



Global morphodynamic response of deltas to sea-level rise in the 21st century

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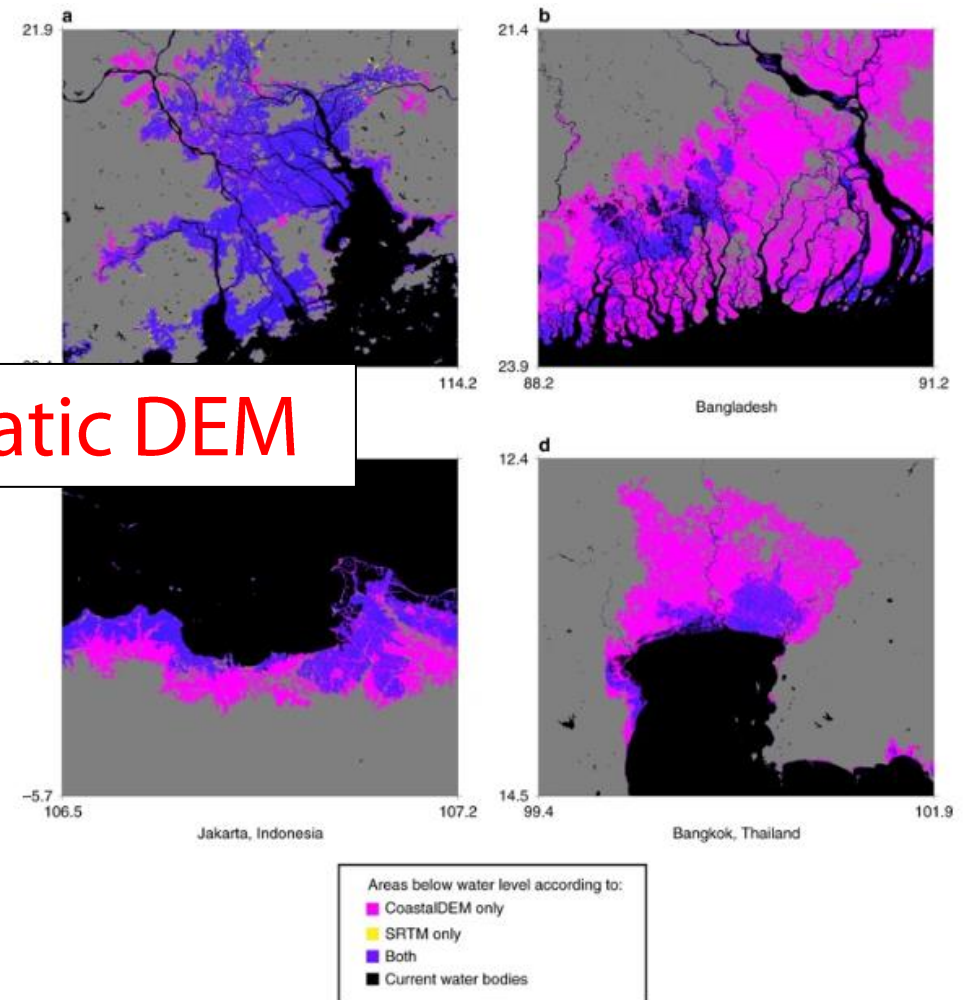


How will deltas respond to SLR in the 21st century?



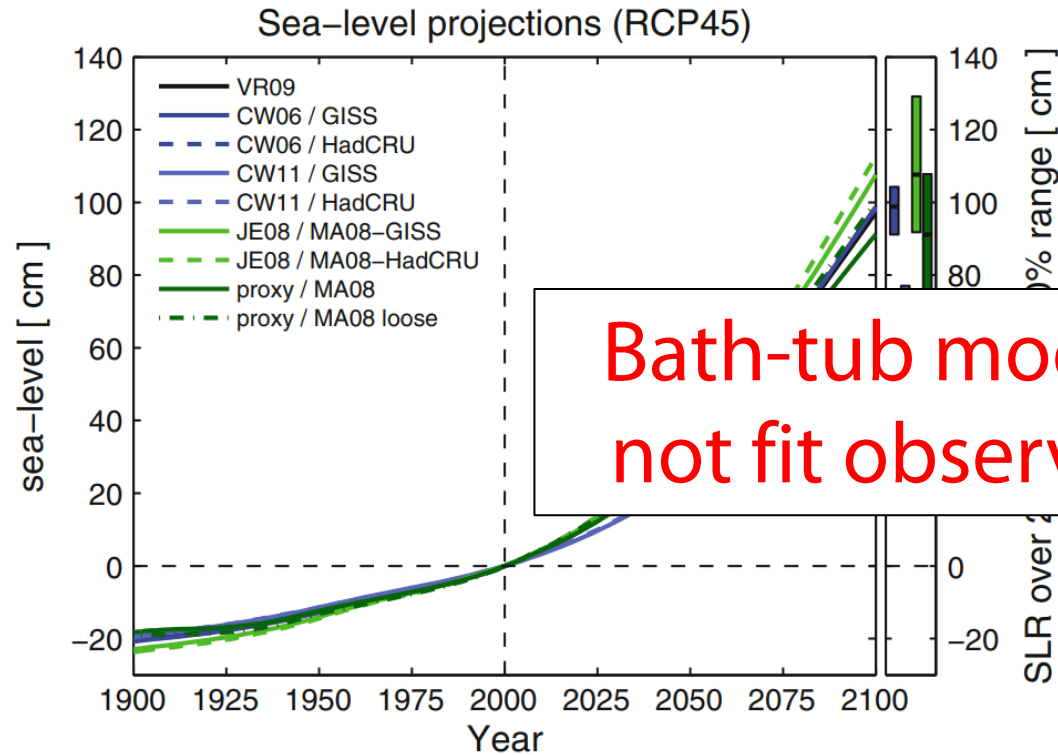
NOAA Sea Level Rise Viewer

bath-tub model: static DEM

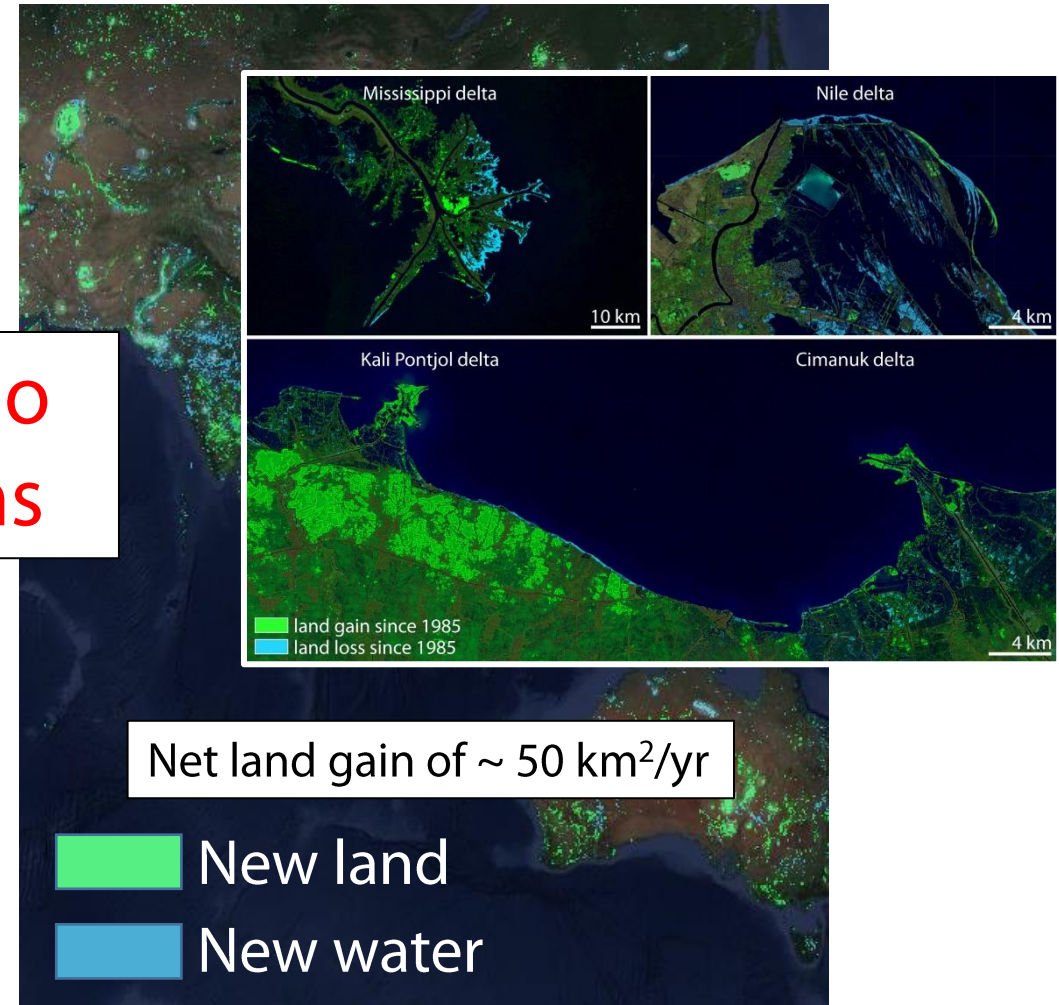


Kulp & Strauss, Nat. Comm., 2019

How will deltas respond to SLR in the 21st century?



