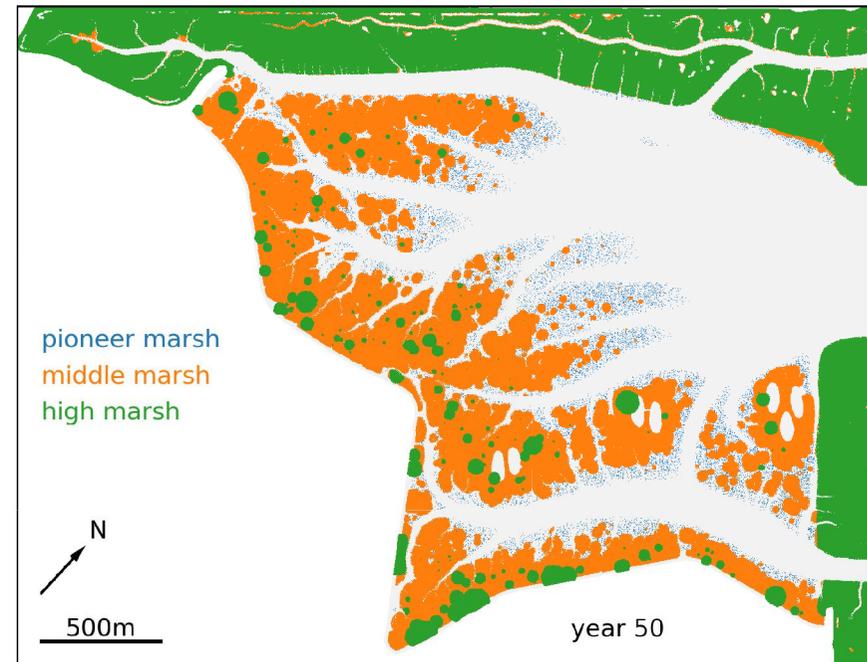
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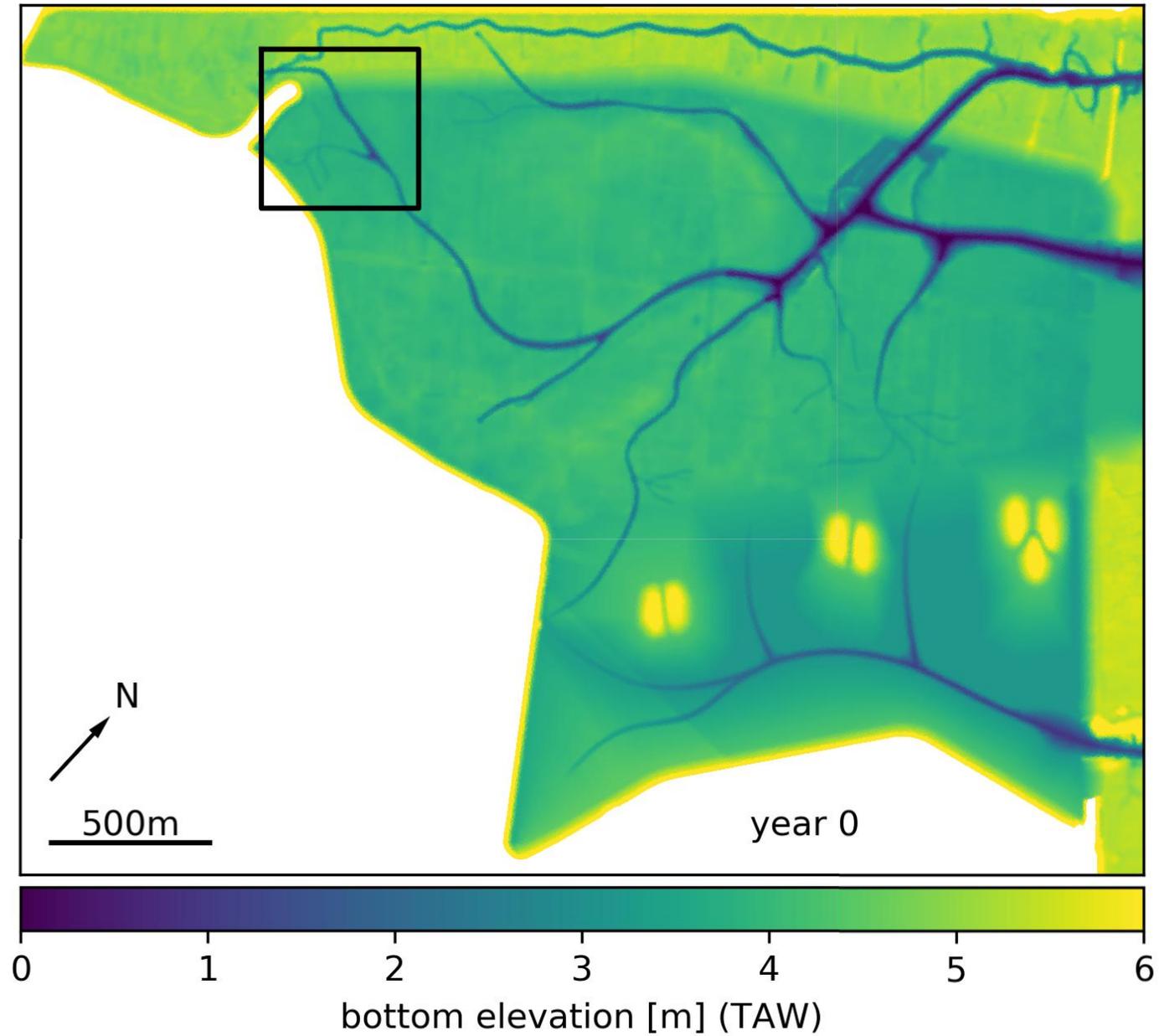
(classical approach)

