

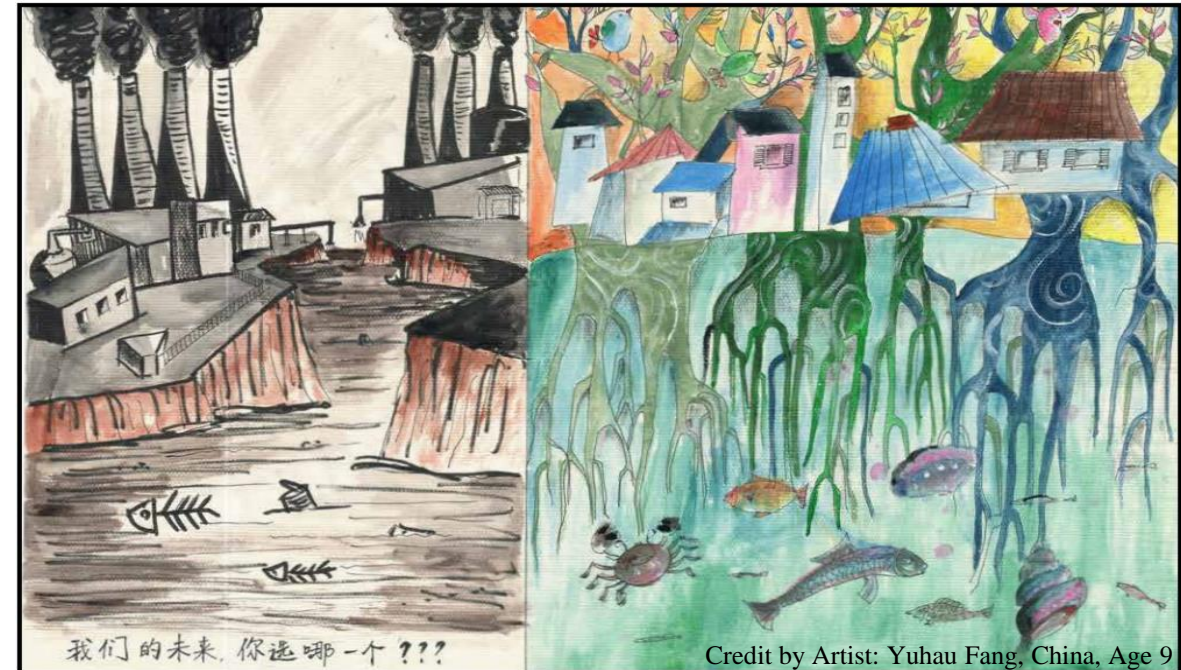
The fate of mangrove assemblages

in the face of changing coastal systems

Danghan Xie⁽¹⁾, Christian Schwarz⁽¹⁾, Muriel Z.M. Brückner⁽¹⁾, Zeng Zhou⁽²⁾ & Barend van Maanen⁽¹⁾

(1) Faculty of Geosciences, Utrecht University, Utrecht, Netherlands

(2) College of Harbour, Coastal and Offshore Engineering, Hohai University, Nanjing, China





Mangroves – A multifunctional coastal ecosystem

- Biodiversity reserves and organisms' habitats.
- Coastal protection from natural hazards
- Water and air purifier
- Carbon storage and sequestration
- Food production (fish, shell fish and algae)
- A source for food, medicine and fuelwood
- Tourist and recreation





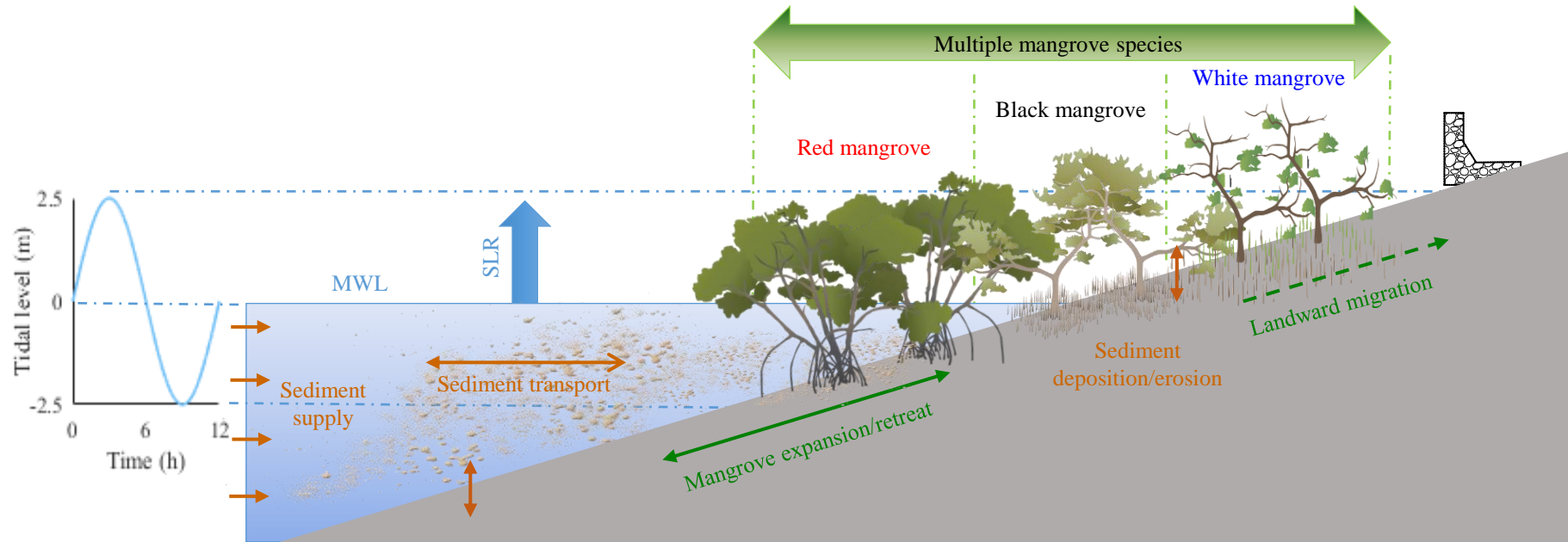
Climate change and human actions – 2 potential threats