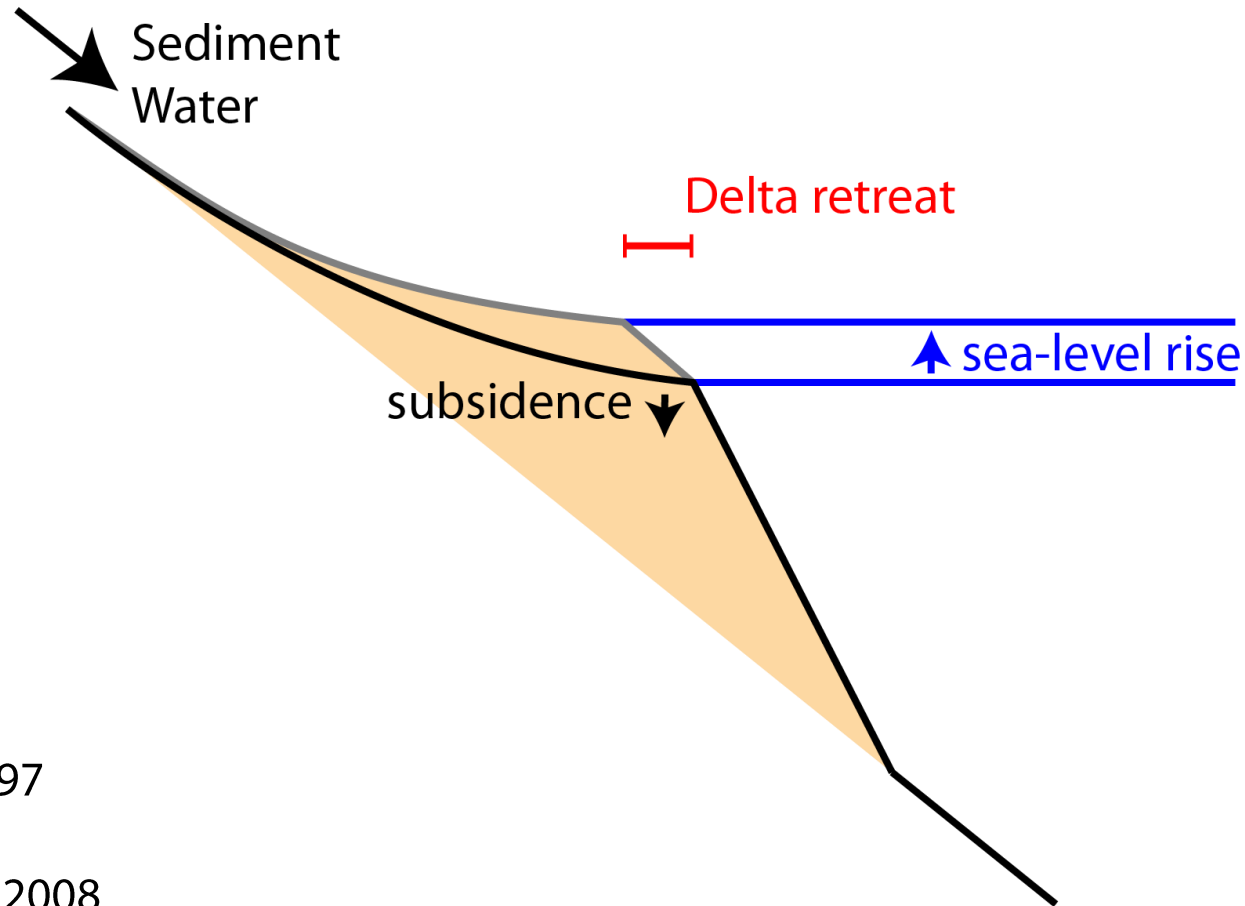
Rahmstorf et al., Clim. Dyn., 2011



Donchyts et al., Nat Clim Change 2016
Nienhuis et al., Nature 2020

This talk

1. Include sediments and SLR in a model for past delta change
2. Use model to make projections of future delta change

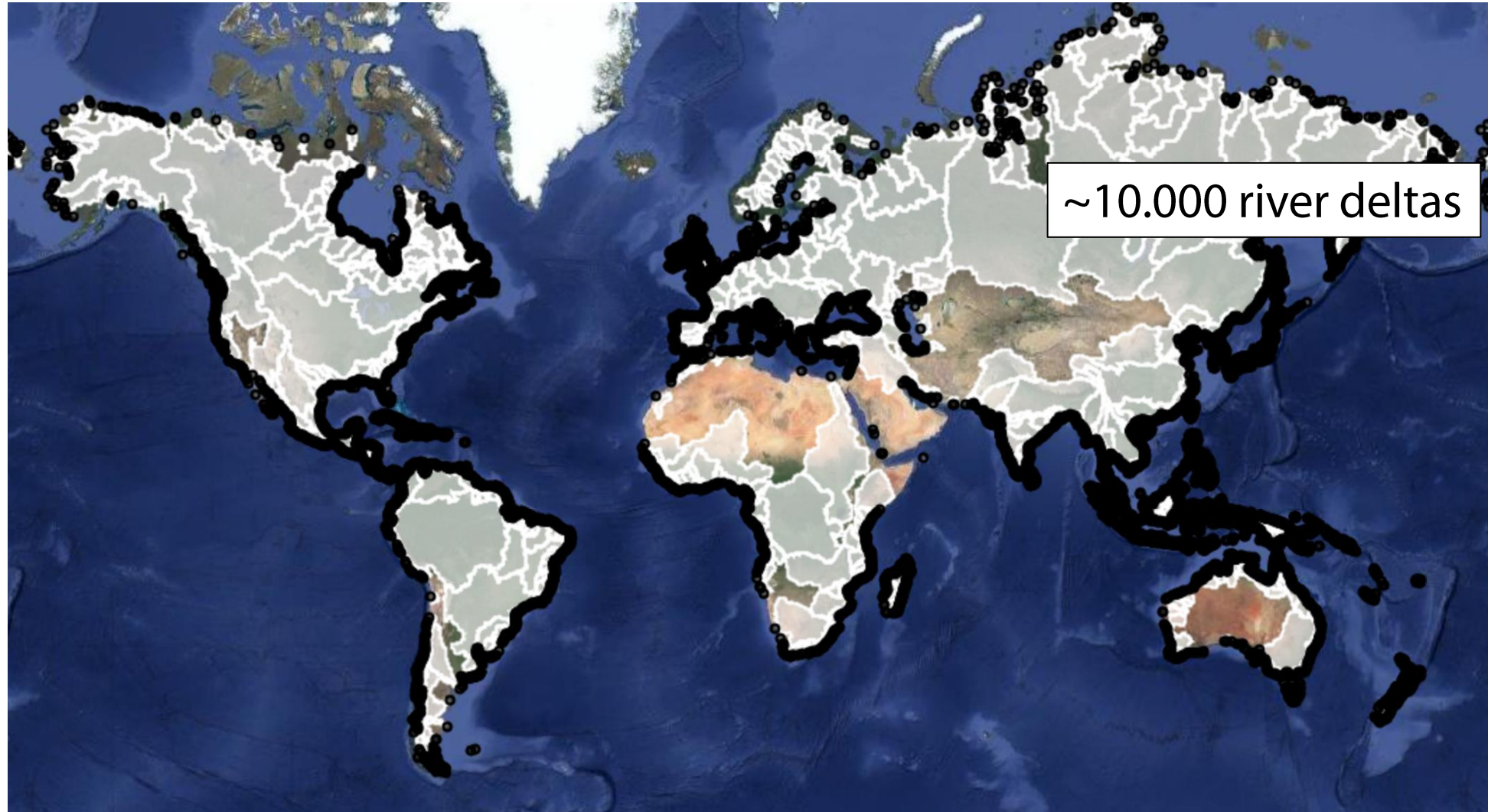
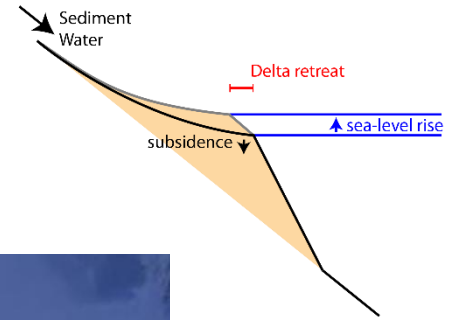


