

Breakout notes: White Paper Discussion

Notes by Theresa Morrison

(Refer also to [Wilbert's Slides](#))

Discussion point 1: Does the Grand Challenge need to be revised?

Grand Challenge (GCQ): *What are the roles of regional processes and feedbacks, atmospheric and oceanic coupling to lower latitudes, in shaping the high-latitude Earth system, its variability and trends and what are the consequences of high-latitude climate change for the regional and global carbon cycle and sea level rise?*

Discussion:

Gudrun (GM): impact of high lat. on low lat. ?

Vladimir (VA): pose the question about feedbacks first - then their roles in shaping processes

Balu: Time scales are not mentioned

Follow up - what time scales should we be focused on? - unclear, maybe we should give a range (intraseasonal to 30 year)

Scott (SE) (to VA): new process will be discovered, but we should prioritize in possibilities (but that is maybe not best suited to GCQ)

Wilbert (WW): Predictability - should this be included?

Xiandong: reword to be simpler - "My suggestion is: What are the roles of regional and remote processes and feedbacks in shaping the high-latitude Earth system, ..."

BN: change "*variability and trends*" to "*variability and predictability*"

VA: "*high-latitude climate change* and predictability ->

Younger: Atmosphere-Ocean coupling?

SE: include land and ice?

WW: SLR should that be called out?

BN : likes Atmosphere-Ocean only - because they are both responsible for large scale transports

WM: increasing focus on coastal regions - could tie to SLR, should we call out coastal? (SE: yes)

GM: there is an arctic coast specific GCQ - that is not ours.

Wieslaw Maslowski (WM): coastal connection to the rest of the Hilat system, physical and BGC, changes in hydrology, carbon delivery - large scale input, beyond the coast

WW: human dimension? Impacts on people or the role of people in causing changes?

Discussion point 2: What long-term and short-term goals should be mentioned in the White Paper?

SE: biophysical effects of river chemistry - offline in the near term, long term online. Coupling? yes real freshwater flux, but still dealing with virtual salt flux - could be harder. But as we move to E3SMv1 will give better

Hajo (HE): changes in mixing and entrainment of AW - not just heat but also for BGC? Impacts on carbon cycling, but also higher trophic levels (HTLs).

WW: RGMA may not be able to address HTLs - but could go up to plankton/zooplankton

HE: need better coordination with NOAA - would be a good opportunity in this effort. NOAA is the lead agency on anticipated change in food webs for 3-5 decades, but they may not have good projections about key physical processes (entrainment, under sea ice blooms, etc.)

WW: overfishing impact on LTLs? Blooms and productivity?

SE: yes works both ways

HE: yes, very topical question - research in the southern ocean would be very relevant

WW: what provides the most uncertainty?

SE: comment about prioritization - not just BGC even!

WW: can we identify which feedbacks are most important?

VA: interconnectedness of the feedbacks - how they work with each other, they all work together. They cannot be separated, they are non-linear!

WW: spatial variability of the feedbacks, and how they amplify or do not

VA: warm blob around bering strait resulted in changes in sea ice, biology, erosion, warming, etc.

Hansi: interactions between feedbacks and transport

Robert: Modeling tool to make the physics modular - remove type of cloud, enforce optical depth, eg. to answer some questions about feedbacks,

WW: mixed layer depth

SE: forced to do that in river studies

Hansi: careful studies of feedbacks, but what about understanding seasonality of feedbacks? Especially in shoulder seasons

VA: might be low hanging, but not easy to pick because of interconnectedness

Hansi: yes for feedback contribution, but still a fruitful area of research to expand understanding.

Hansi: the pace and spread of climate change - natural variability vs. feedbacks and forcing, for ecosystem and human resilience

HE: Great comment about rate of change being a potential focus area - this will be very interesting both from a process & impacts perspective.

John Walsh: Mixing - broadened to include mixing in sub arctic and AMOc. Do we have confidence in deep convection. Especially with Greenland and Beaufort Gyre contributing freshwater

Theresa (TM): Greenland melt and impact on AMOC

WM: how does freshwater gets to arctic - and Beaufort Gyre to Baffin Bay to Lab Sea and how ice sheet water gets to those regions

TM: agree - high resolution grids (especially variable resolution from MPAS) is great for bathymetry and resolving deep convection