N-opslag in duinbodems en kleinschalige verstuiving als PAS maatregel

Camiel Aggenbach & Yuki Fujita

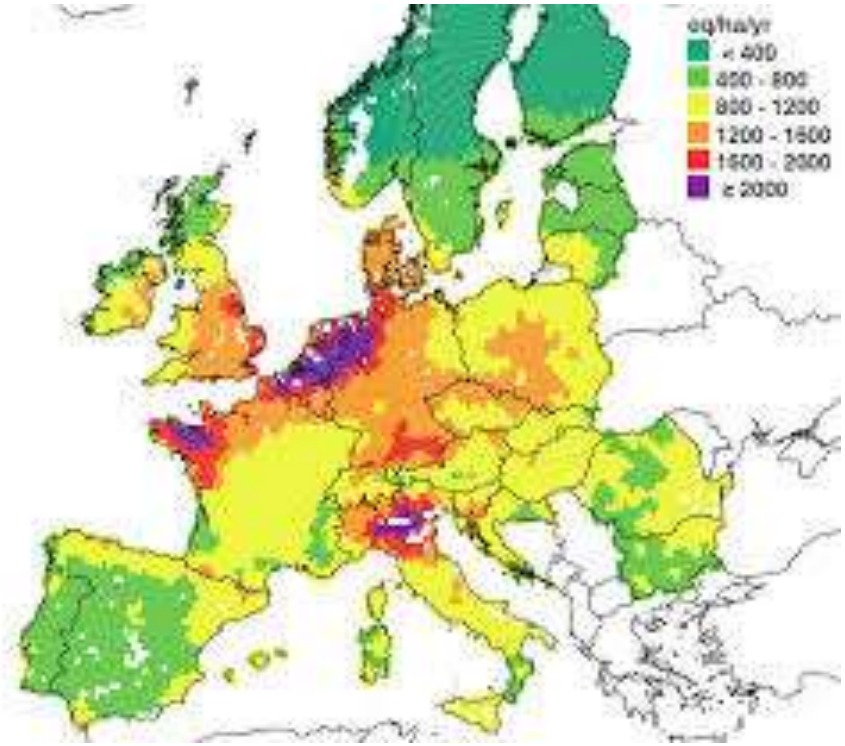
KWR

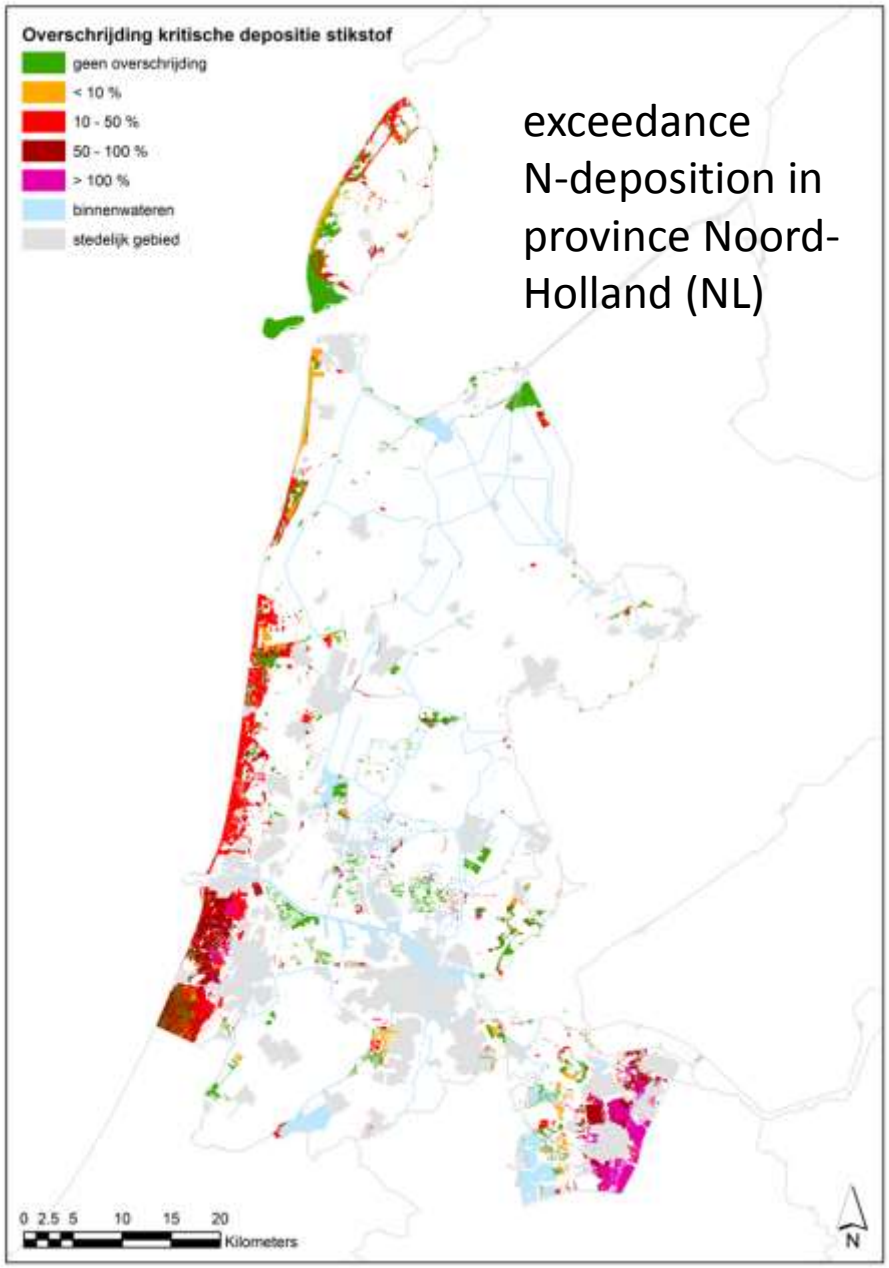
Kenmerken van kustduinen

- jonge landschappen en bodems
  - nutrientenarm
  - bodem & vegetatiesuccessie
- eolische activiteit
  - nieuwe successie
  - beinvloeding oude bodems
- complexe variatie ruimte-tijd

