



Historical land use change has lowered terrestrial silica mobilization

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A cooperation



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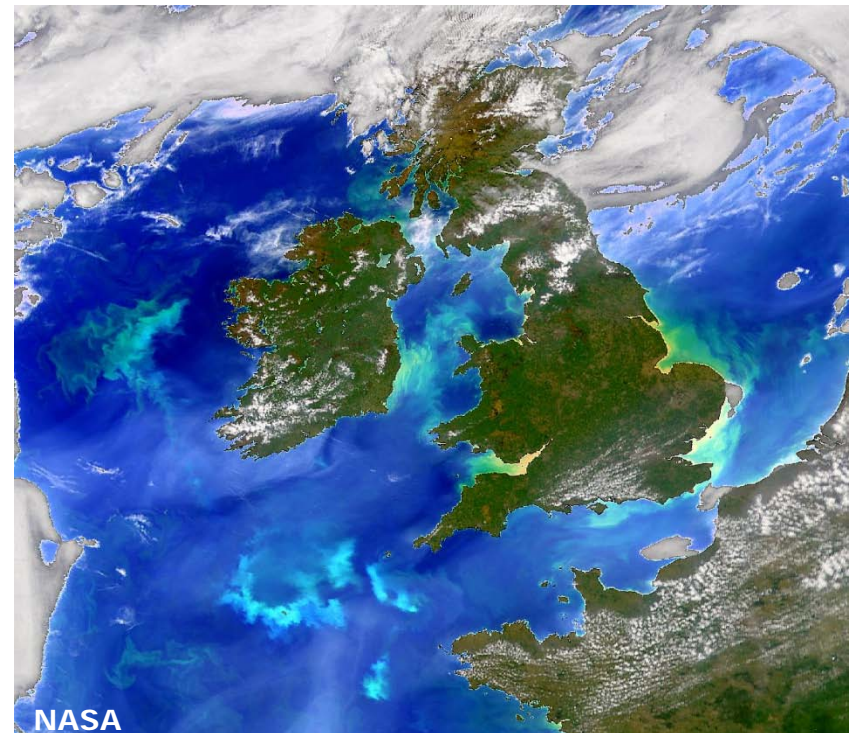


Terrestrial...?



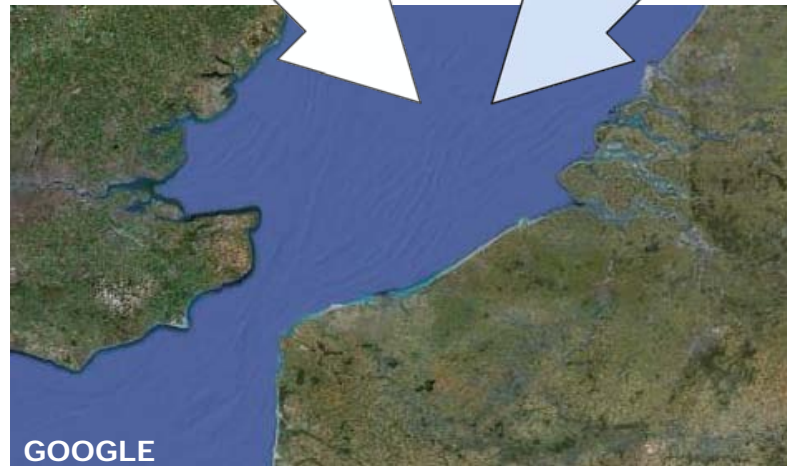
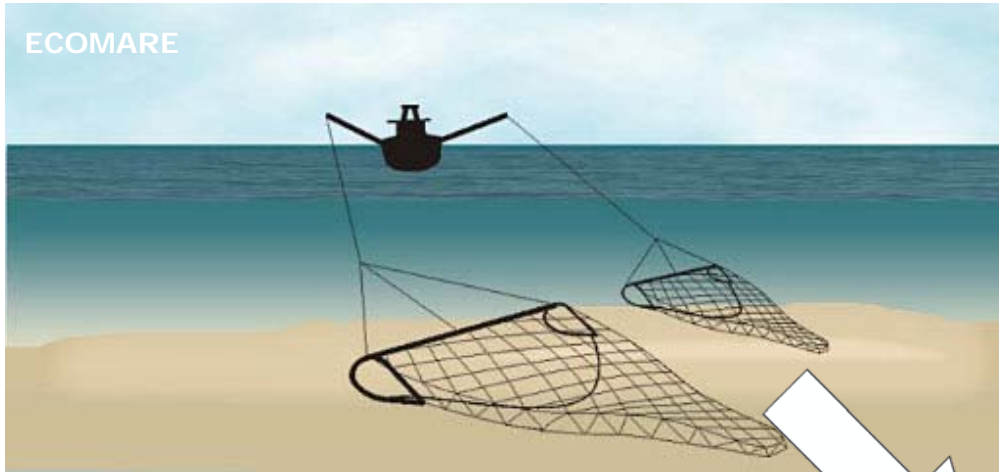
Land-coast
coupling