Muto & Steel, *J. Sed. Res.*, 1997

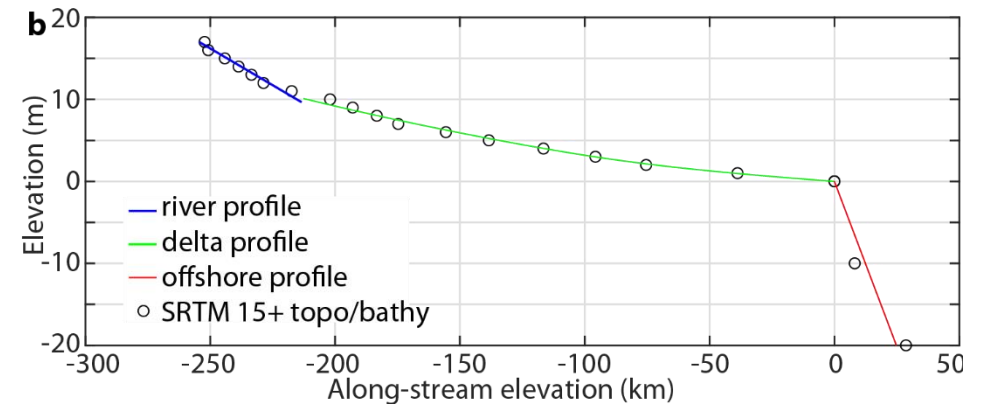
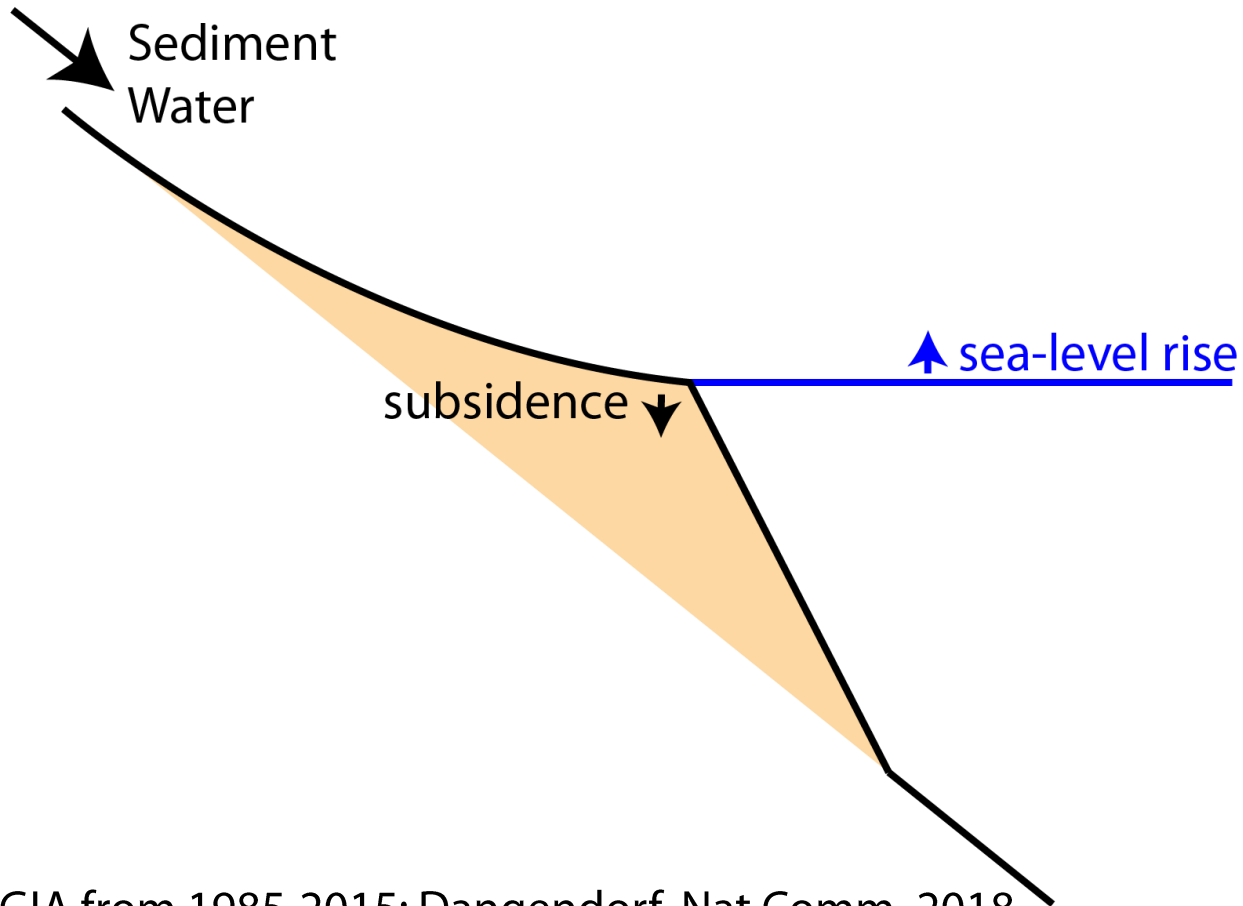
Muto, *J. Sed. Res.*, 2001