atmospheric S+N-deposition

> critical N load Grey Dunes



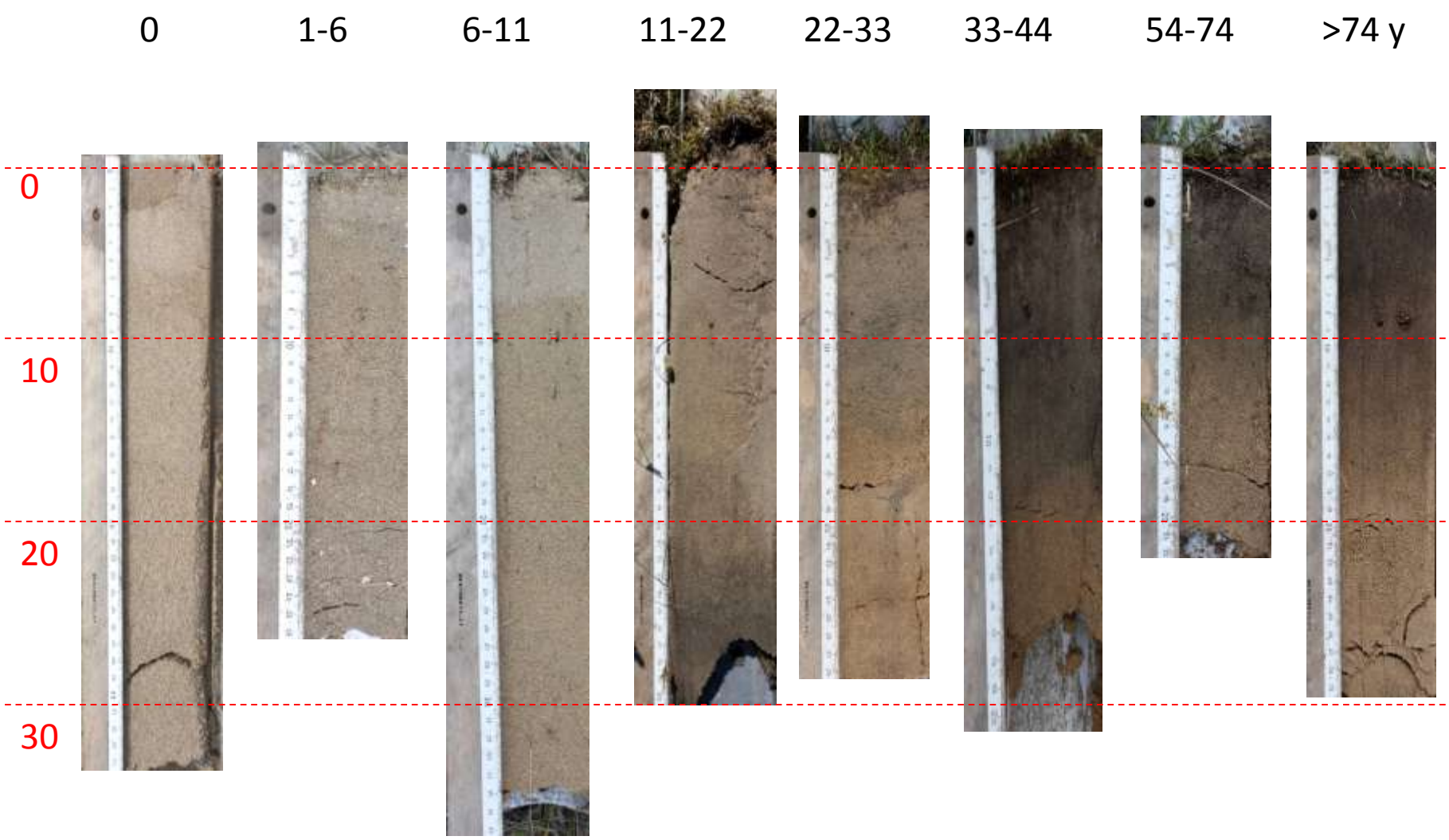


exceedance N-deposition in province Noord-Holland (NL)

Outline

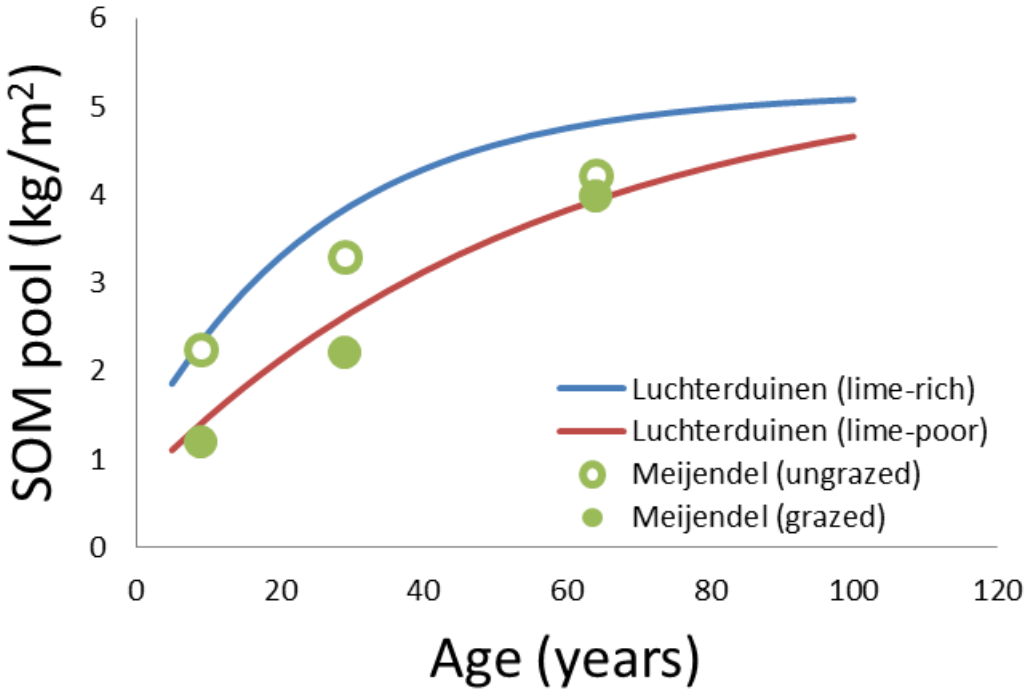
- effecten van bodemsuccessie (SOM, N, water, vegetatie)
- invloed van N-depositie op N-opslag
- de invloed van verstuiving op bodemkwaliteit (vooral basenhuishouding en vegetatie)