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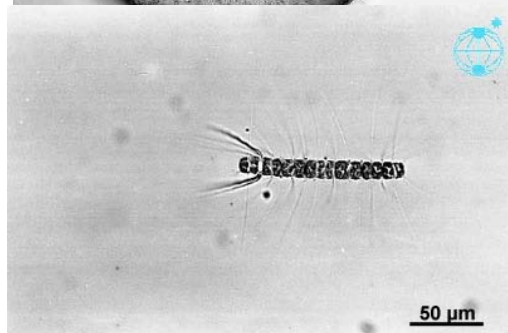
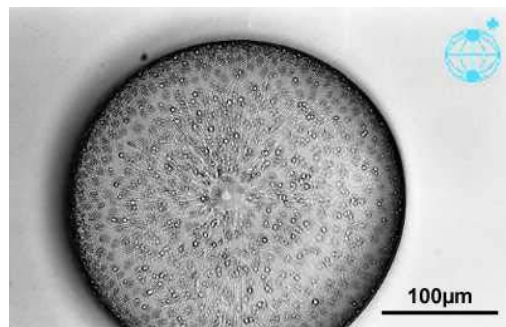
Human disturbance





North Sea phytoplankton

Diatoms



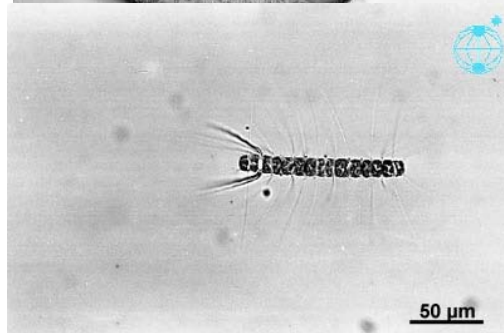
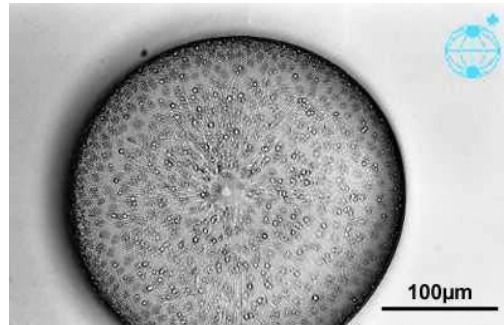
Phaeocystis spp. colonies