Parker et al., *Sedimentology* 2008

Our approach: global application

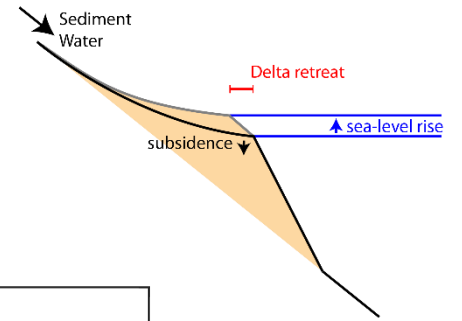
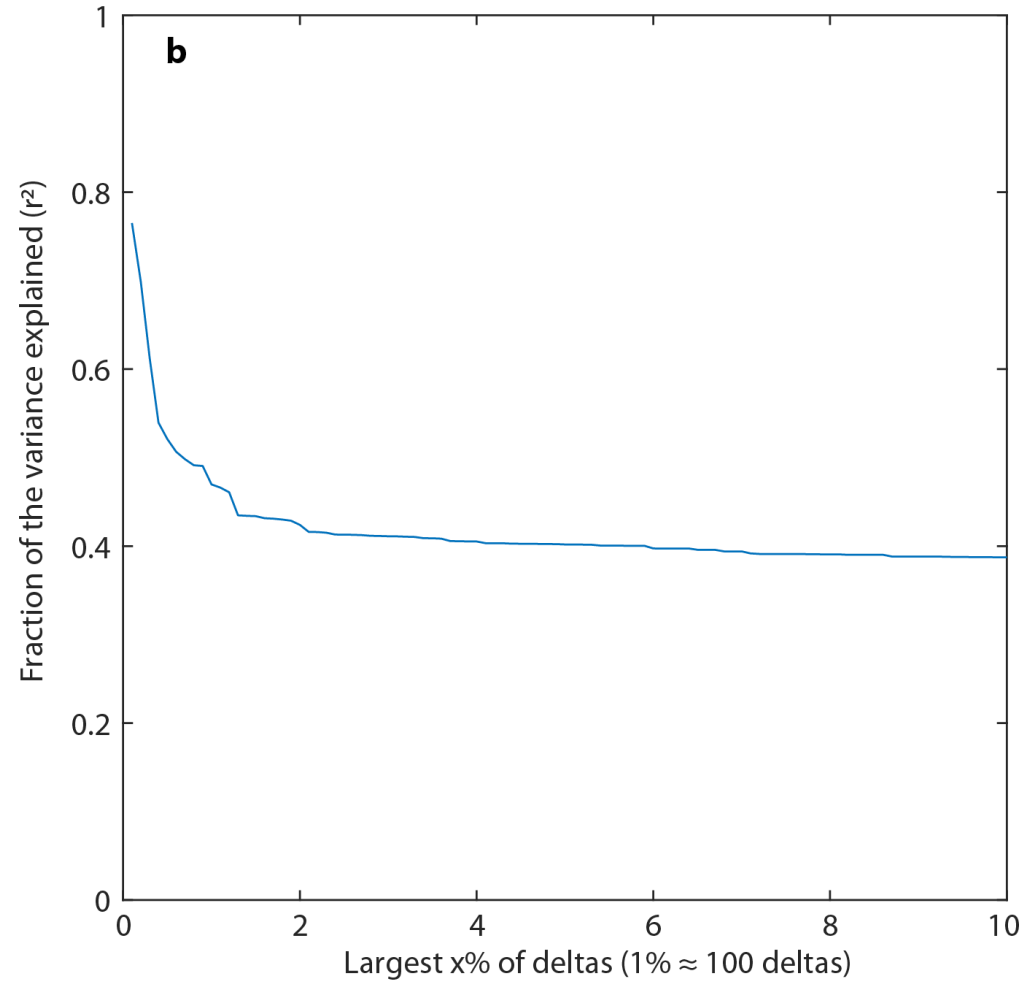
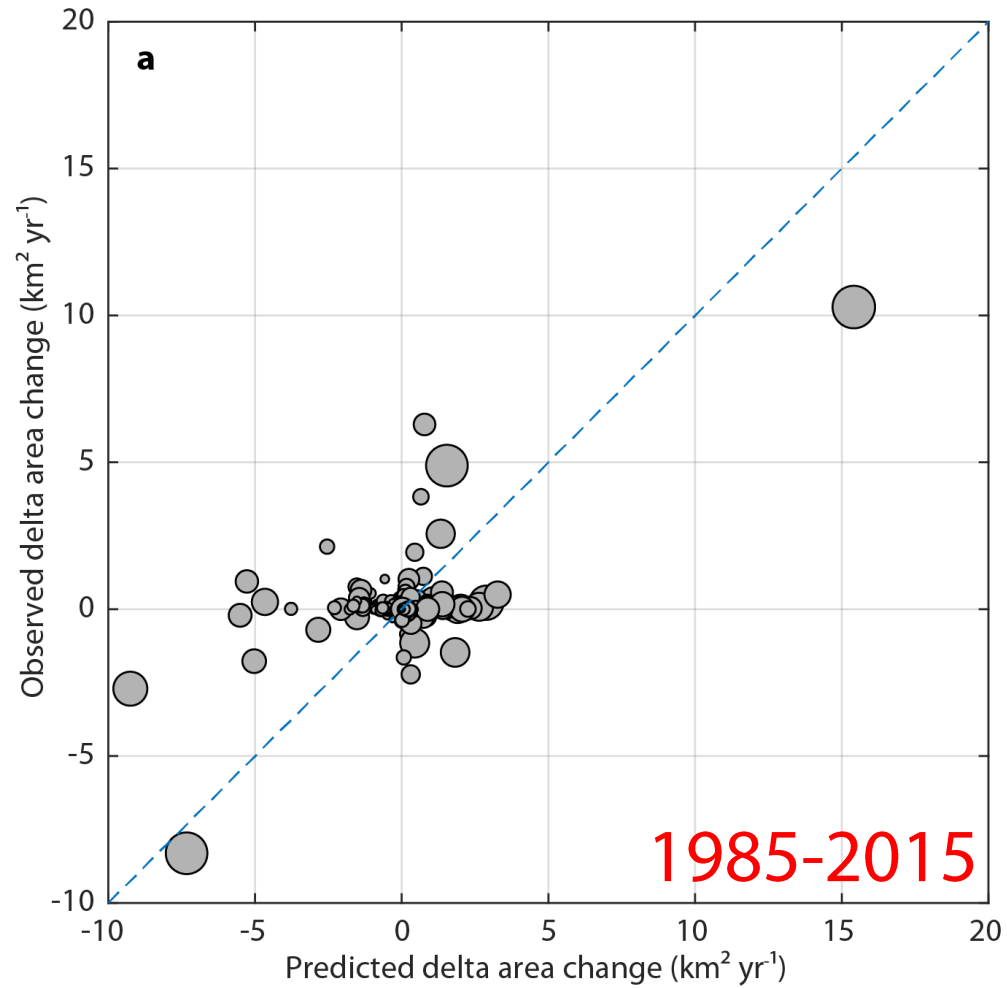


Estimate delta profile

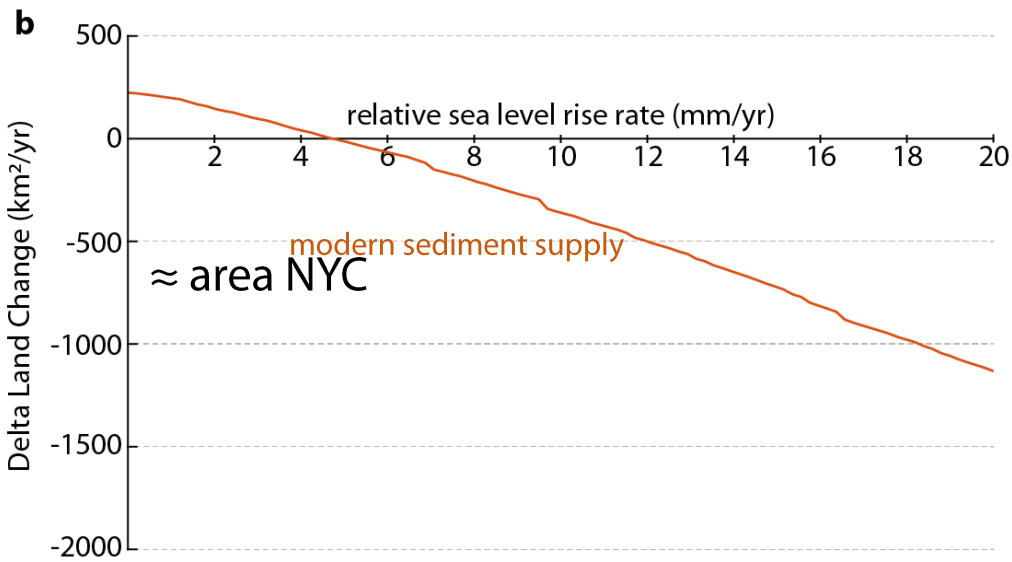


SLR + GIA from 1985-2015: Dangendorf, Nat Comm, 2018
Subsidence from 2000-2014: Erkens and Sutanudjaja, Proc. IAHS, 2015
Sediment: Cohen et al. *Computers & Geosciences* 2013
Elevation from SRTM and GEBCO

