No-Analogue Climates and ecological responses in the past and future (NoAClim)

John Birks

Start-up workshop October 2013

3-year NFR NorKlima supported grant

1 January 2014 – 31 December 2016 (31 December 2018)

I retire from my University position at end of January 2015 so hopefully I will become Emeritus and be able to see the project through. Unusual but nice way of ‘retiring’

Project inspired by the work of Jack Williams, Steve Jackson, and John Kutzbach on no-analogue climates in the future and the work of Jack Williams, Tom Webb, Steve Jackson, and others on no-analogue pollen assemblages and hence no-analogue vegetation and no-analogue climates in the past.

Concept of no-analogues poorly explored in NW Europe.

NoAClim attempts to redress this knowledge gap.

In NW Europe, tendency for palaeoclimatology to have little or no contact with biodiversity research, especially terrestrial biodiversity, even in Bergen where there are leading centres in climate research, palaeoecology, and biodiversity

NoAClim brings together palaeoclimatologists, climate modellers, palaeoceanographers, and palaeoecologists

"Fossil pollen and climate models suggest a messy world in 2100, as surviving species reshuffle into entirely new combinations, creating 'no-analog' ecosystems" (Fox 2007)

"As climate change continues to erode biodiversity, the two disciplines need to improve their dialogue. ... A little extra thought could go a long way in aligning the interests of ecologists and climatologists" (Editorial, Nature Geoscience 2009)

NoAClim tests the scenario of novel, no-analogue climates and ecosystems in Norden

Key question for future management and hence adaptation plans is what will happen to Norden's ecosystems in response to climate change, particularly Norden's vast forests

But as Williams and Jackson (2007) warn, "***how do you study an ecosystem no ecologist has even seen?***"

Palaeoecology looks to the **past**. Global-change ecologists look to the **future**. Both **rely** on understanding modern ecosystems and ecosystem processes as a basis for **reconstruction and prediction**.

Palaeoecology applies methodological uniformitarianism and use the present as the key to the past, whereas global-change ecologists forward project uniformitarianism and use the present as the key to the future.

But the present is only one time-slice (and perhaps an atypical Anthropocene one) in the context of the last 11,500 years of the Holocene.

Key NoAClim questions

1. Are today's ecosystems and climates representative of ecosystem–climate relationships under past or future climate change?
2. Are they robust to climate conditions outside modern states?

