

The successive roles of proglacial drainage, normal ice-age rivers and marine processes in eroding the Strait of Dover and North Sea in the last 500 ka

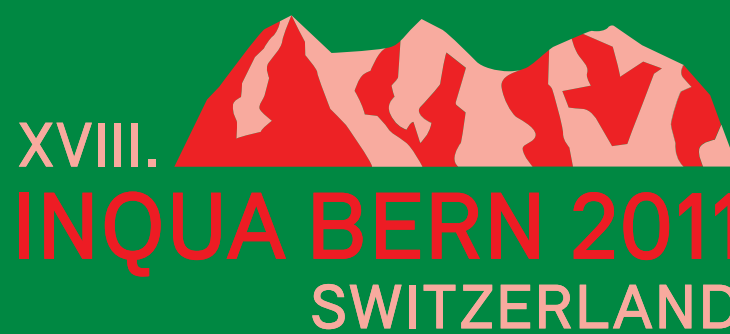


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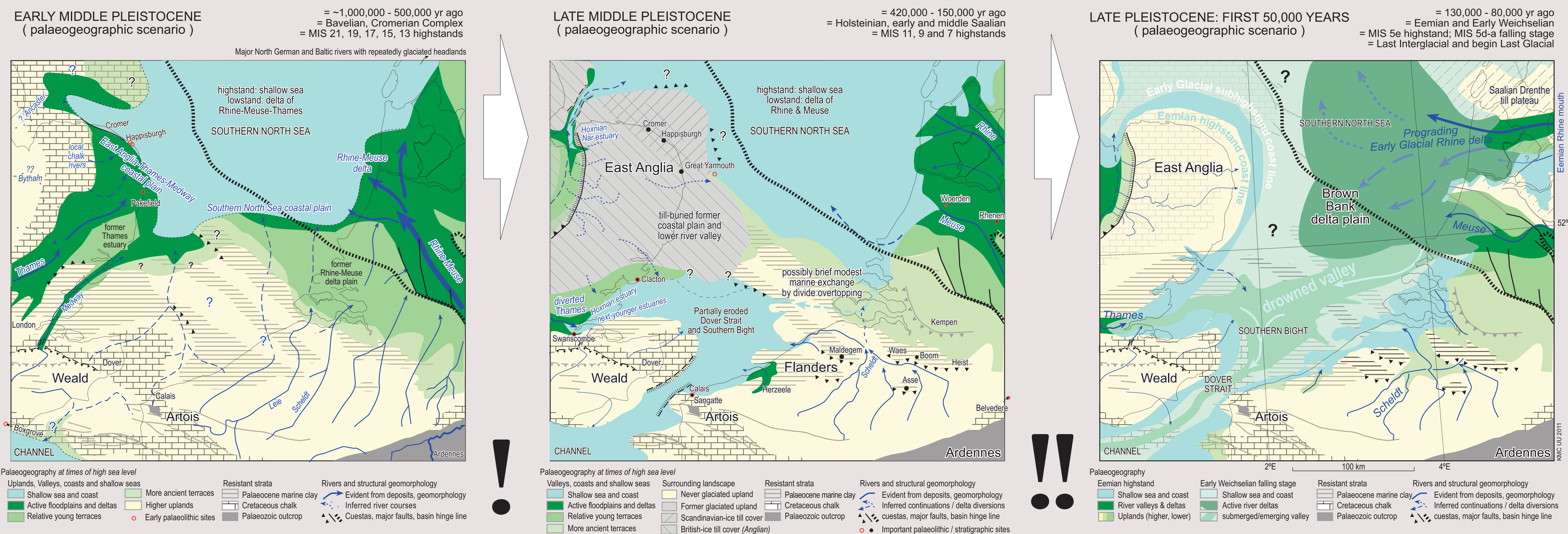
Kim Cohen, Freek Busschers, Philip Gibbard