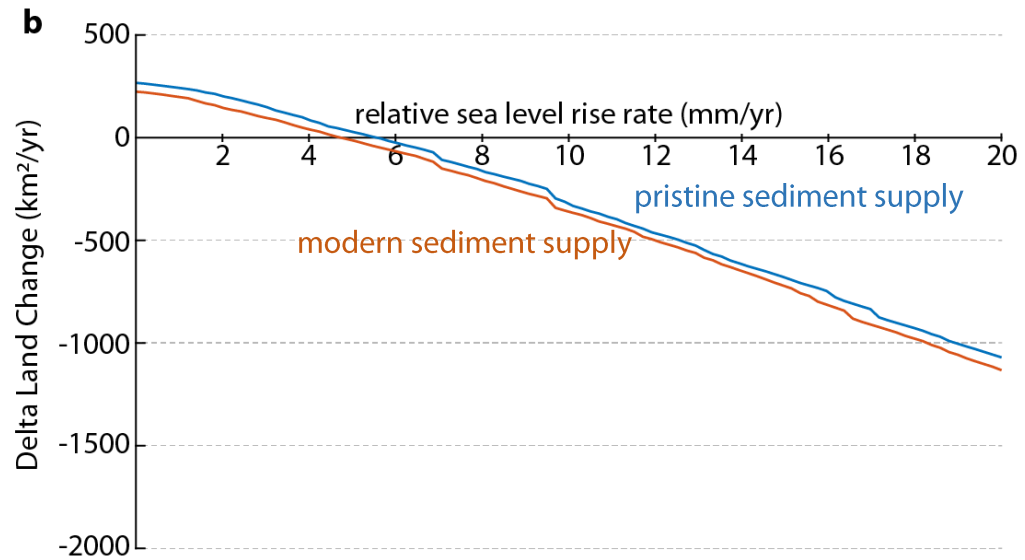
Test against observations



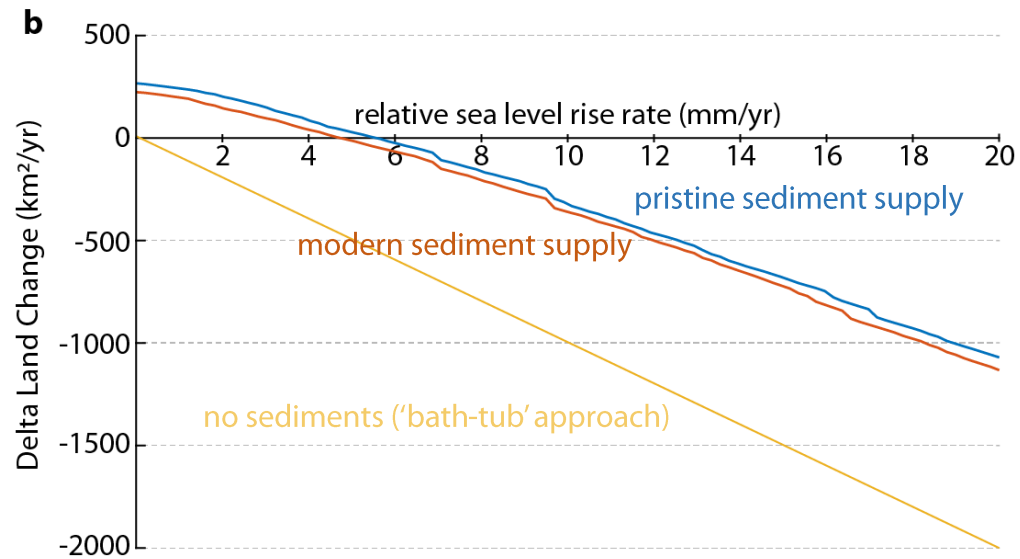
What about future RSLR?



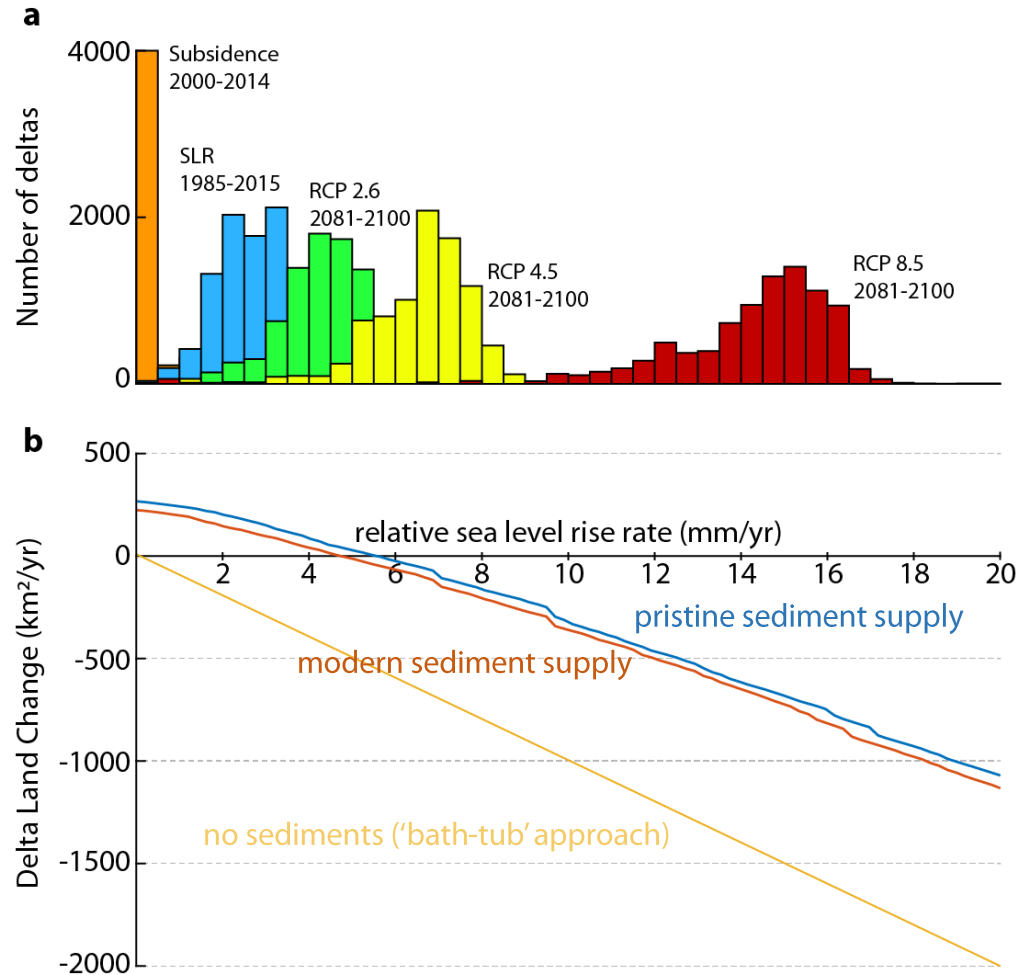
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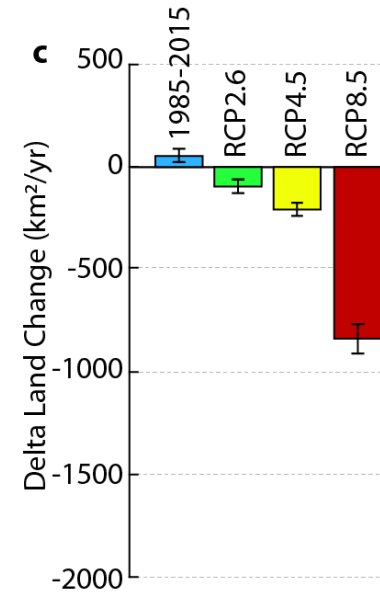
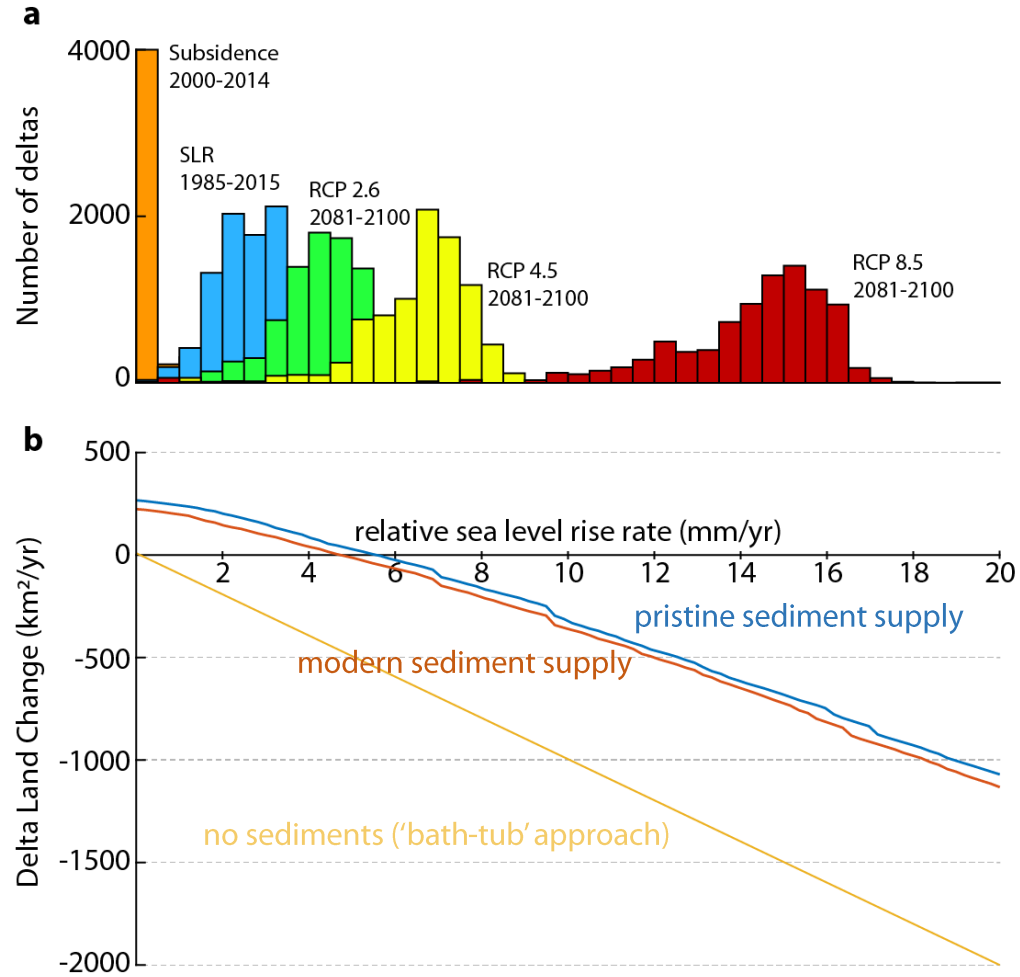