Sea

se
ence

Q Schematic of 1D eco-morphodynamic model:

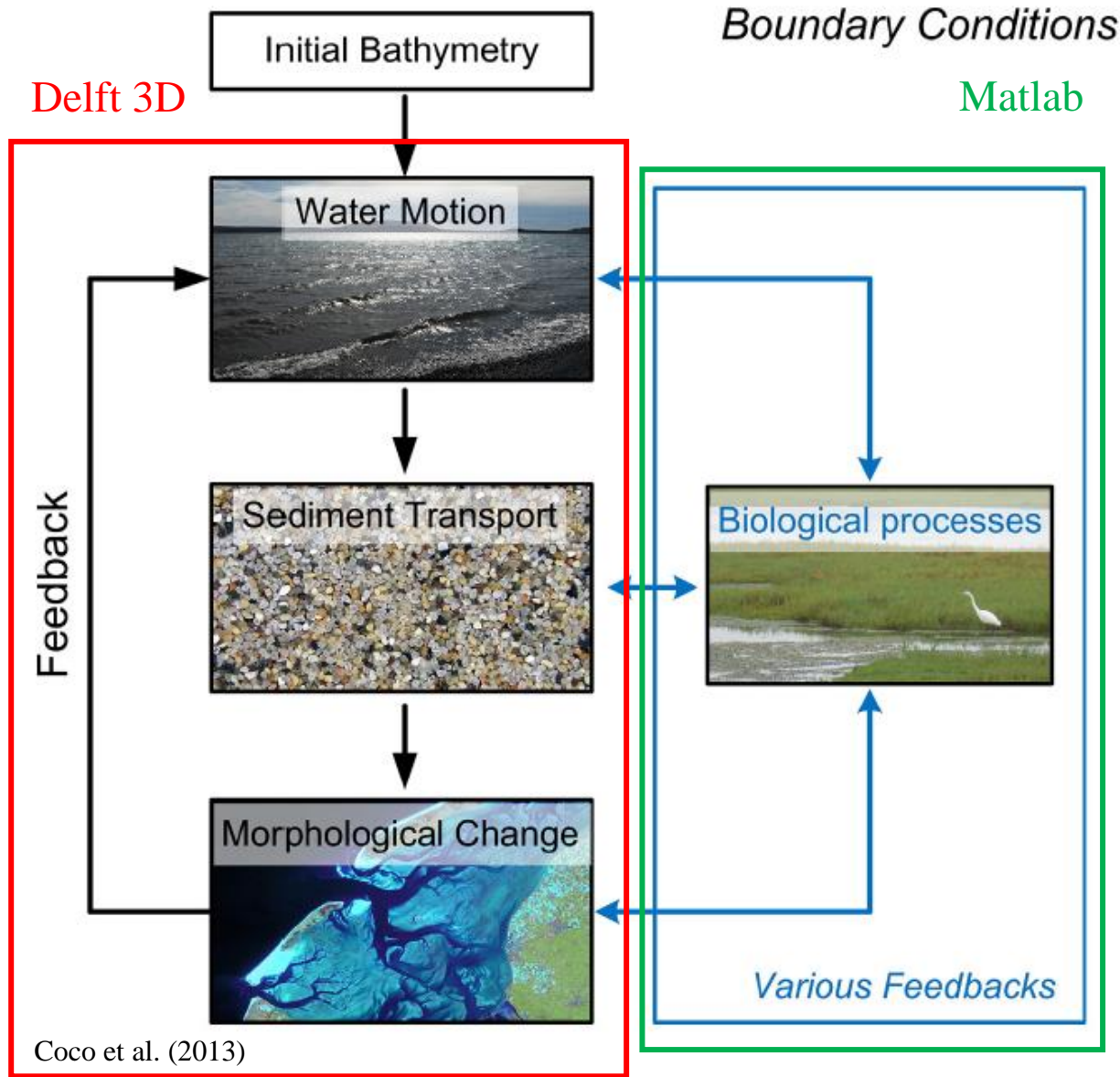


Comprehensive treatment of sediment transport processes:
Erosion/deposition and transport of sediment between regions