Bodemsuccessie

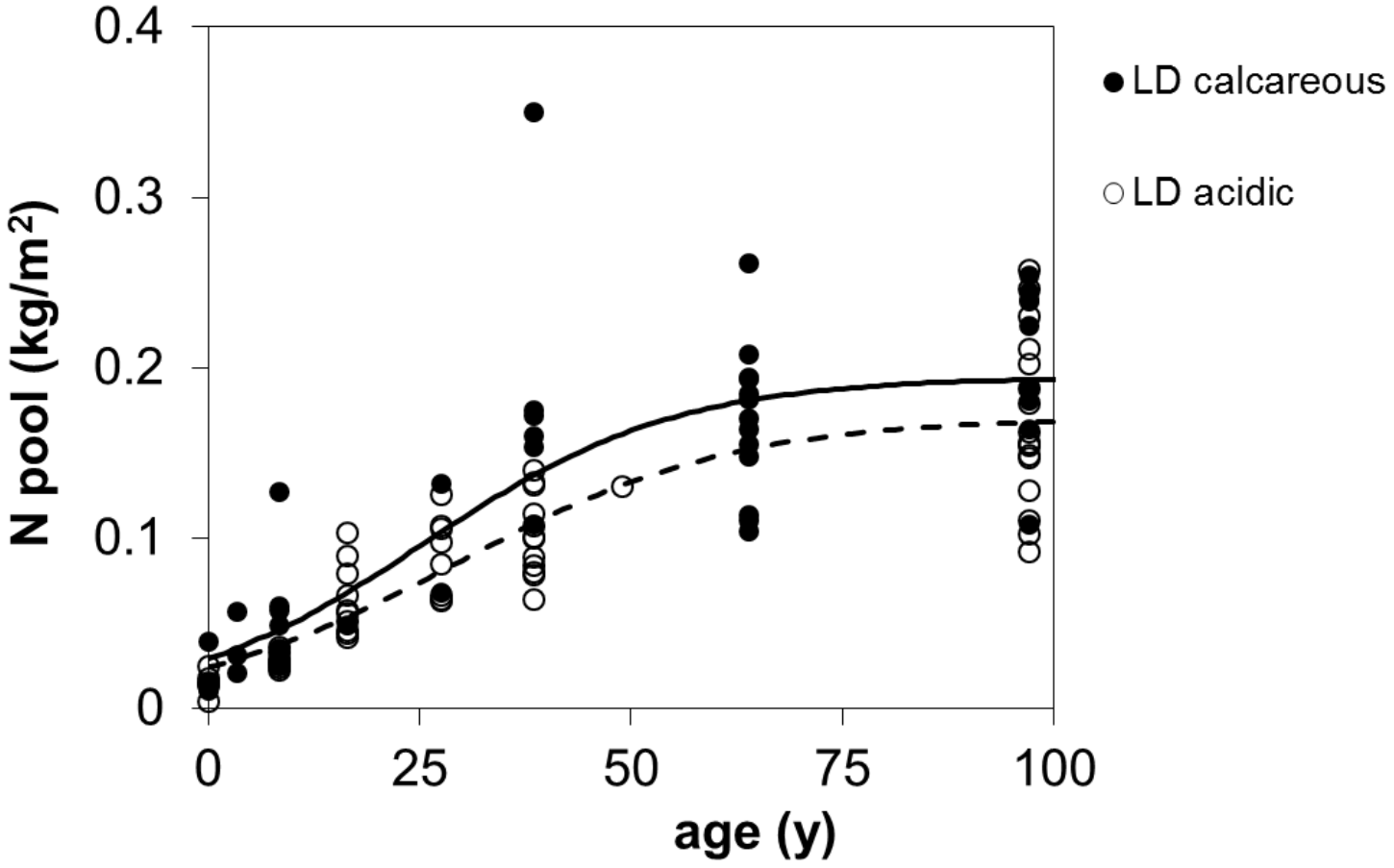


Chrono-sequences bodem

- bodem ontwikkeling -> 40-60 jaar
- effect kalkrijkdom

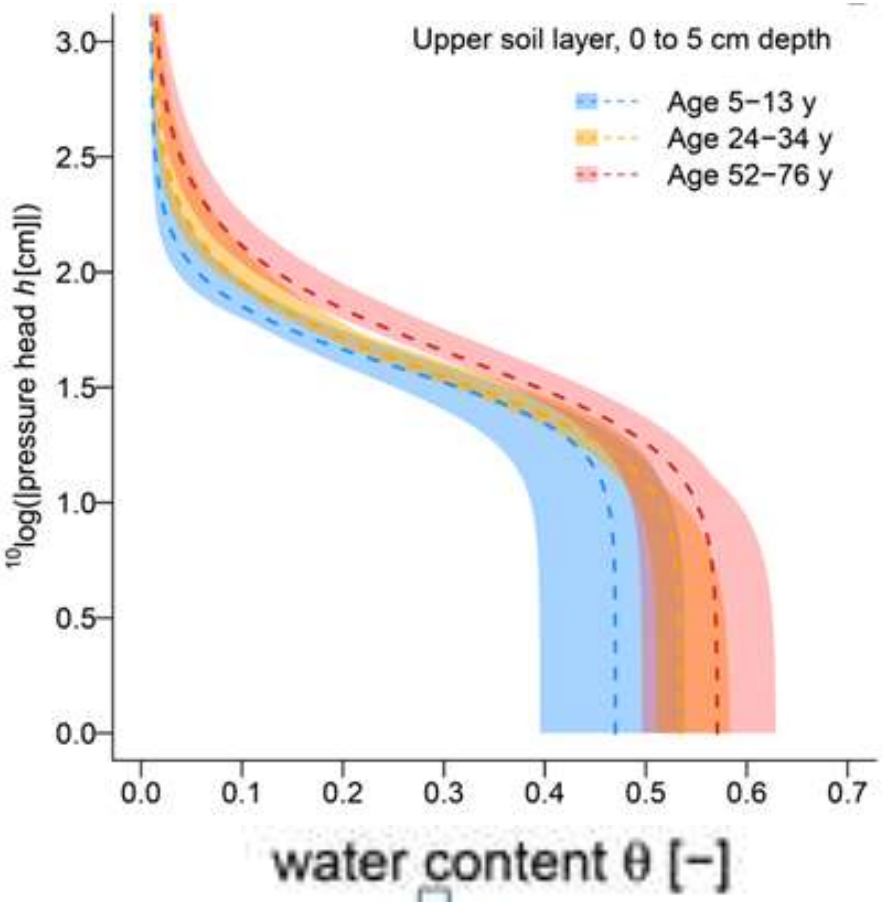


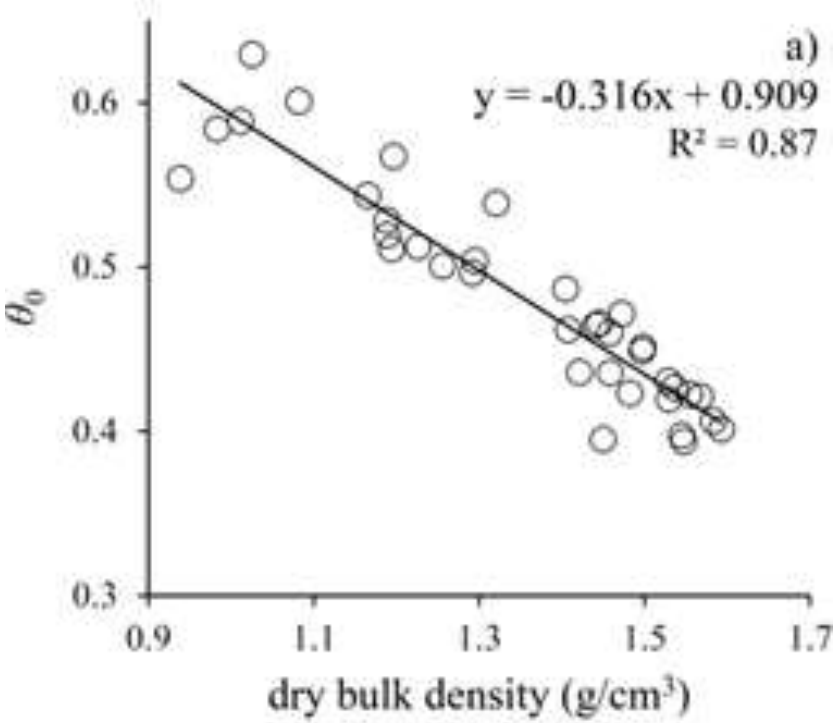
Bodemsuccessie



chrono-sequences Luchterduinen : DPWE onderzoek 2012

Bodemsuccessie



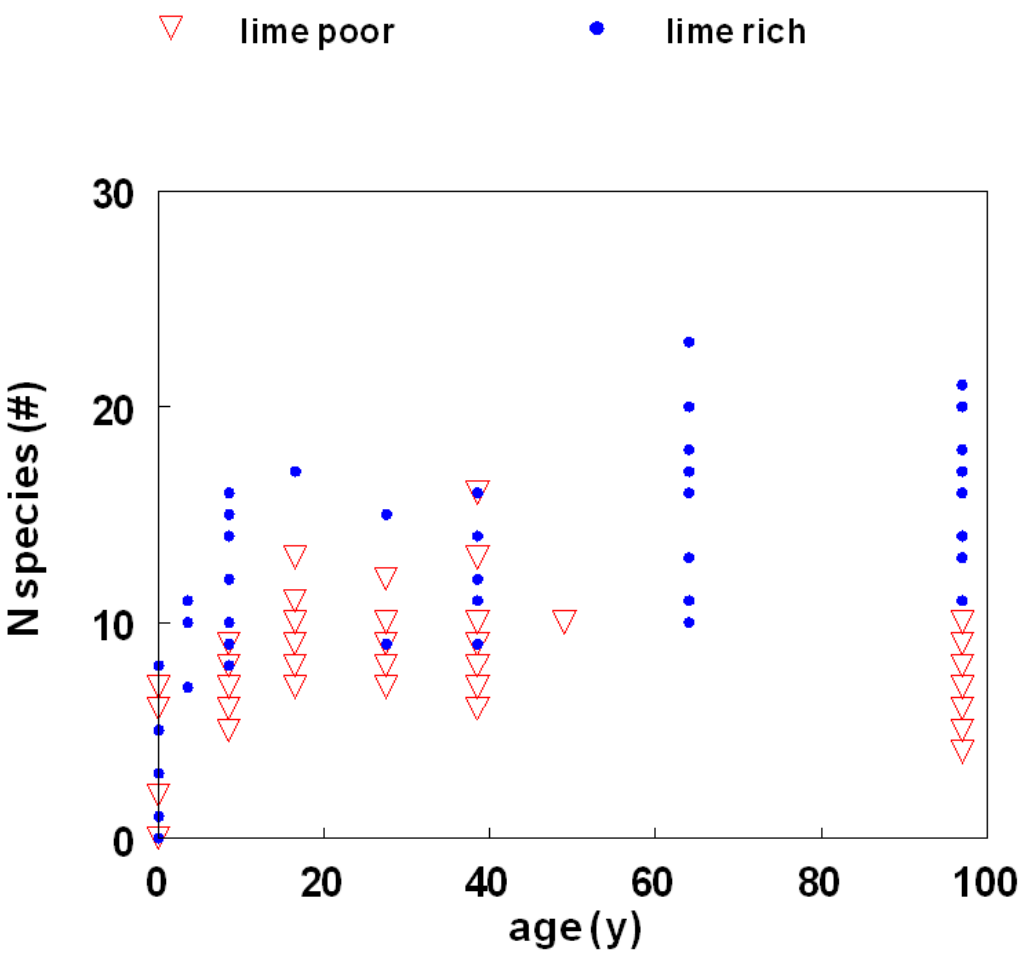