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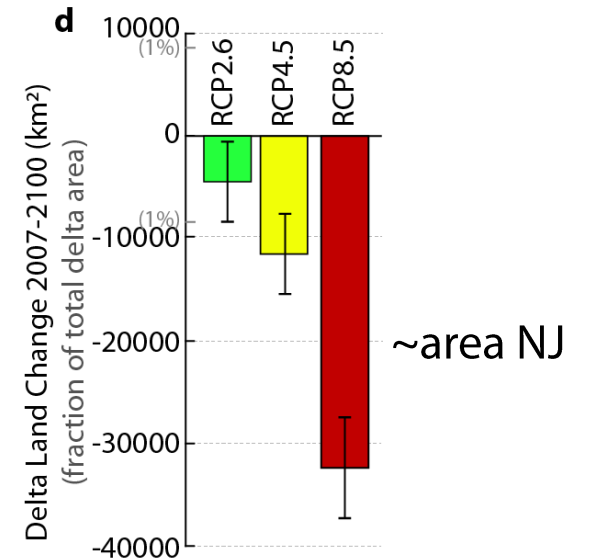
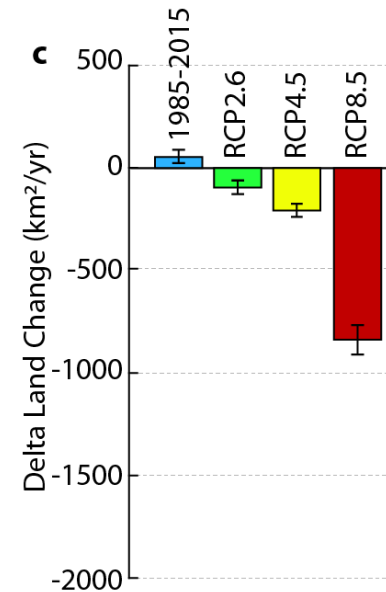
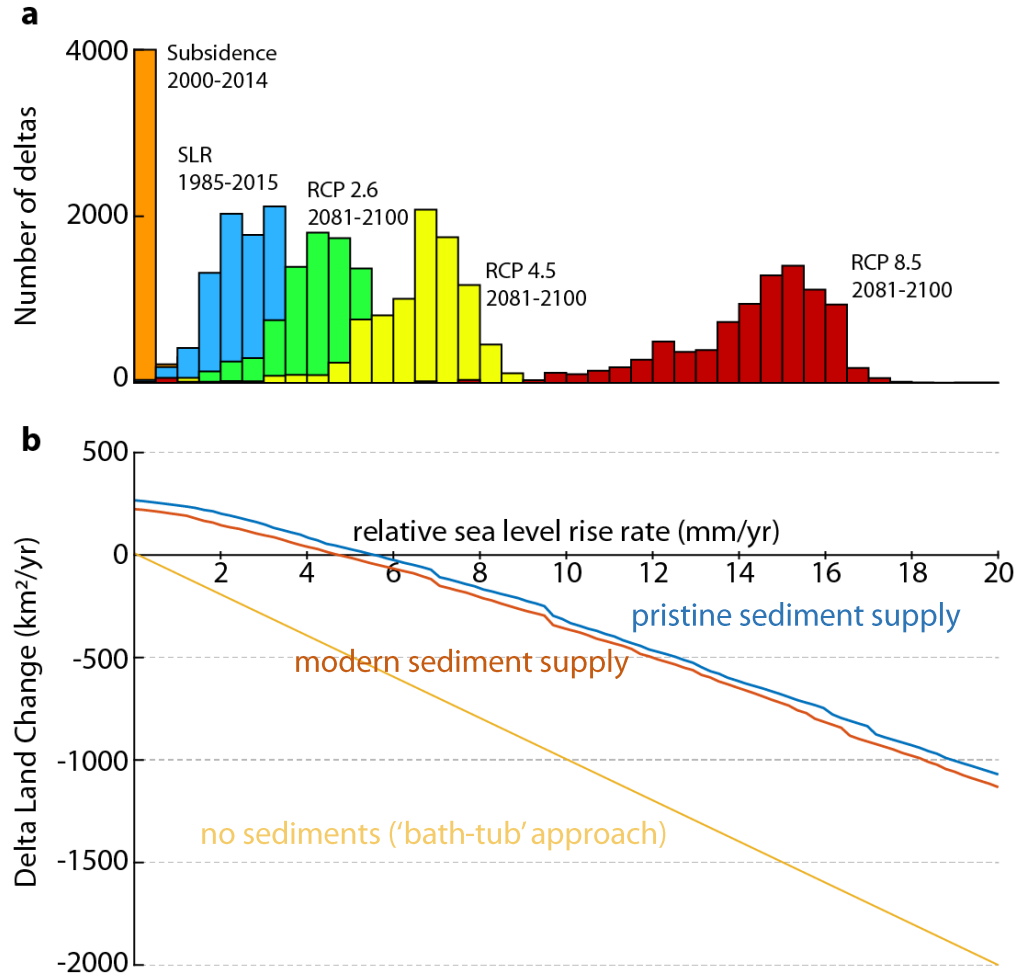


SLR + GIA from 1985-2015: Dangendorf, Nat Comm, 2018
 Subsidence from 2000-2014: Erkens and Sutanudjaja, Proc. IAHS, 2015
 Future SLR: SROCC Report, 2019

What about future RSLR?