North Sea phytoplankton

**N and/or P
limiting**



PlanktonNET



**Si
limiting**



René van Wezel



N-P-Si ratio

**Human N and P
inputs**

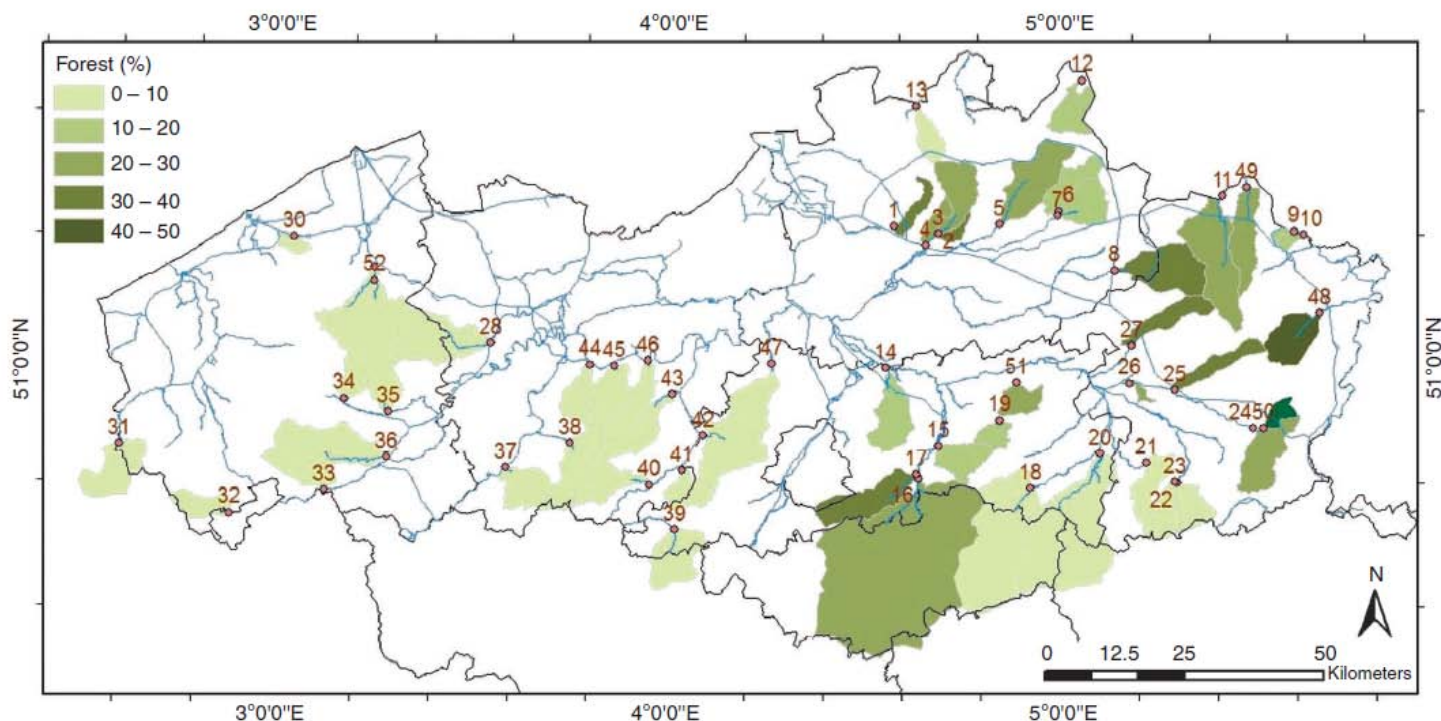


**Si-limitation more
frequent**

**Si inputs
unchanged?**