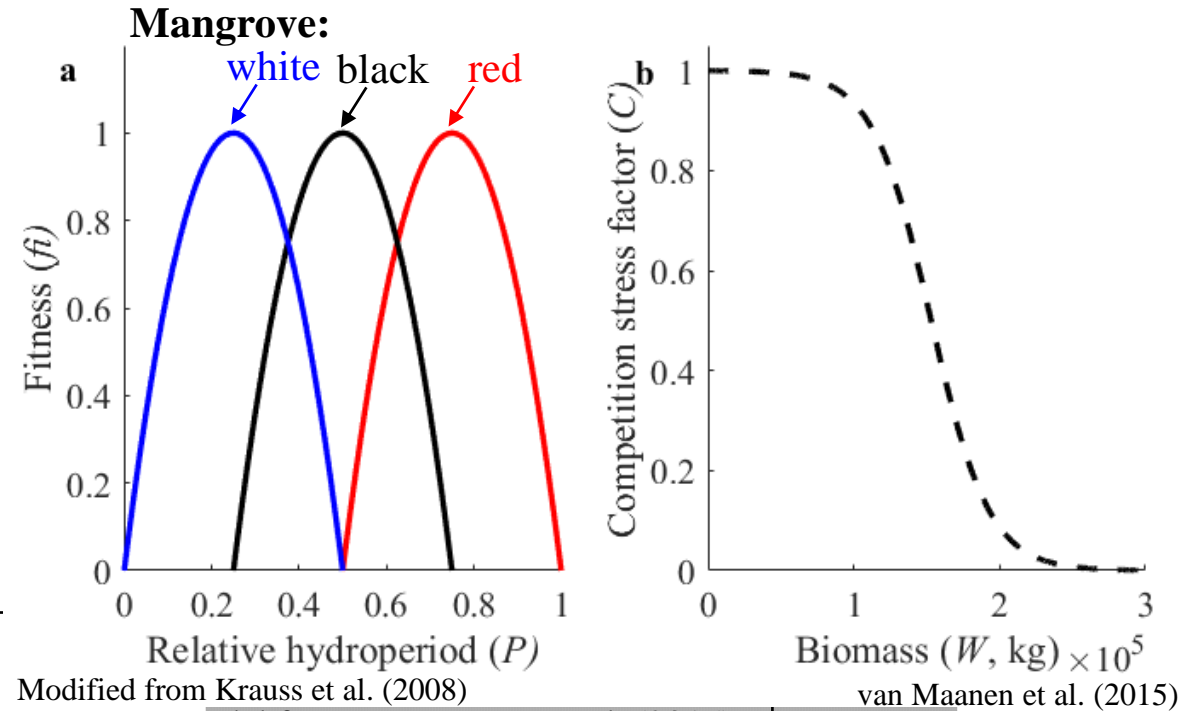
Multiple mangrove species:
Dynamic growth of red, black and white mangroves

Human barriers:
Barriers are incorporated in the model, restricting the upland movement of water and vegetation

Working structure of eco-morphodynamic model:

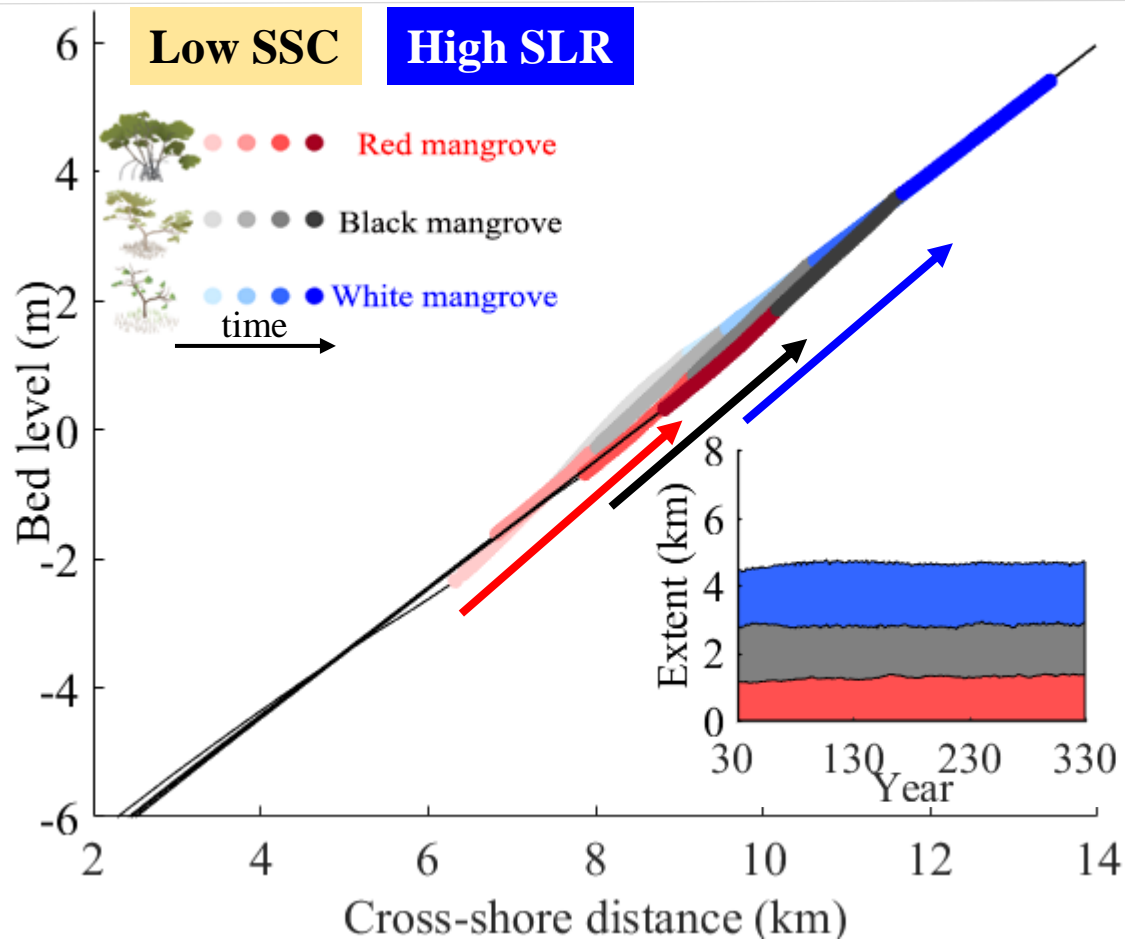


Vegetation life processes: Colonization, growth and mortality Fitness and competition