chrono-sequence Meijendel : Voortman et al., in press

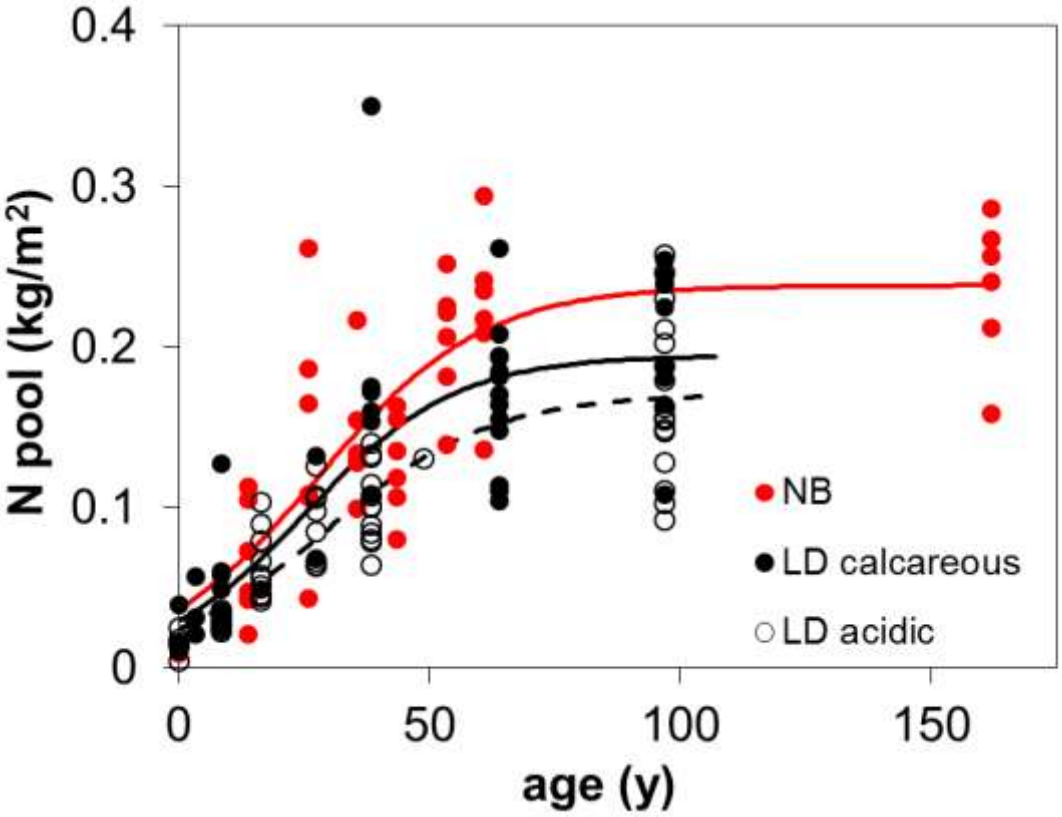
Bodemsuccessie

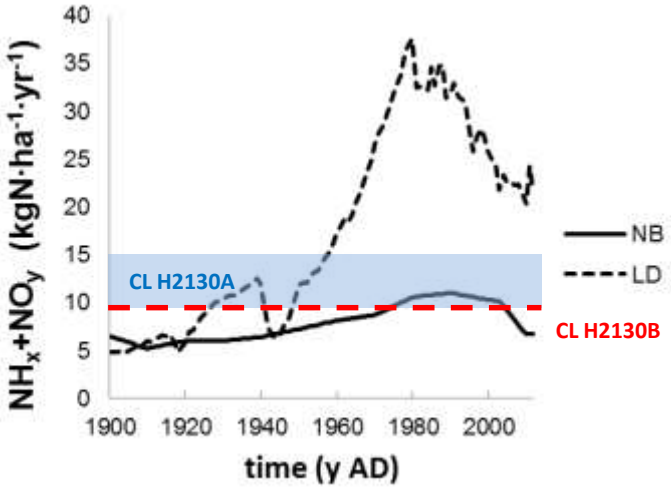
- SOM accumulation
  - more species
- calcarious soil
  - stays high
  - Grey Dunes

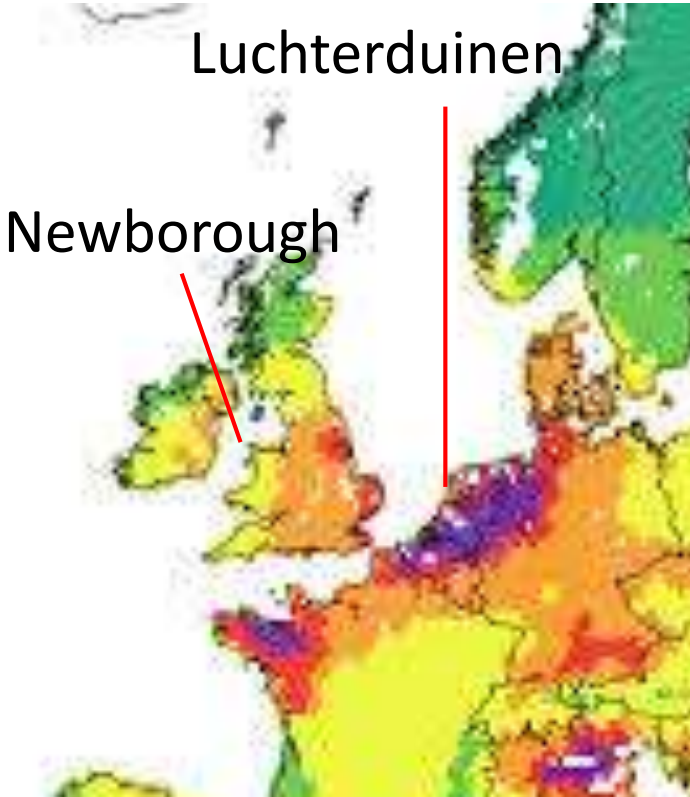
    > 60 y
- non-calcarious
  - drops after 40 y due to acidification