Millennia of cultivation

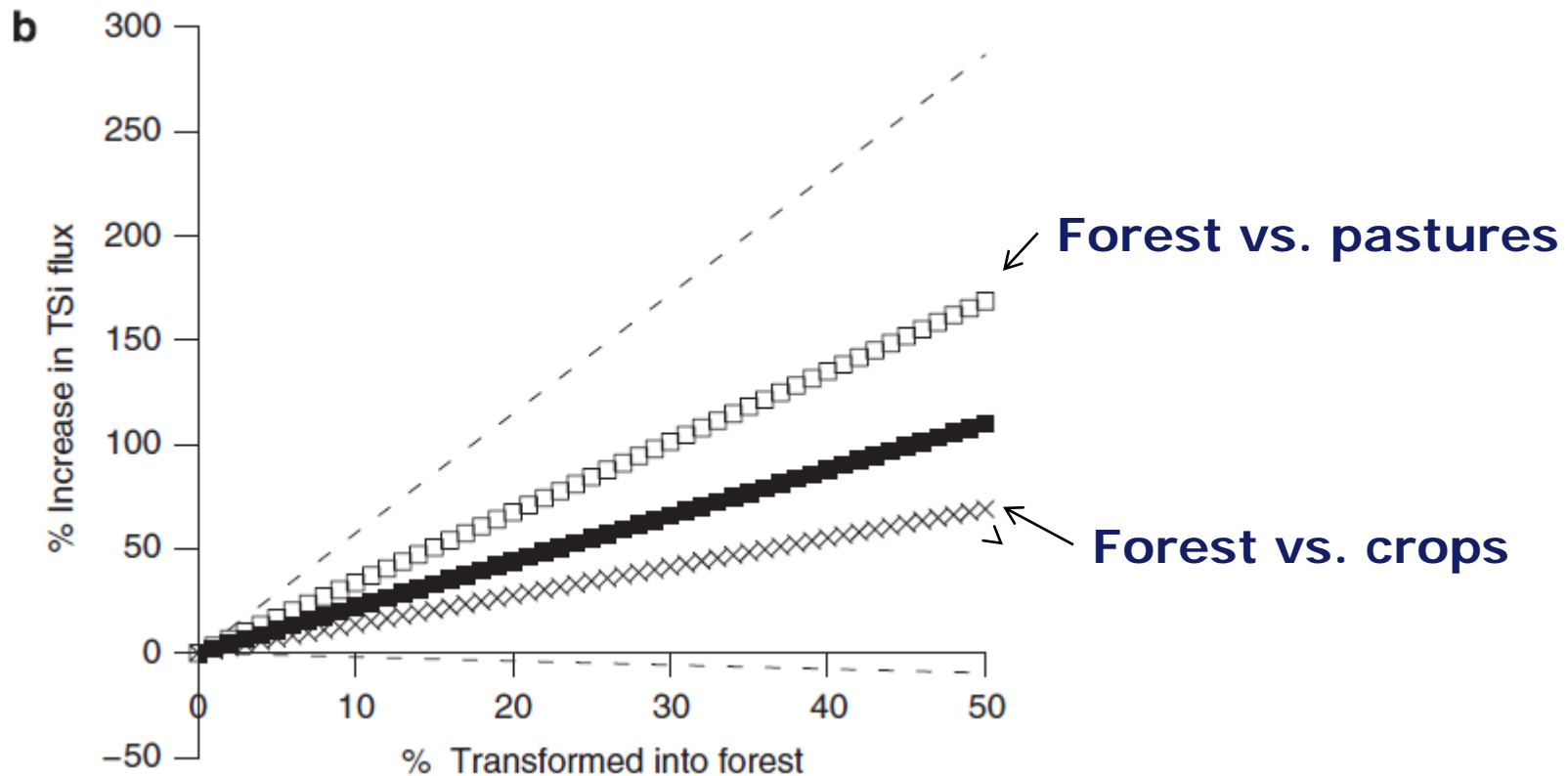


Schelde basin: +/- 100% forest cover 1250 years ago

→ +/- 10% now



Si-export reductions

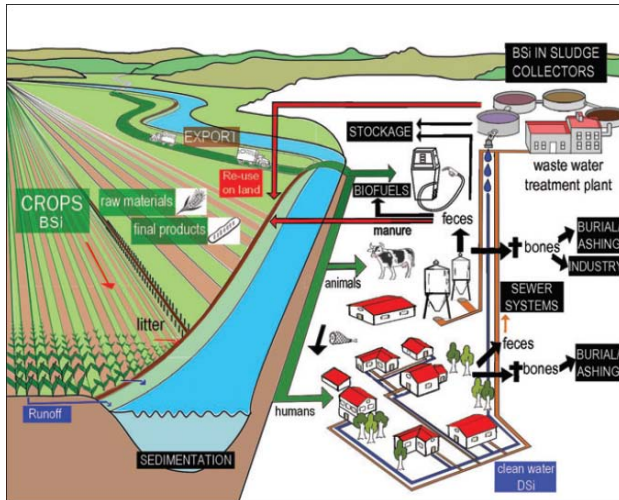


Struyf et al. 2010, Nature Communications