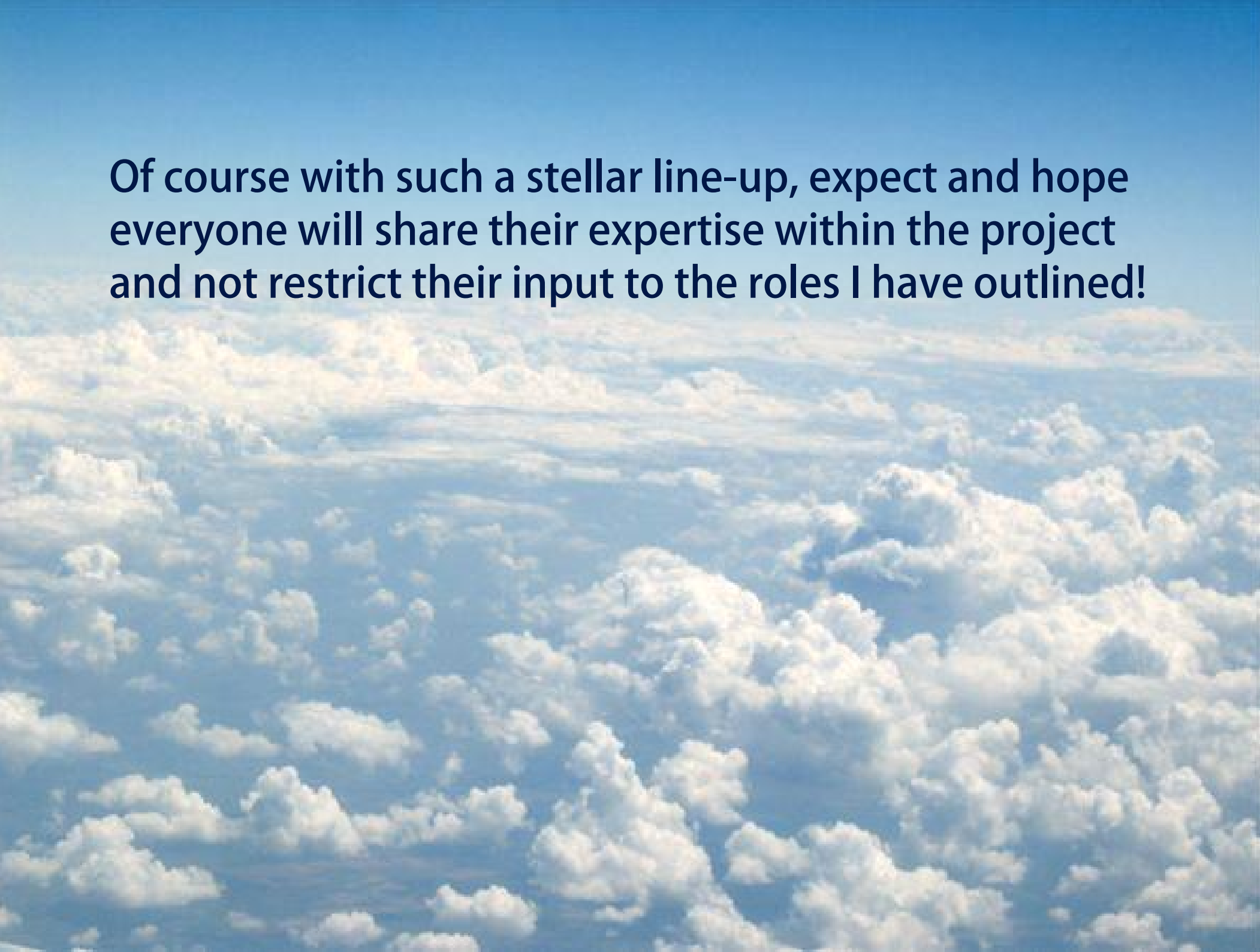
To answer these questions, we need

1. **Climate models** capable of providing estimates of past, present, and future climates at relevant spatial and temporal scales for Norden
2. Numerical estimates of how **analogous** (similar) **past and future climates** are to present (or pre-industrial) climate
3. **Pollen-stratigraphical data** to provide information on past composition and abundance of Norden's ecosystem and numerical estimates of how analogous past fossil assemblages are to modern assemblages

4. Statistical estimates of key realised **niche metrics** (optimum, tolerance, range) of major pollen taxa today and at different times in the Holocene to test the uniformitarian assumption that ecological responses have not changed over time (niche conservatism) and to obtain robust estimates of the realised niches today and in the past when there may have been no modern climate analogues
5. Predictions, using these niche metrics and future climate forescasts, of the **future distribution and abundance** of pollen taxa and hence plant abundances in major ecosystems of Norden
6. Predictions, other independent scientific information, and expert knowledge for robust **scenario-planning** for Norden's major ecosystems in the future and to provide evidence-based management and adaptation strategies

Project Members and Major Roles

John Birks	**PI**
Cathy Jenks	Project and data manager (30% over 5 years)
Post-doc (Bergen)	TBA (100% over 3 years)
Paul Valdes & Will Roberts (Bristol)	Climate modelling, climate analogues
Camille Li (Bergen)	Climate modelling, climate analogues
Jack Williams (Wisconsin)	Advisor on analogue analyses & other aspects
Bjørg Risebrobakken (Bergen)	Climate analogues, marine-terrestrial links
Richard Telford (Bergen)	Analogue analysis, statistical & data-analysis advisor
Anne Bjune (Bergen)	Pollen-analytical data, pollen analogues & predictions
Heikki Seppä (Helsinki)	Pollen-analytical data & related topics
Thomas Giesecke (Göttingen)	Pollen-analytical data & related topics
Alistair Seddon (Bergen)	Past & present pollen niche metrics, species-distribution modelling
Marc Macias-Fauria (Oxford)	Niche metrics, species-distribution modelling
Kathy Willis (Oxford, Kew & Bergen)	Future scenarios & dissemination, conservation & management
Arild Breistøl (Bergen)	Data storage, database design
Mathias Trachsel & Knut Jensen (Bergen)	Statistics and computing


Of course with such a stellar line-up, expect and hope
everyone will share their expertise within the project
and not restrict their input to the roles I have outlined!

Work Packages

1 Climate modelling	Paul/Will with Camille, Jack, post-doc, & Arild
2 Climate analogue analysis	Richard with Camille, Paul, Bjørg, Jack, post-doc, & Cathy
3 Compilation of modern & Holocene pollen-analytical data	Anne and John with Heikki, Thomas, Jack, Cathy, Arild, & post-doc
4 Quantifying past & present pollen-climate relationships & analogue analysis	Richard & John with Heikki, Anne, Thomas, Jack, Alistair, Marc, post-doc, Arild, & Cathy

Work Packages

5 Predicting future pollen & plant abundances	John, Thomas, Richard with Jack, Kathy, Heikki, Anne, Alistair, Marc, & post-doc
6 Developing future ecological scenarios	John with Kathy, Marc, Anne, Heikki, Thomas, & post-doc
7 Communication, dissemination, & publication	Anne, Kathy, John, Cathy, Arild, & all other members

Project Timetable (approximate)

	13	14	15	16	(17)	(18)
Website	+	+	+	+	+	+
Start-up workshop	+					
WP-7 Communication		+	+	+	+	+
WP-1 Climate modelling		+	+			
Database development	+	+	+			
WP-3 Pollen-data compilation		+	+			
WP-2 Climate analogues		+	+			
Mid-term workshop			+			
WP-4 Pollen-climate relationships			+	+		
WP-5 Future plant abundances			+	+	+	
WP-6 Future ecological scenarios			+	+	+	
Final workshop					+	

Key Milestones

1. Appointment of post-doc – hopefully soon
2. WP-1 climate model results at least for every 1000 years, ideally every 250 years, from Paul Valdes and his Bristol group by early 2015, as everything else depends on these results
3. WP-3 pollen-data compilation by early 2015, as like climate model results, everything else depends on these data
4. Mid-term workshop about June 2015 – should have climate model results, pollen data, and climate analogue analysis done. Can then really see where we are going

Project Administration

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All everyday queries to Cathy

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Research co-ordinator at Bio and main contact with NFR

Workshop Plan

1. Introductions and outline of research interests and expertise relevant to NoAClim
2. Discuss WPs 1–7 and critical parts within them based on previous experience, ideas, and other projects
   Advice on what to do and not do
   Missing parts
3. Demonstration of Classifynder by Arild Breistøl
4. Links with on-going projects
5. Any other matters