N-depositie op N-opslag

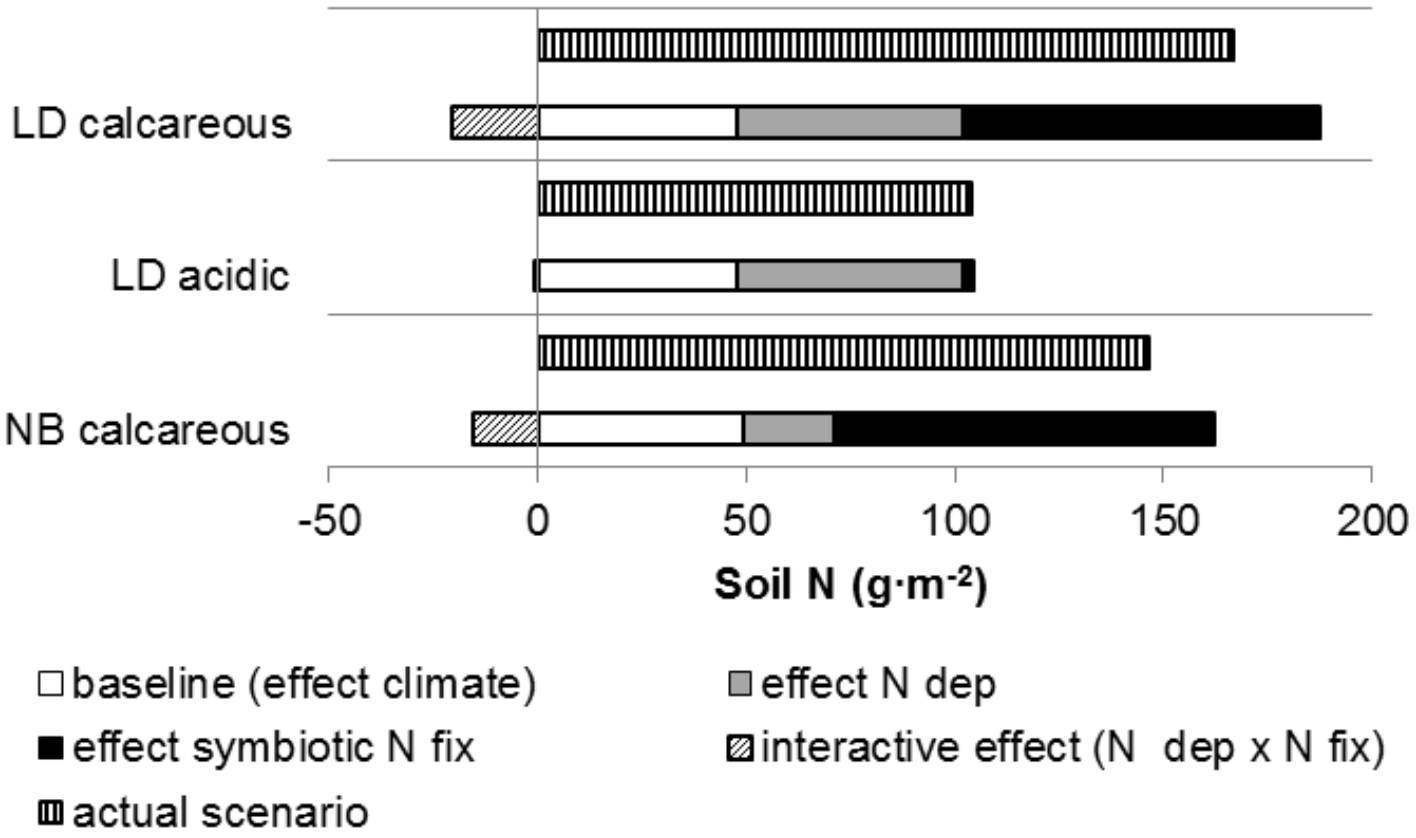






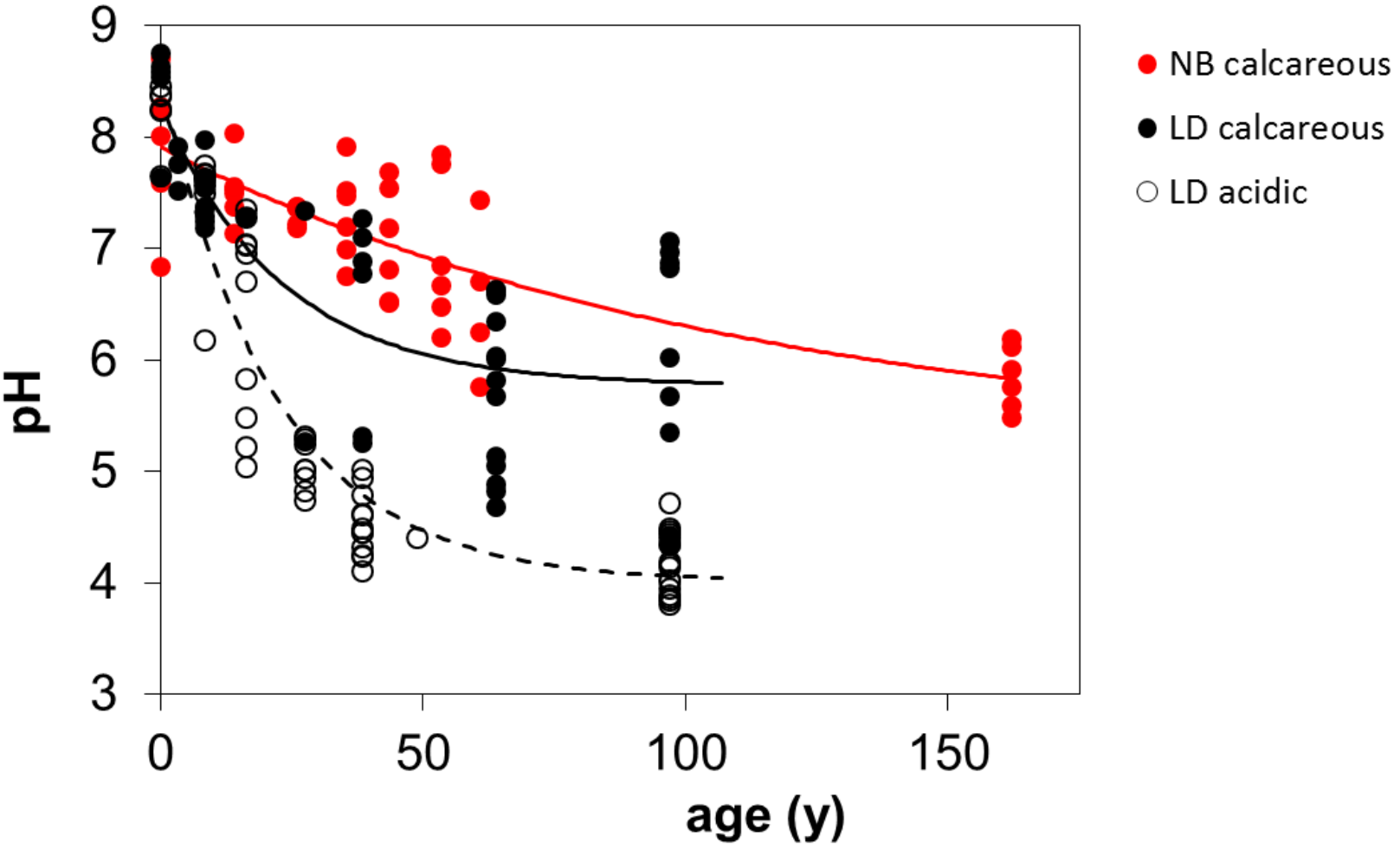
Aggenbach et al. in press

N-depositie op N-opslag

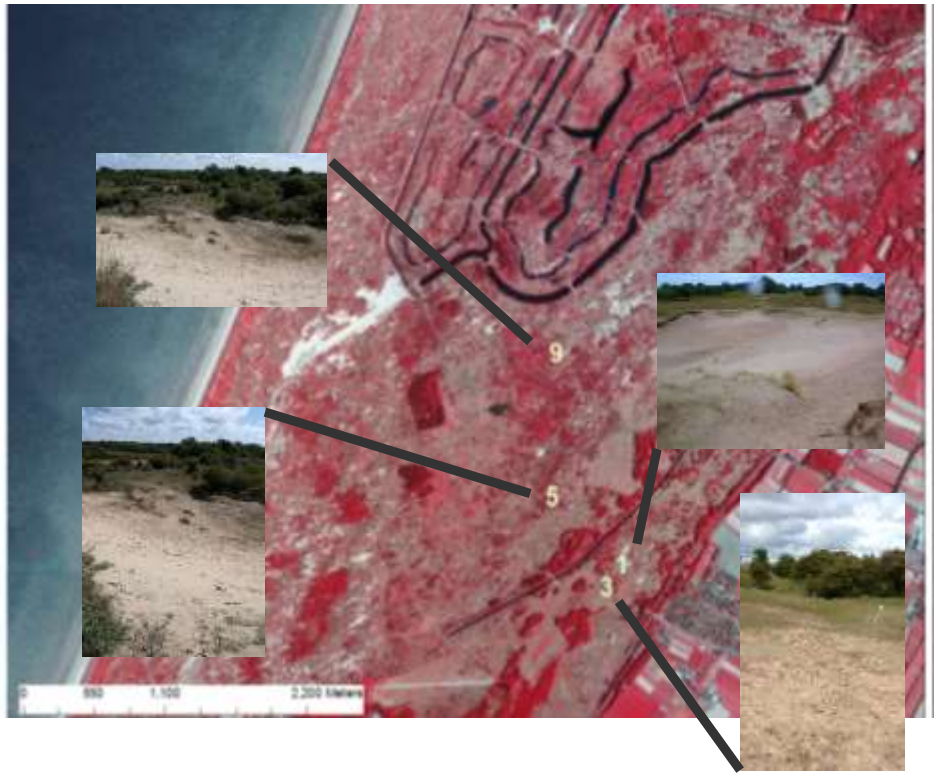


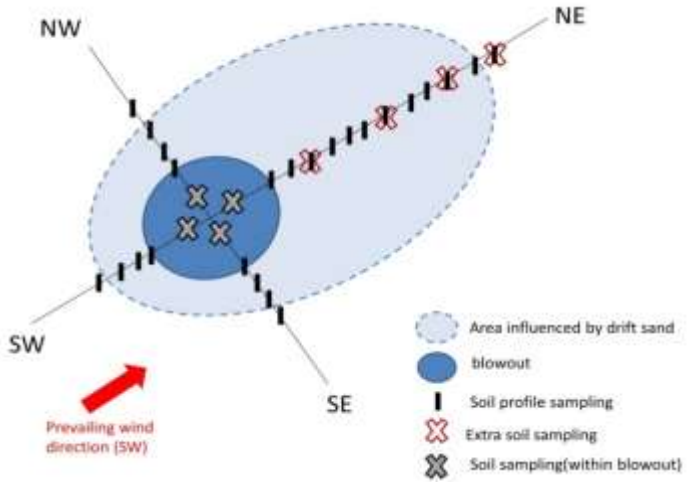
Modellering met CENTURY