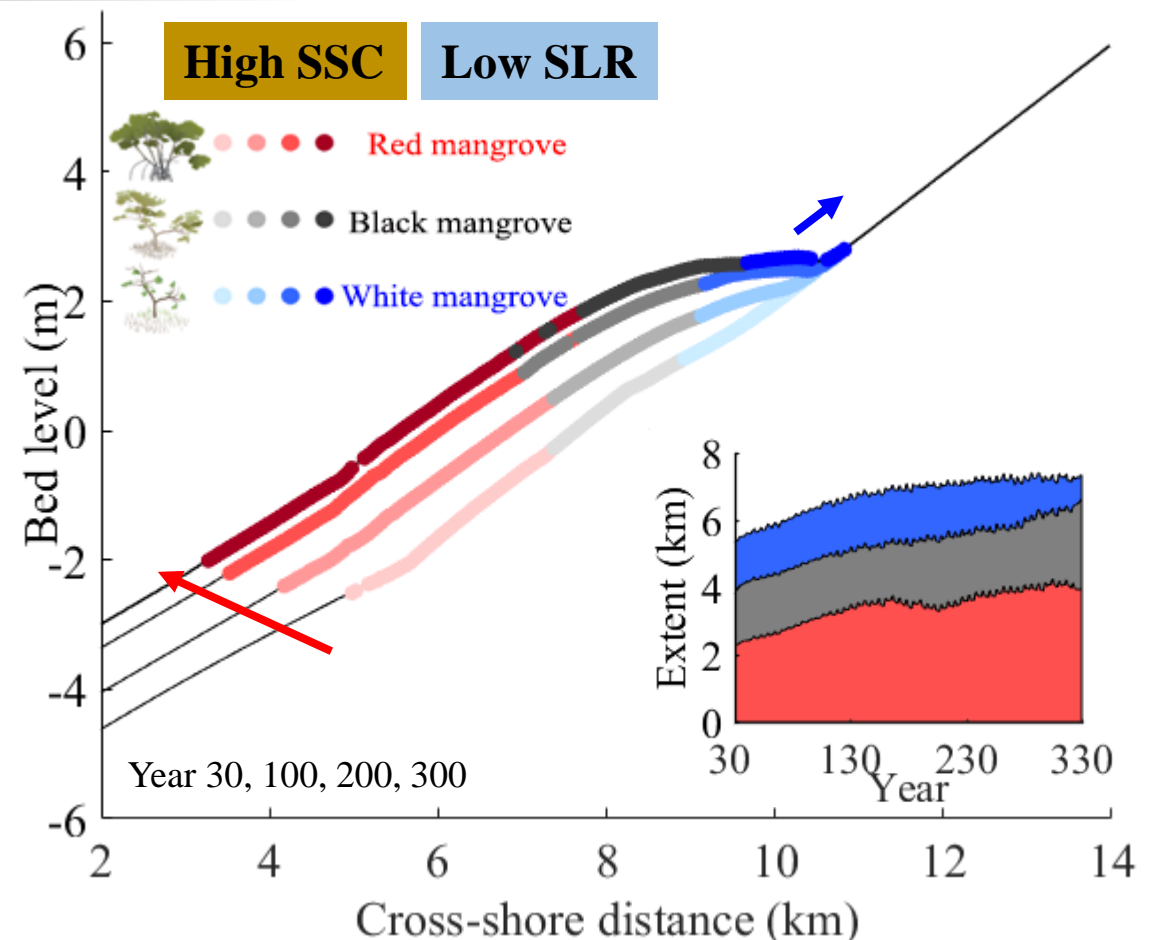




Impacts of sediment supply concentration and sea level rise



All mangrove species shift to upland

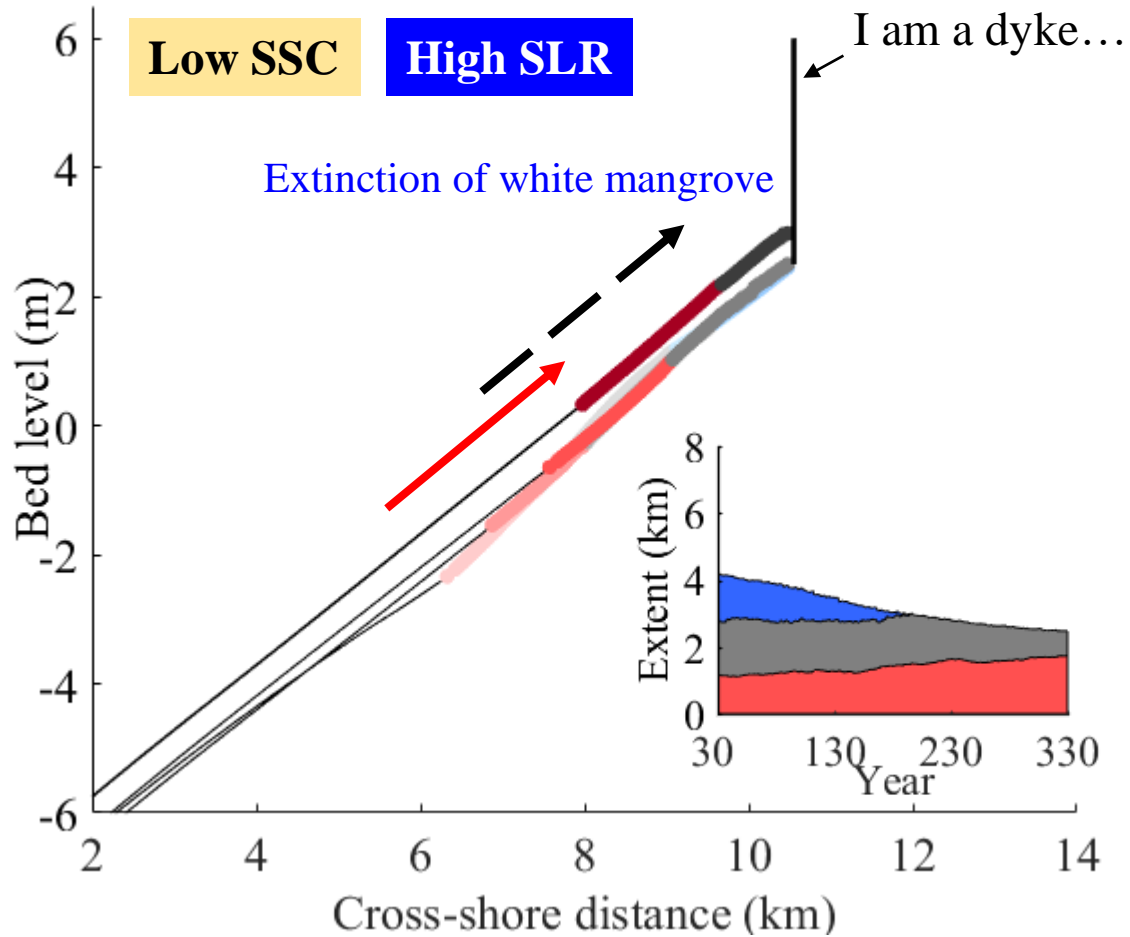


Mangroves expand to both seaward and landward