stochastic (slow) colonization



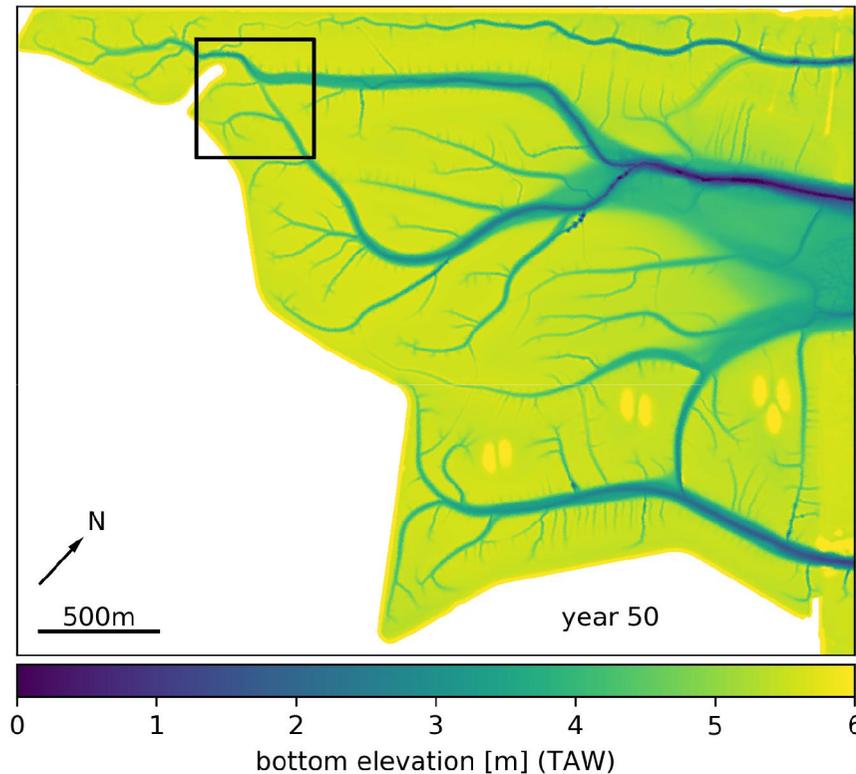
(our new model)