N-depositie op N-opslag



Verstuiving & bodemkwaliteit

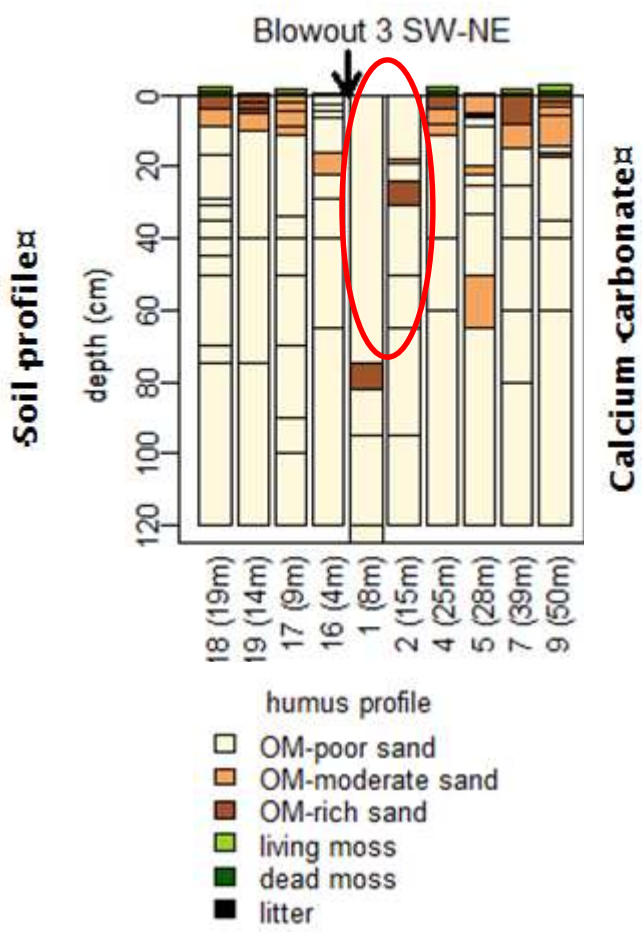


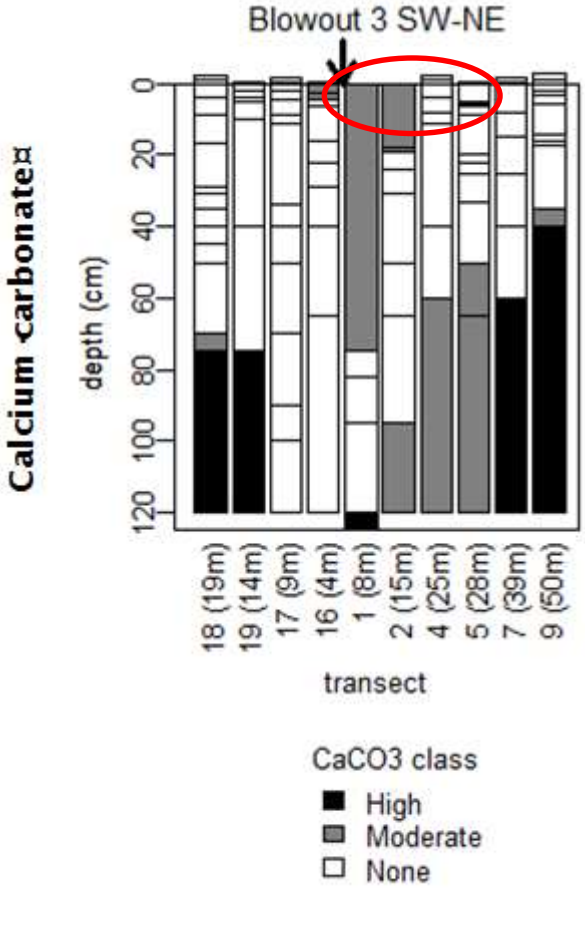


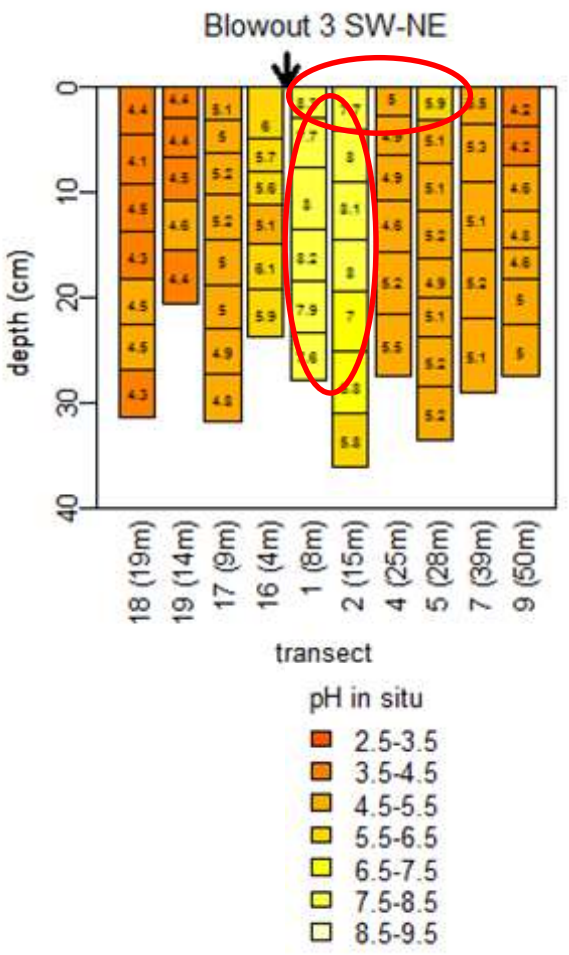
> 35 y eolean activity

research in Luchterduinen, The Netherlands (Fujita et al. 2015)