**Si inputs 50 to 200 %
higher from forests!**



A new concept



Vandevenne et al. 2012, Frontiers Ecol Environ

**Harvest Si loop
with large
potential sinks...**

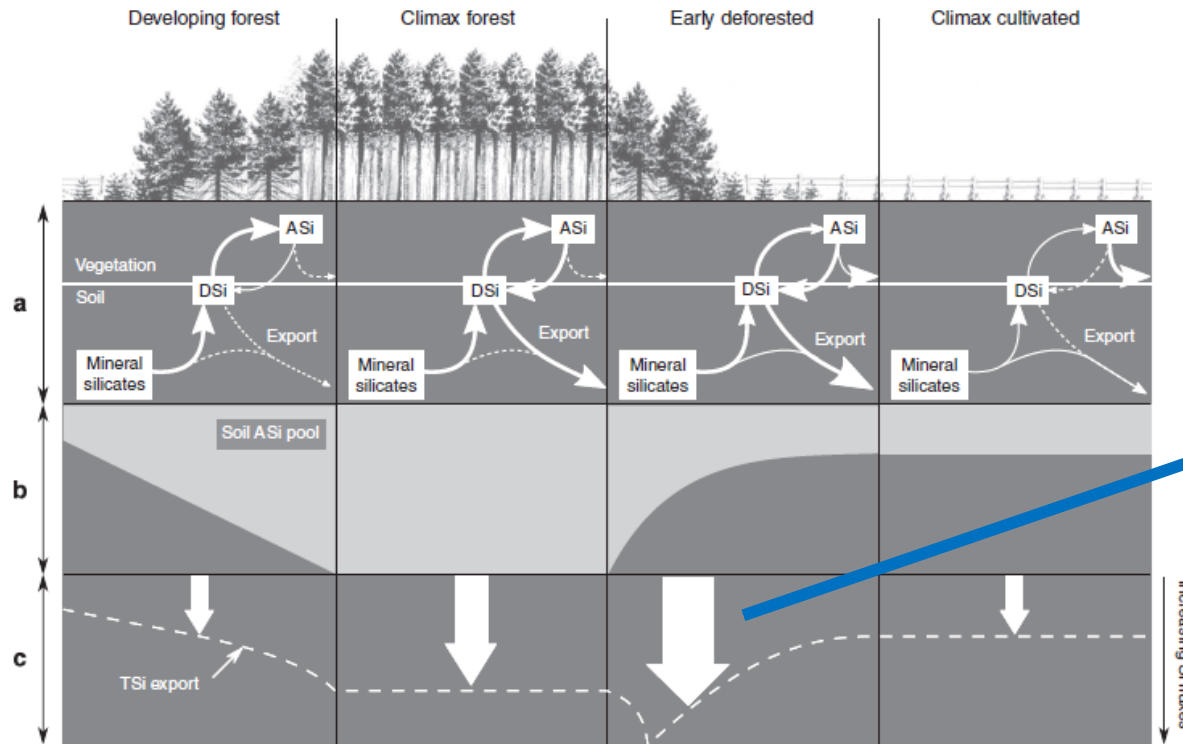
**Soil erosion:
Reduced contact
water/soil Si**