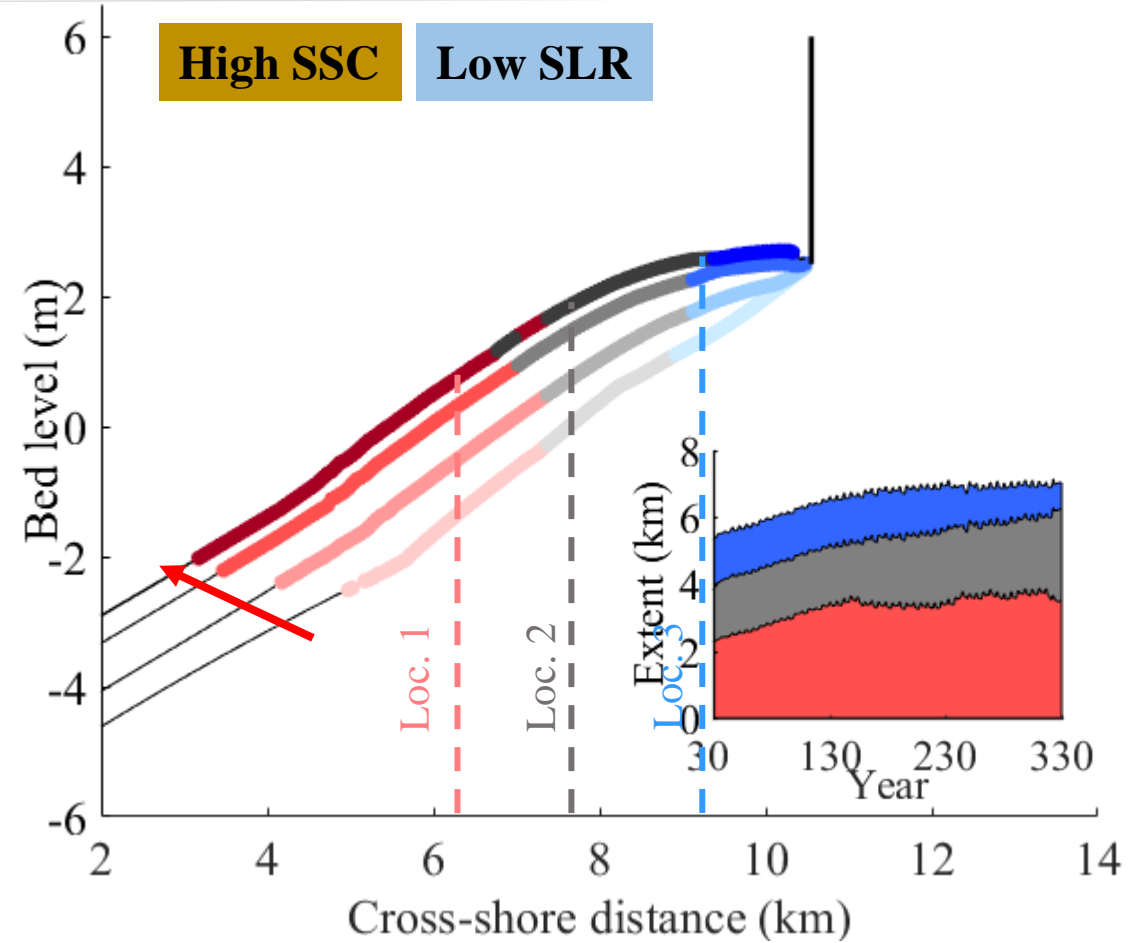
* **SSC**= Sediment supply concentration; **SLR**=sea level rise



Impacts of human barriers



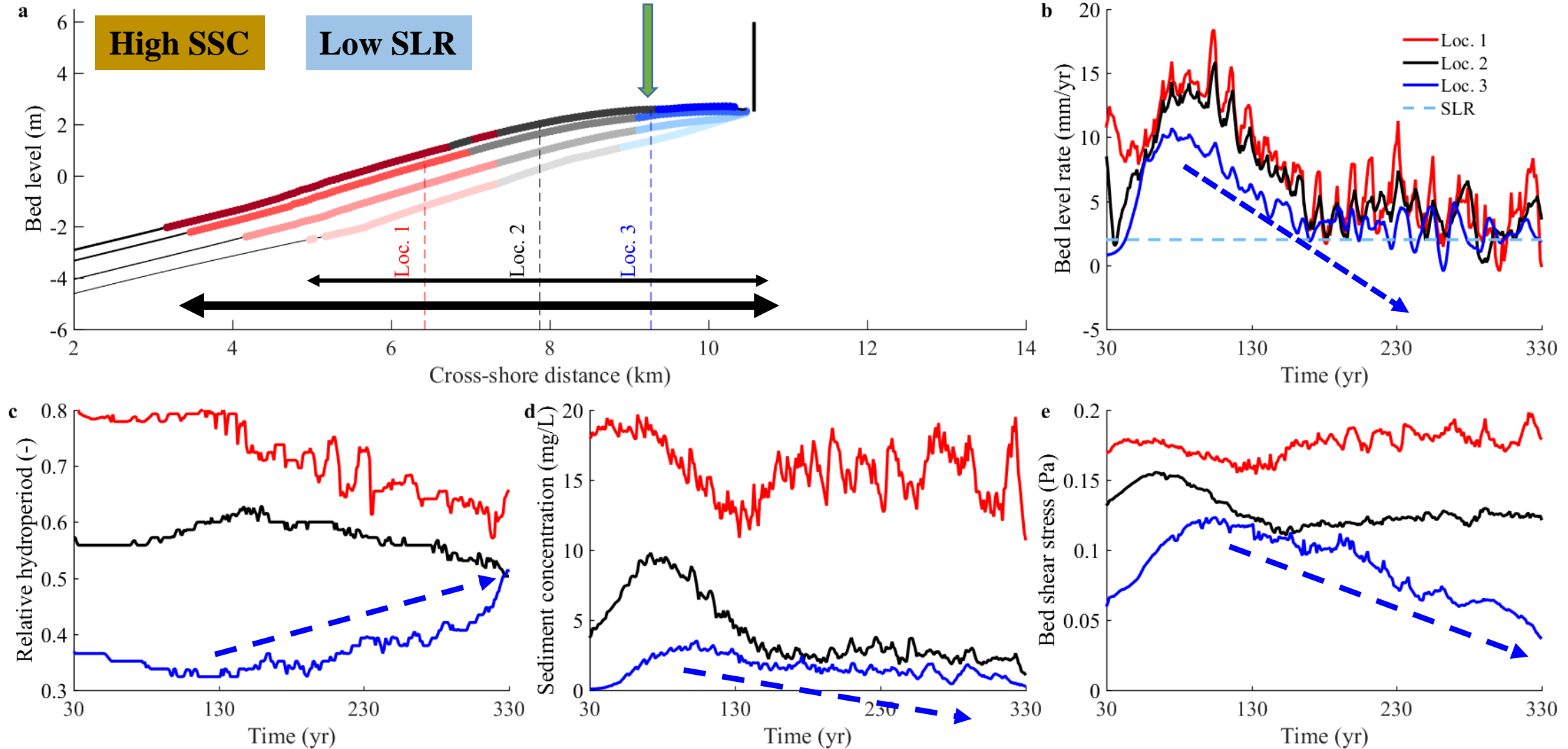
All mangrove species shift to upland, extinction happens