Gradient soil moderately CaCO3 rich blowout

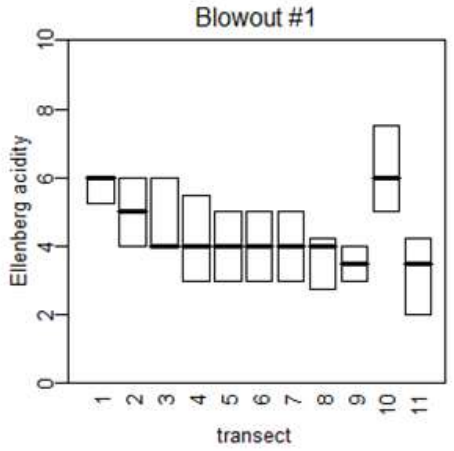


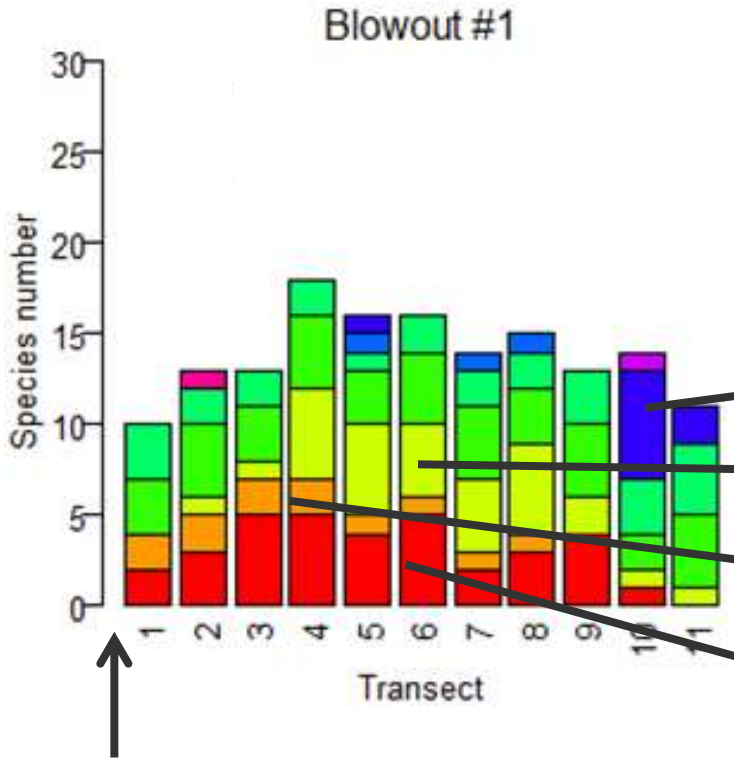




Vegetation gradient CaCO3 rich blowout

ecological plant species groups





shrub and forest

Grey Dunes: nutrient poor and base poor

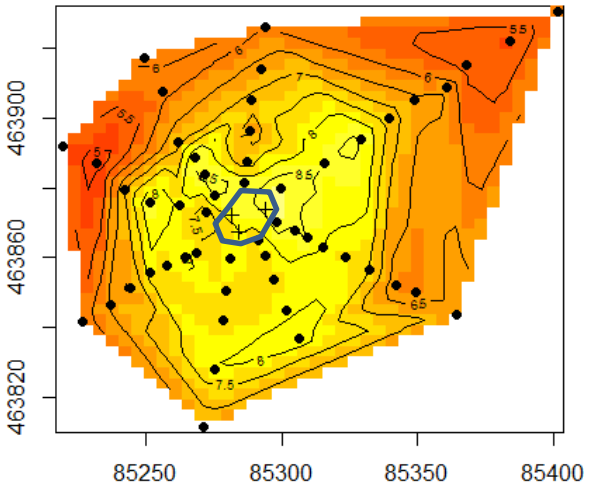
pioneer: nutrient poor and base rich

Grey Dunes: nutrient poor and base rich

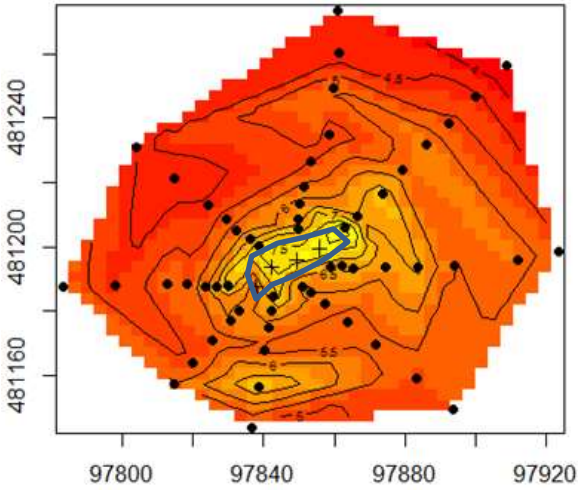
deflation zone

pH patroon gestabiliseerde stuifkuilen

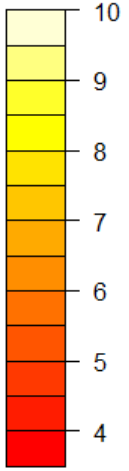
6-14 y stabilized; CaCO3 = 2.7 %



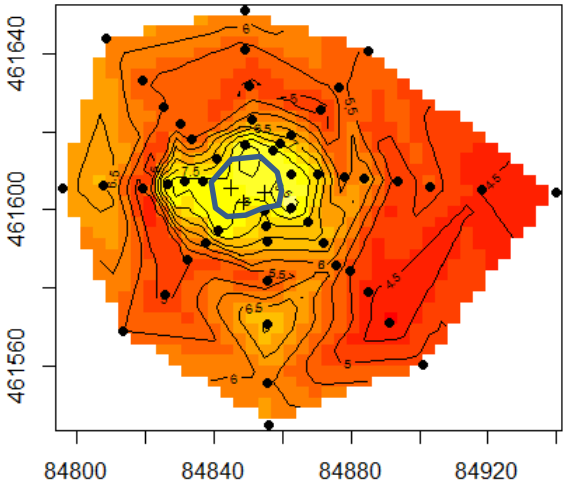
14-25 y stabilized; CaCO3 = 1.0 %



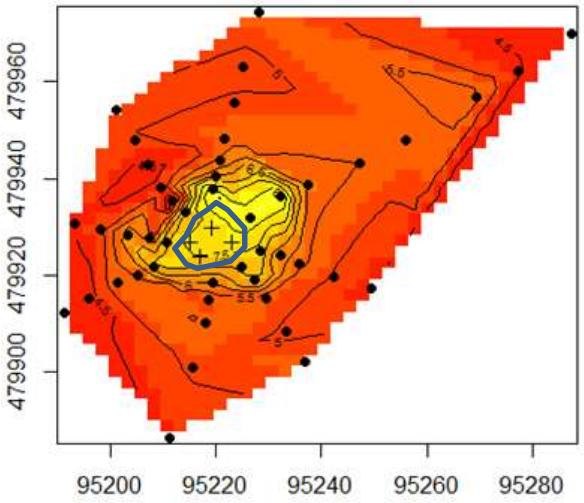
pH in situ
2.5 cm-mv

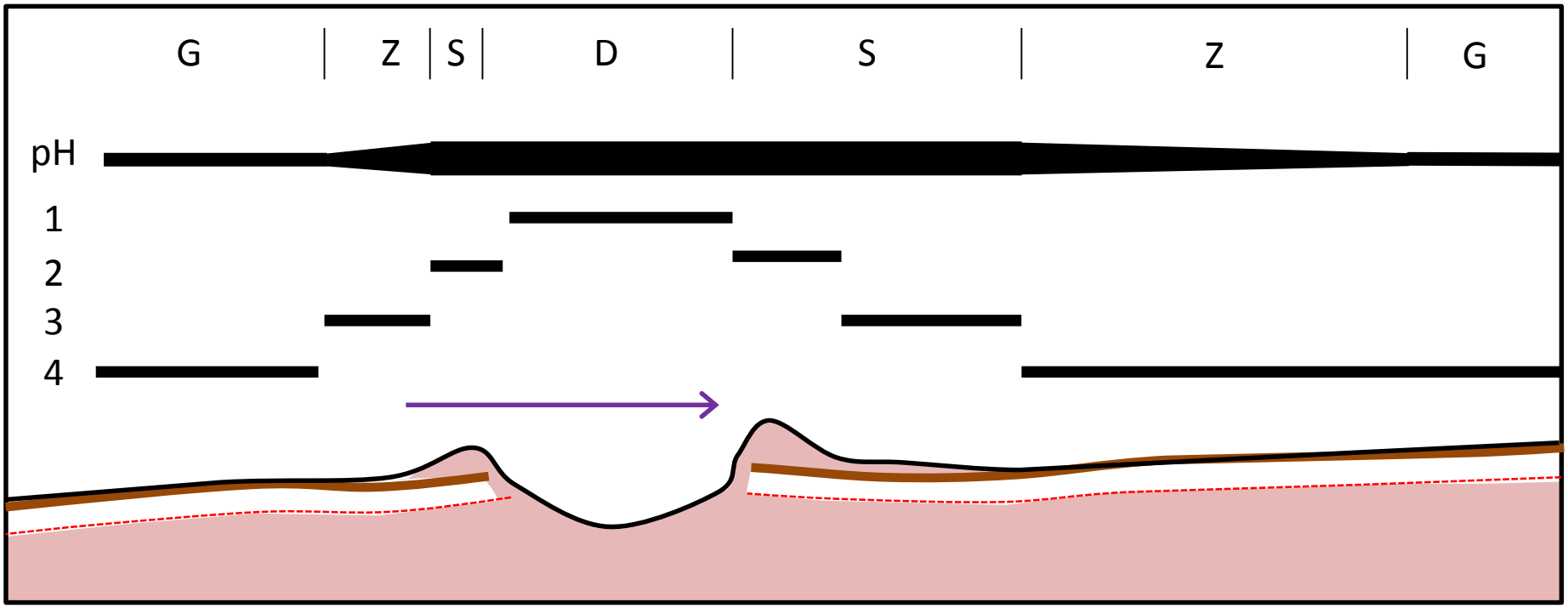


6-14 y stabilized; CaCO3 = 2.2 %



ca. 25 y stabilized; CaCO3 = 1.2 %





zones stuifkuil
D: deflatiezone
S: accumulatiezone met sterke instuiving
Z: accumulatiezone met zwakke instuiving
G: geen instuiving

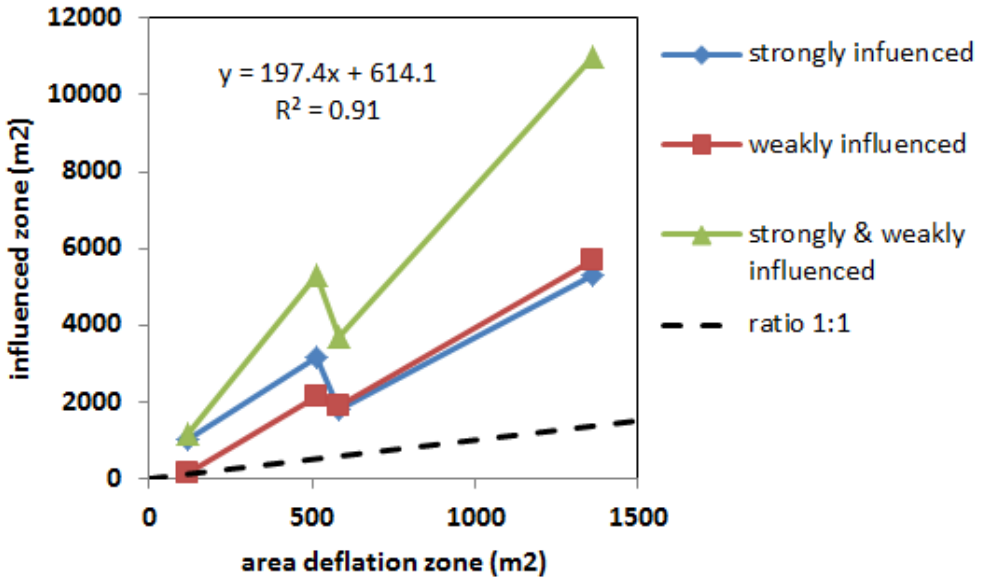
vegetatie
1: kaal zand
2: Helm/ kaal zand