Wim Clymans, KULeuven



To complicate matters



Struyf et al. 2010, Nature Communications

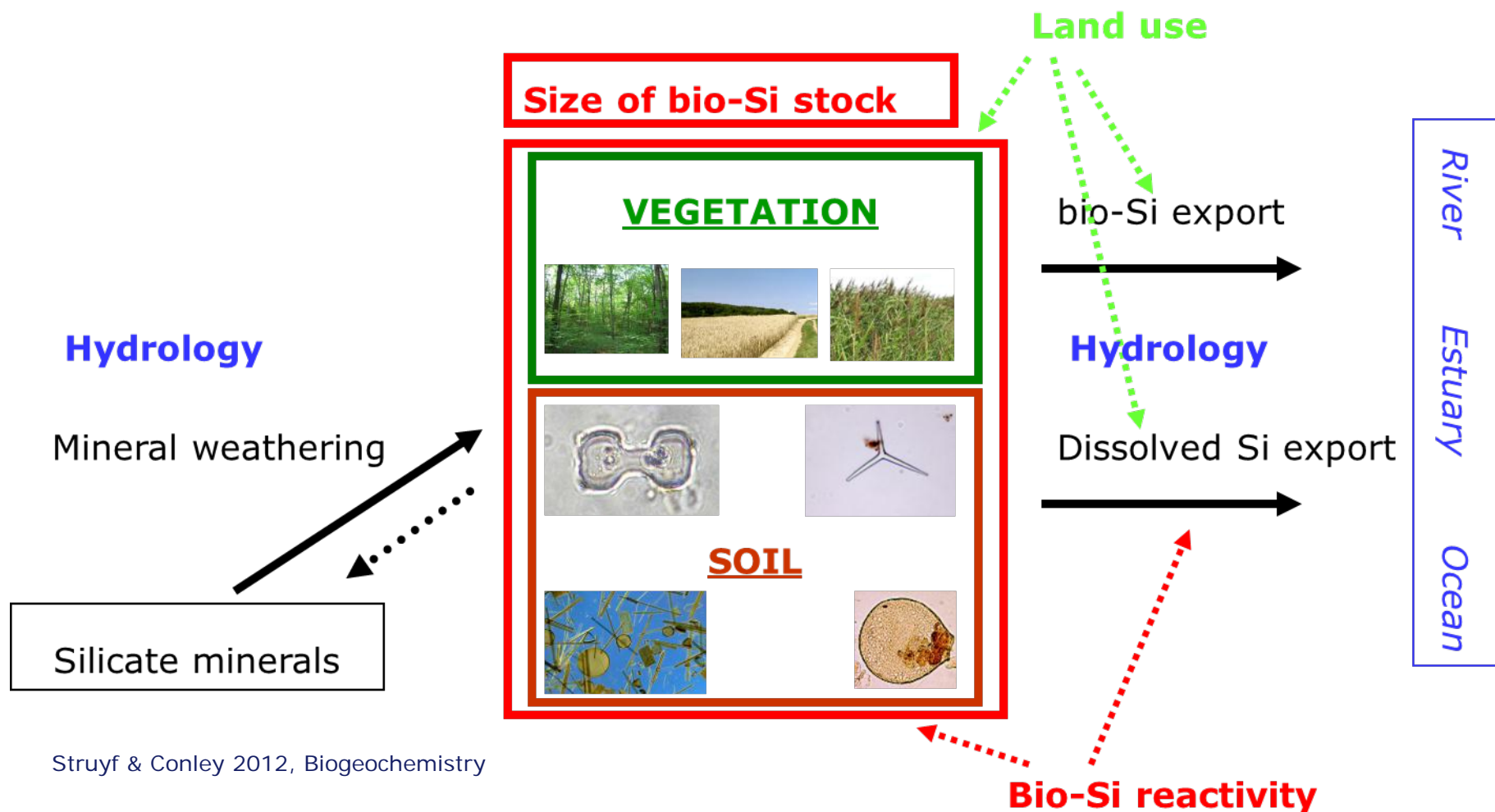
First
+/-
100 years:

Si flux
increases
before
it collapses

In recently cultivated regions, severe Si-limitation
“masked” by sudden Si-pulse preceding Si flux
collapse...



Ecosystem Si filter



Struyf & Conley 2012, Biogeochemistry



Conclusion

- **Land use** strongly impacts Si fluxes
- Long-term cultivation **has strengthened the shifts in N-P-Si limitation** in Scheldt estuary and coastal zone **through Si output reduction**
- Impacts **food webs, turbidity, O₂-concentration**
- **Masking effect for eutrophication** in recently cultivated areas of the world



Thanks!