Initial topography

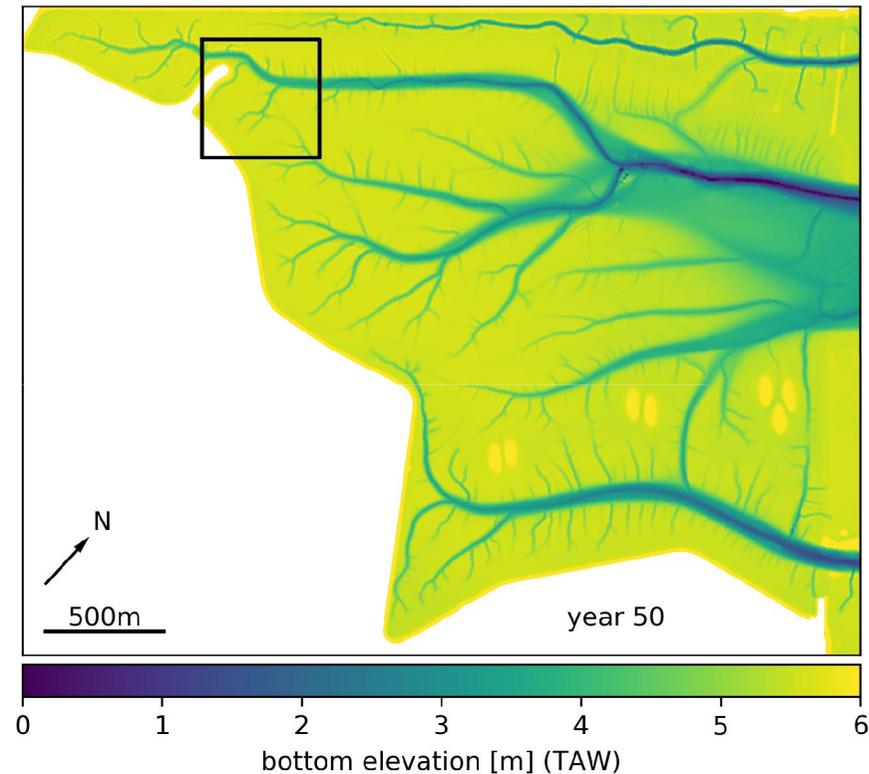


Consequences of geomorphology

instantaneous (fast) colonization



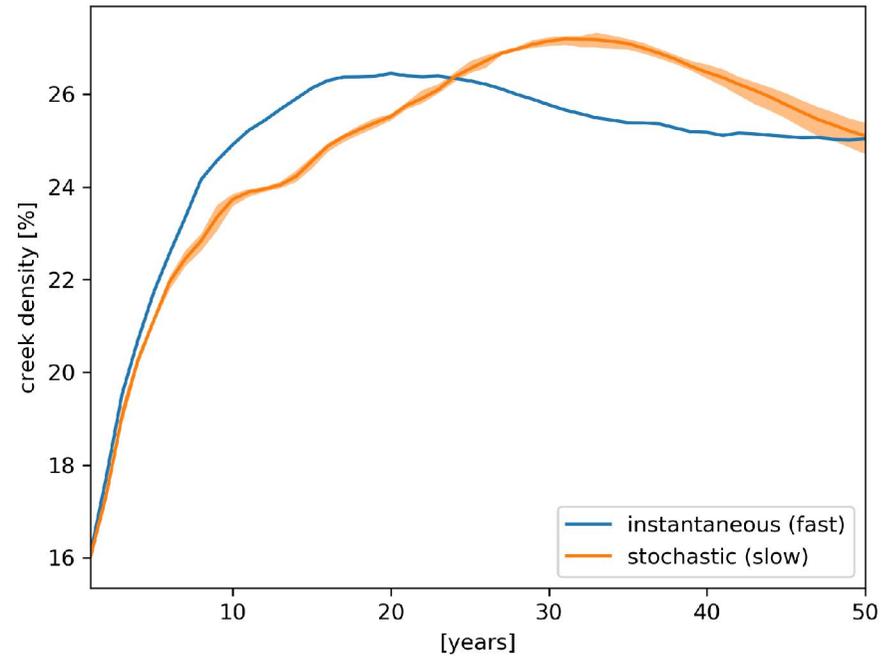
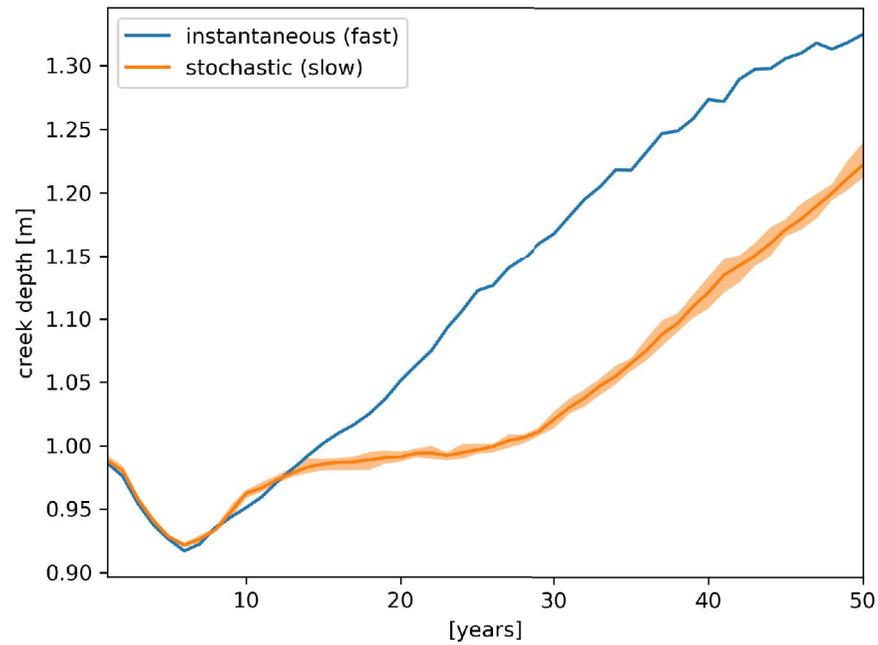
stochastic (slow) colonization



Stochastic colonization:

- initial channel structure less present
- number of new secondary channels higher

Creek characteristics



Stochastic colonization:

- shallower creeks
- slower increase in creek density

Conclusion

1. Fast colonizers are **fixing** existing landscapes
2. Slow colonizers are **reshaping** new landscapes
3. Bio-geomorphic models should include **stochastic** colonization

Supporting publication:

C. Schwarz, et al. Self-organization of a biogeomorphic landscape controlled by plant life-history traits, *Nature Geoscience*, **11**:672-677, 2018.