3: pionierstadium duingrasland
4: oud gesloten duingrasland

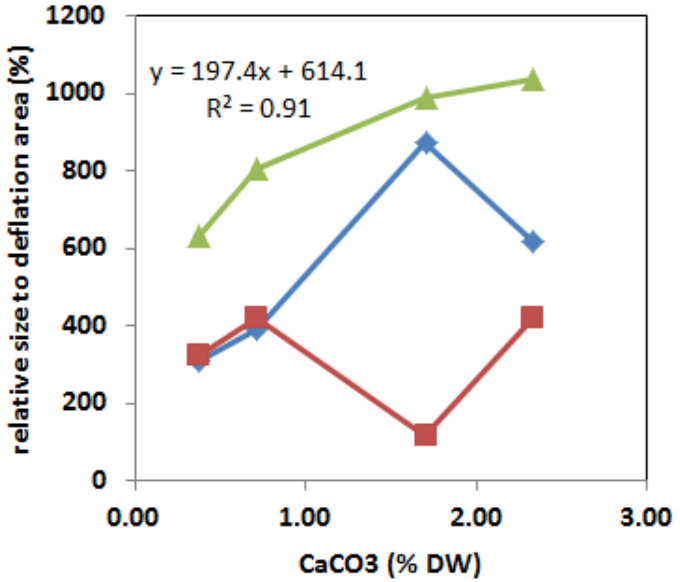
bodem
maaiveld
humushoudende A-laag
ontkalkingsgrens
kalkhoudend zand

wind
overheersende windrichting

Spatial effects permanent blowouts

effect of size and CaCO3 content of deflation zone





Conclusies

- gezond duinsysteem = bodemsuccessie + eolische dynamiek!
  - soortenrijke duingraslanden = oude bodem!
  - gebruik oude kalkrijke bodems voor herstel
  - tijdschaal successie >2-6 decennia
- N-depositie en N-opslag
  - in kalkrijke systemen geen extra N-accumulatie
  - in kalkarme systemen effect onduidelijk
  - hoge N-depositie onderdrukt N-fixatie -> samenstelling vegetatie?
  - depositie -> habitat kwaliteit: verzuring
- kleinschalige eolische activiteit
  - eolische activiteit verhoogd basenrijkdom bodem
  - ruimtelijke effect: 10'en m (6-10 x deflation zone)
  - effect in de tijd: minstens enkele decennia na stabilisatie
  - re-vitalisatie op korte en lange termijn
  - effecten op N-huishouding???


12
ICEPEAK