Marc Hijma, Annelies van Hoesel, Derek Karssenberg

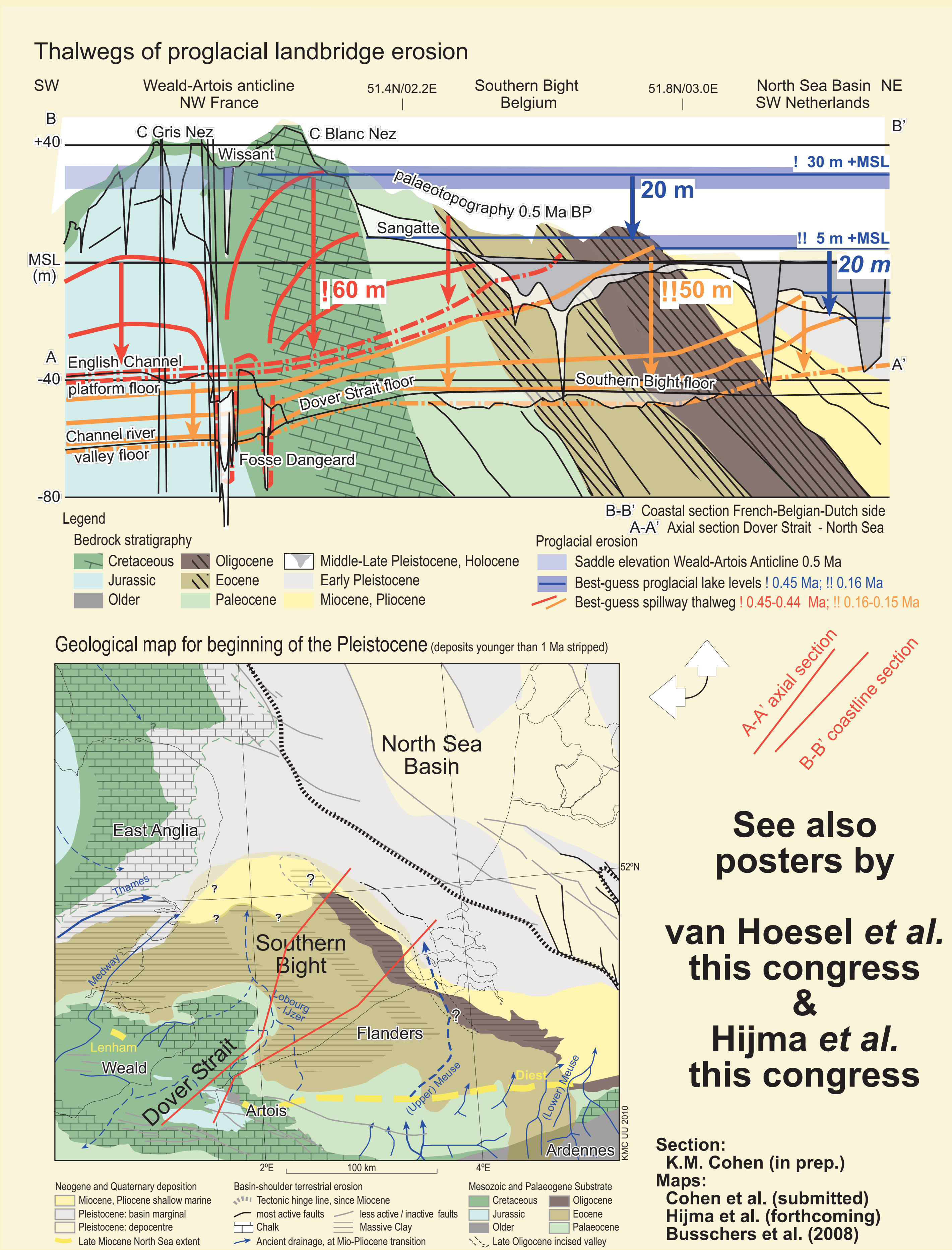
k.m.cohen@uu.nl | Department of Physical Geography, Faculty of Geosciences, Utrecht University, The Netherlands



Progressive erosion and opening seas. Offshore area between Britain and mainland Europe. Sediment fluxes between Middle Pleistocene glaciation fronts and the Atlantic Ocean margin.