Mangroves expand to seaward but blocked on upland



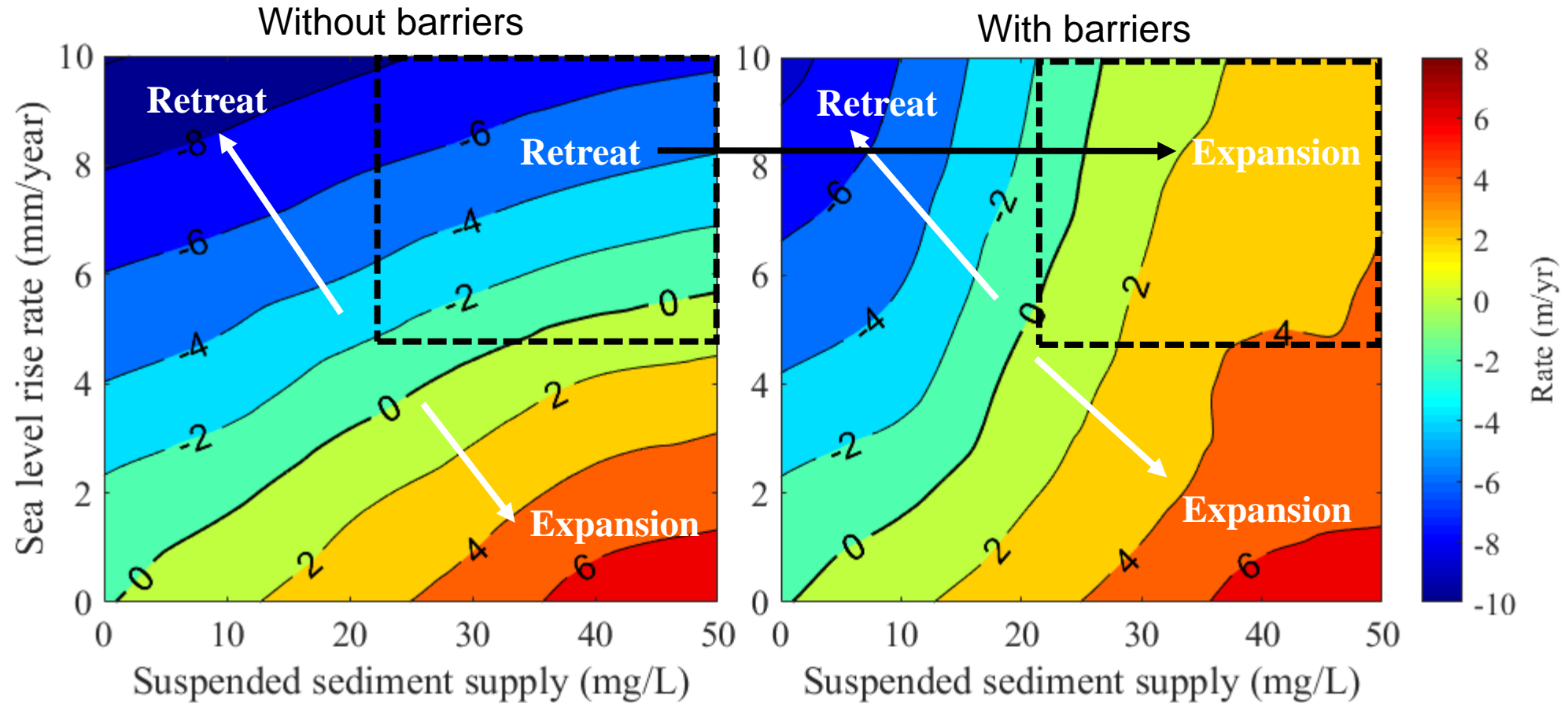
Impacts of human barriers



Bed level accumulation rate decreases while inundation period increases → species are linked!!!