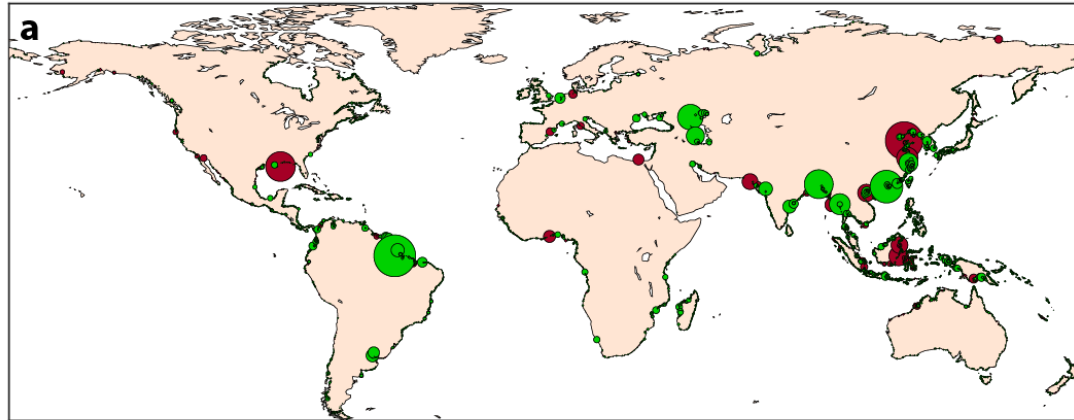
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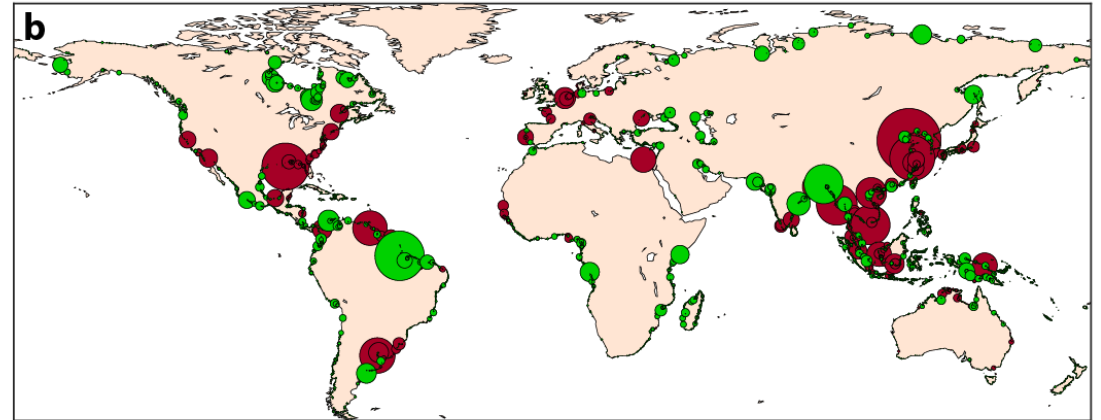
Interesting but highly uncertain!

Projections per delta

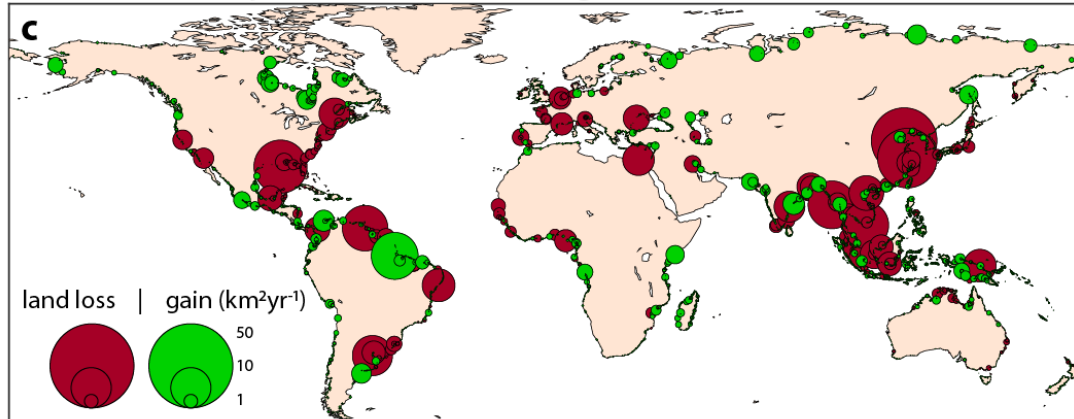
Observed land area change (1985-2015)



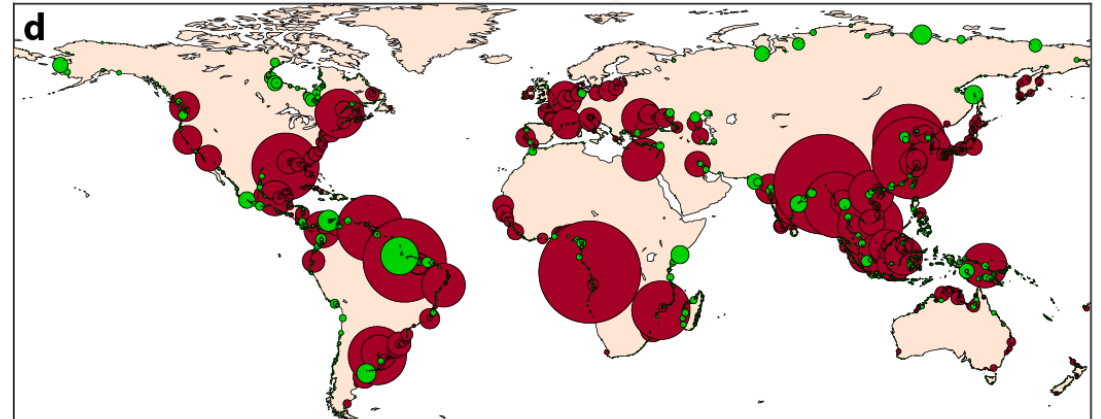
Projected land area change (RCP2.6, 2081-2100)



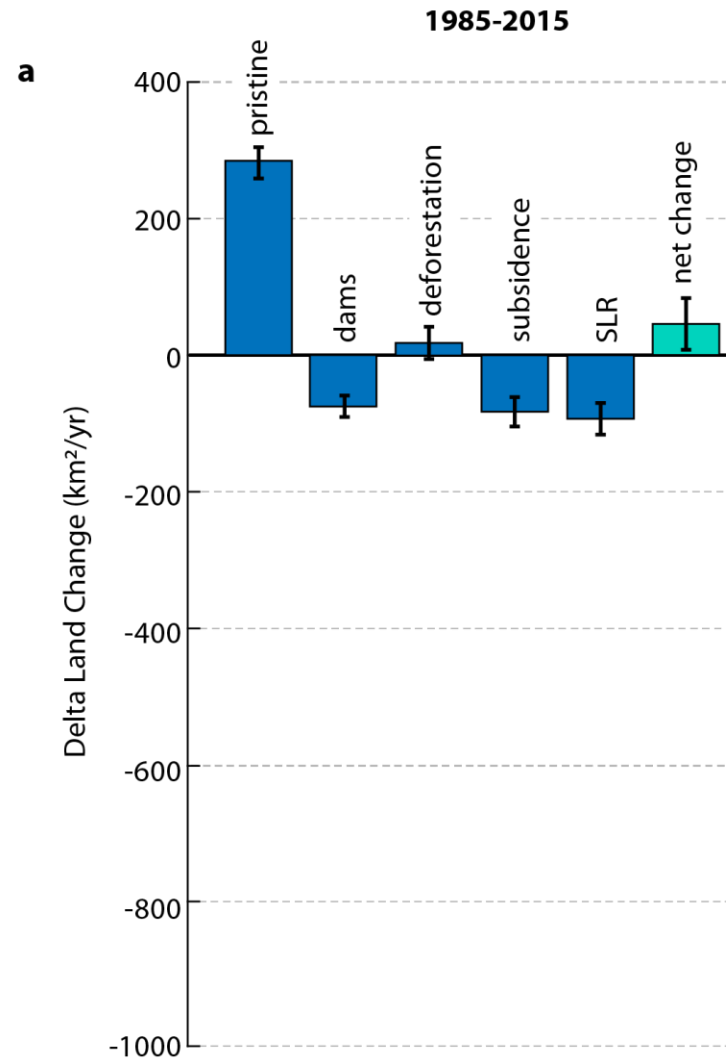
Projected land area change (RCP4.5, 2081-2100)