Structural controlled initial landbridge geomorphology → Proglacial erosion of 1st major north sea glaciation → Normal ice-age rivers and coastal erosion follow up landbridge not yet gone → Proglacial erosion of 2nd major north sea glaciation → Normal ice-age rivers and coastal erosion follow up landbridge now gone



See also posters by van Hoesel et al. this congress & Hijma et al. this congress

Section: K.M. Cohen (in prep.)
Maps: Cohen et al. (submitted), Hijma et al. (forthcoming), Busschers et al. (2008)

Erosion budgets: Major glaciations versus Normal situations

What volume was removed where and when? What processes contributed what?

LANDBRIDGE EROSION BUDGET RECONSTRUCTION-BASED VOLUMETRIC ESTIMATES

for DOVER STRAIT

Time steps	duration (yr)	% of total	Mesozoic 'Chalk' (and more erodible strata)					
			width (km)	% of total	erosion depth (m)**	length (km)	volume gone (km ³)	out flux (km ³ per yr)
! Episode 450 ka ^	10,000	2%	5	14%	70	50	17.5	1.75
Interbellum axial rivers* coast retreat*	280,000	62%	6	70%	10	50	3.0	0.17
!! Episode 160 ka ^	10,000	2%	7	70%	20	50	7.0	0.70
Last 150ka ^^ axial rivers* coast retreat*	150,000	33%	35	100%	10	50	3.5	0.25
			7	30%	65	50	34.0	0.43
Total	last 450 ka	100%	35 km				109.0 km³	km³

for SOUTHERN BIGHT

Time steps	duration (yr)	% of total	Palaeogene 'Clay' (and more erodible strata)					
			width (km)	% of total	erosion depth (m)**	length (km)	volume gone (km ³)	out flux (km ³ per yr)
! Episode 450 ka ^	10,000	2%	20	15%	50	150	150.0	15.00
Interbellum axial rivers* coast retreat*	280,000	62%	12	73%	25	100	30.0	0.64
!! Episode 160 ka ^	10,000	2%	30	73%	30	40	36.0	3.60
Last 150ka ^^ axial rivers* coast retreat*	150,000	33%	30	100%	15	100	45.0	1.17
			34.9	27%	25	150	130.8	0.17
Total	last 450 ka	100%	130 km				542.0 km³	km³

Short episodes of proglacial spillage contribute Periglacial lowstand valley downcutting Cliff retreat and mass wasting (towards rivers)

22% of lost 'Chalk' 6% of lost 'Chalk' 72% of lost 'Chalk' 34% of lost 'Palaeogene' 14% of lost 'Palaeogene' 52% of lost 'Palaeogene'

^ See also Van Hoesel et al. (this congress): erosion modeling complementary to this reconstruction

^^ See also Hijma et al. (this congress), Hijma et al. (forthcoming) & Busschers et al. 2008 (Boreas)

* Combined total erosion envelope, with alternation of highstand (marine) and lowstand (periglacial) activity

** elevation difference averaged over an area; = 'developing paleobathymetry' minus 'initial paleotopography'

*** % relate to total erosion in now offshore area

References

Busschers FS, Van Balen RT, Cohen KM, Kasse C, Weerts HJT, Wallinga J, Bunnik FPM. 2008. Response of the Rhine-Meuse fluvial system to Saalian ice-sheet dynamics. Boreas 37, 3: 377-398.
Cohen, K.M., MacDonald, K., Joordens, J.C.A., Roebroeks, W., Gibbard, P.L. (submitted). Earliest occupation of north-western Europe: a coastal perspective. Submitted to Quaternary International
Hijma, M.P., Cohen, K.M., Roebroeks, W., Westerhoff, W.E., Busschers, F.S. (forthcoming) Pleistocene Rhine-Thames landscapes: geological background for hominin occupation of the southern North Sea region. Cond. Acc. JQS