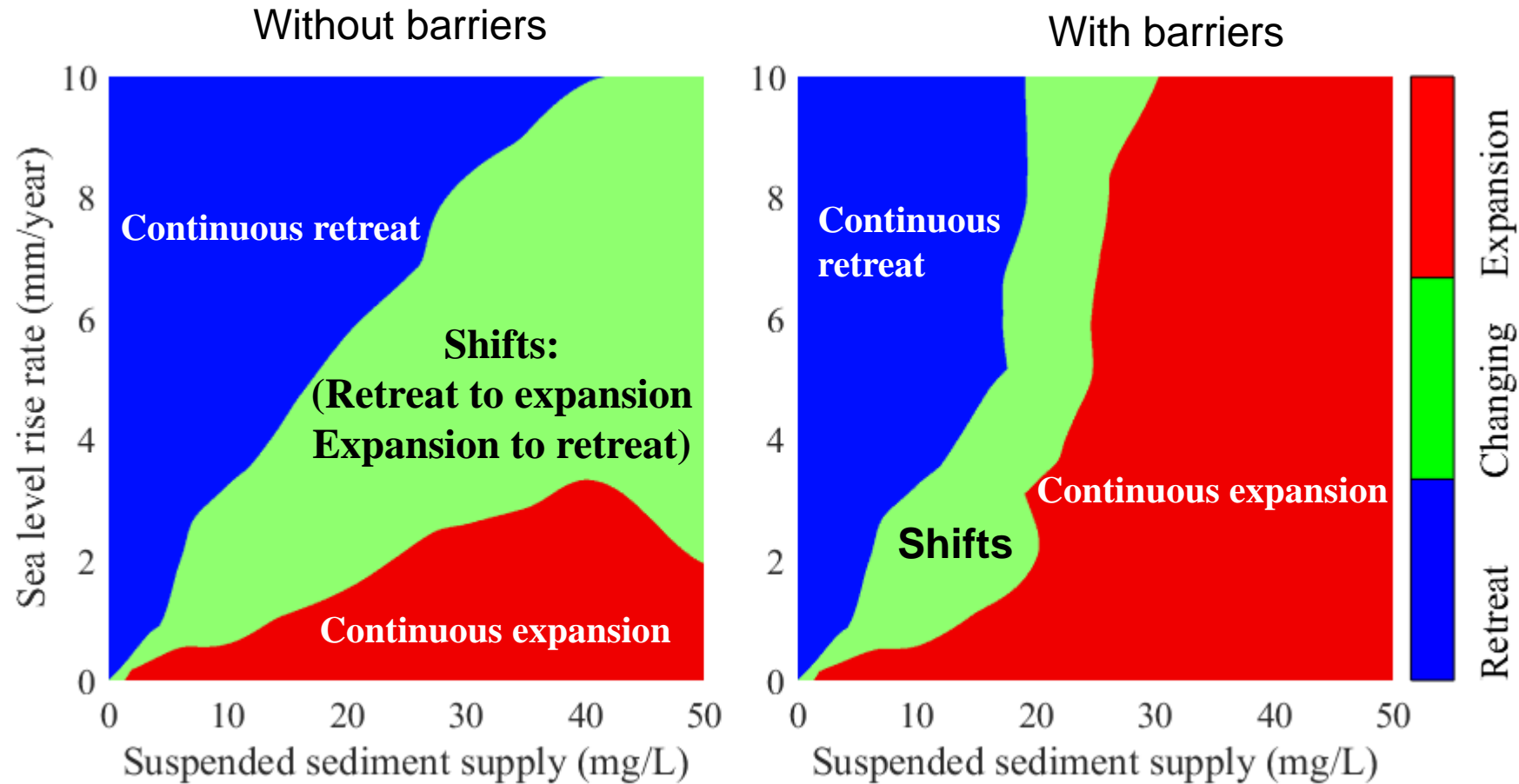
Movement of seaward forest edge averaged over 300 years



Barriers play a role in promoting vertical accretion!



Temporal evolution of the seaward forests edge



Movement of the seaward forest edge may reverse!



Key messages



Mangrove expansion can happen under high sediment supplies, despite sea level rise.

Barriers may enhance sediment accretion but obstruct mangrove landward migration, potentially causing extinction of species.

Mangrove species are linked through complex biophysical interactions and play a critical role in defining forest structural changes.

Sediment accretion across the intertidal area may vary over time... (historical/current accretion rates may be misleading).

want to know more?

Danghan Xie | PhD Candidate | Utrecht University | d.xie@uu.nl

Questions?