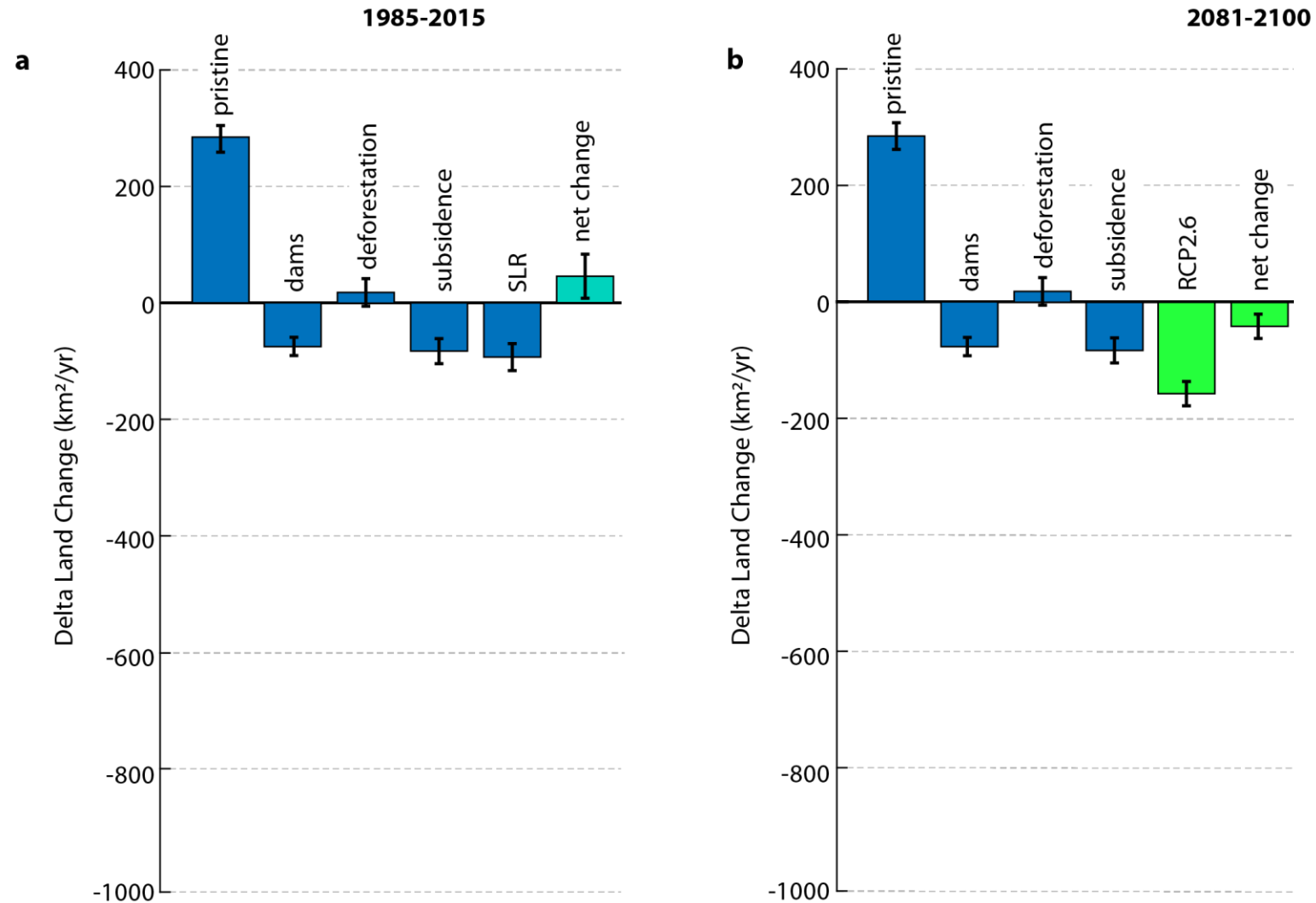
Projected land area change (RCP8.5, 2081-2100)



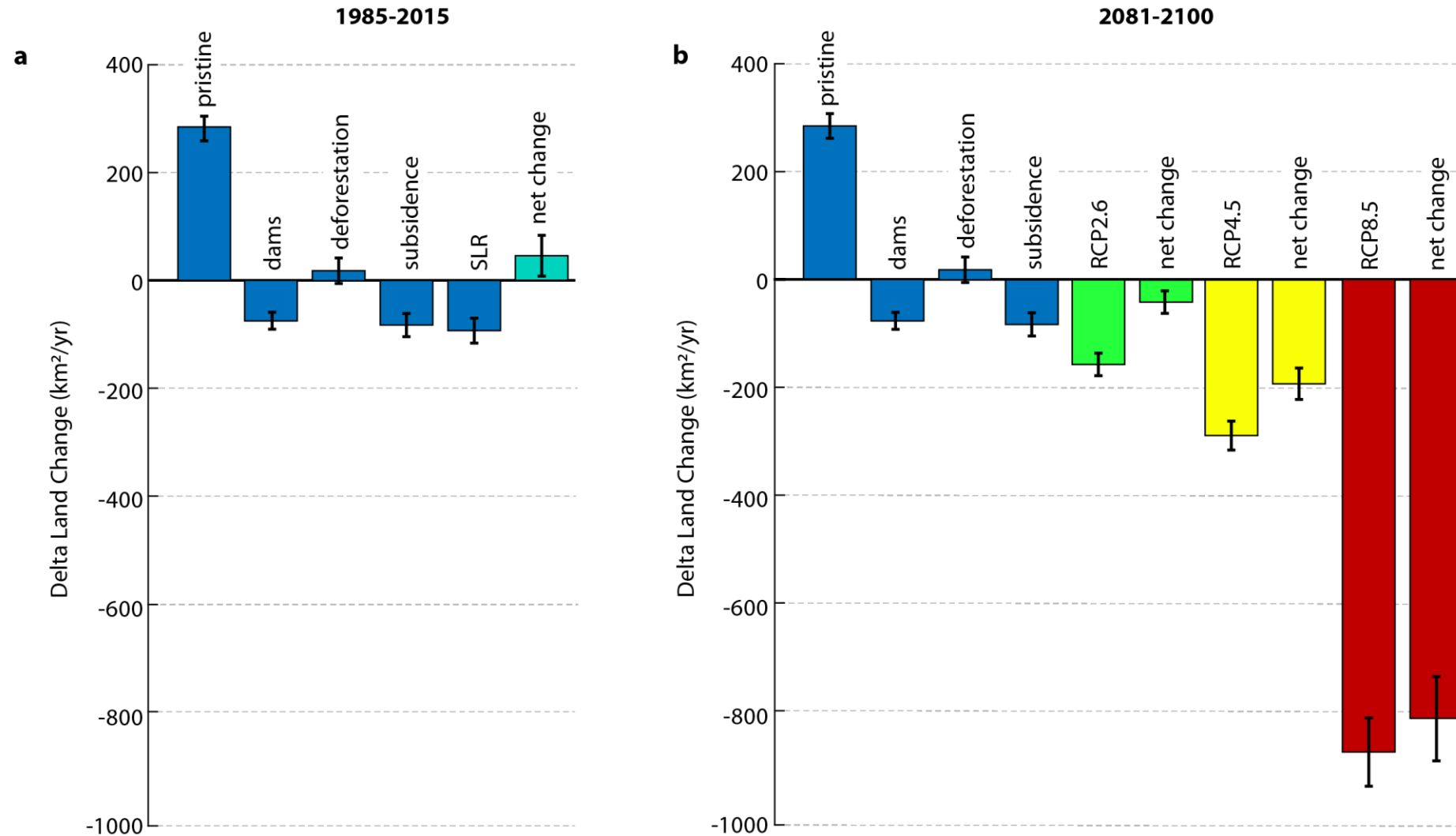
Relative importance of drivers of delta change



Relative importance of drivers of delta change



Relative importance of drivers of delta change



Conclusions

1. 'Validated' SLR impact assessments

2. Global predictions of future land loss w/ changing sediment/SLR

3. We can quantify net effect of dams vs. subsidence vs. SLR on deltas

preprint: <https://eartharxiv.org/4w8u6/>
data: <https://jhnienhuis.users.earthengine.app>
email: j.h.nienhuis@uu.nl
twitter: http://twitter.com/changing_shores

