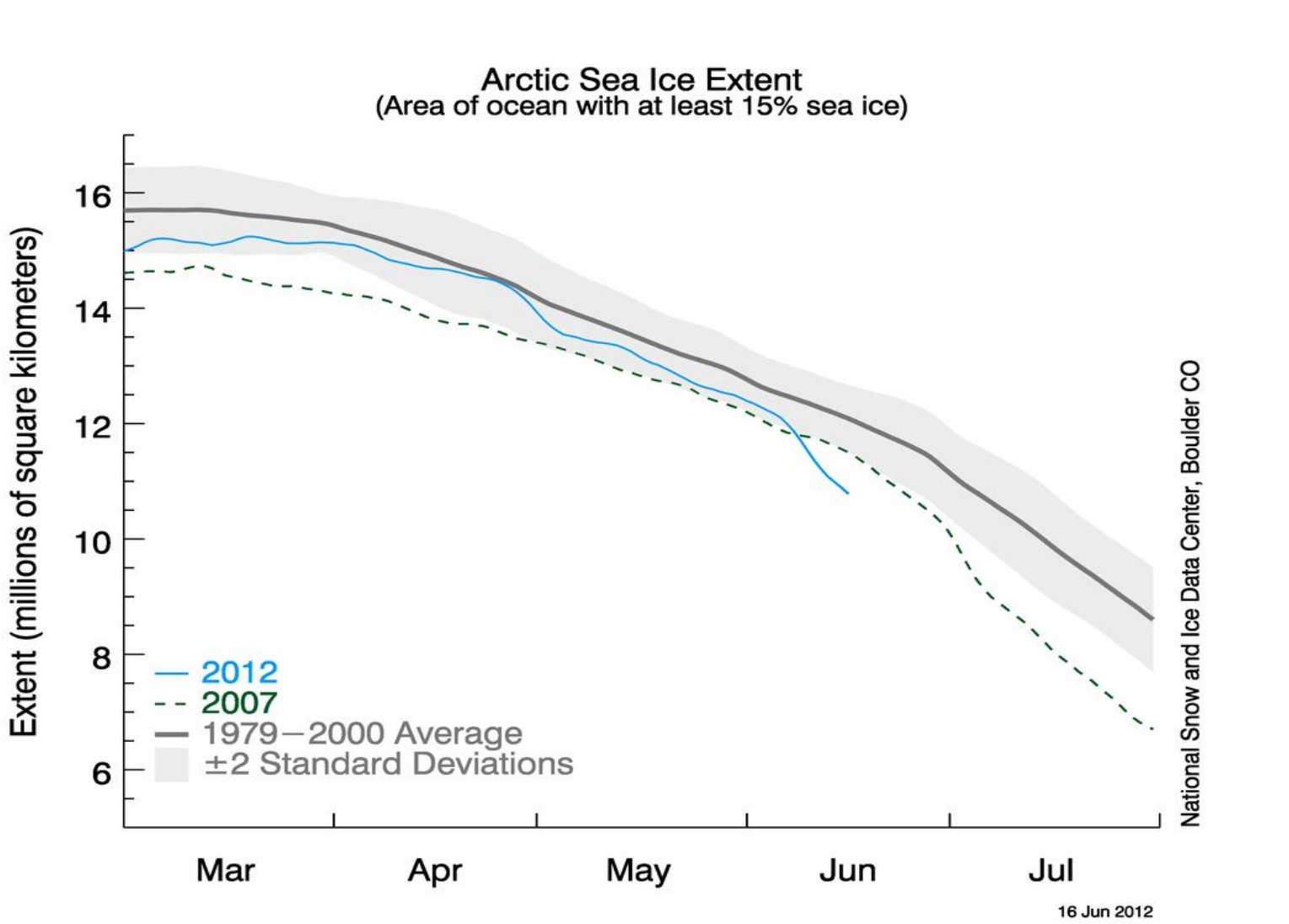
The effect of amplified Arctic warming by summer sea ice loss at today's warming of 0.8°C

Climate system science absolutely commits the world to several times today's warming

Sudden drop in Arctic sea ice June 2012



All Arctic feedbacks operant at today's warming

Feedbacks are added warming commitments

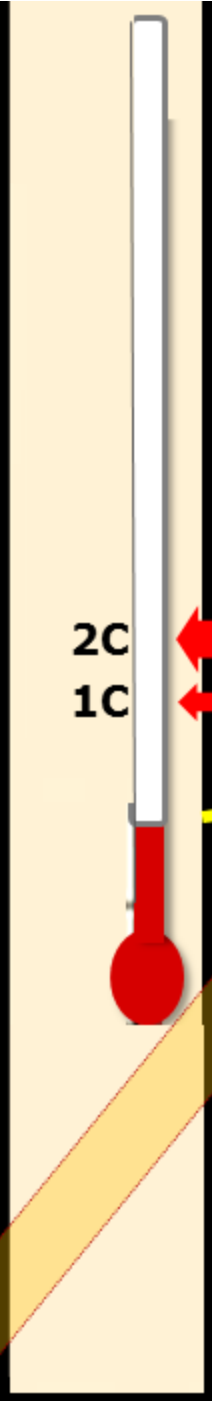
Science commitment by 2100	3.9°C

- Arctic warming 4X faster rest of planet and no slow down
- All Arctic feedbacks for committed runaway global heating operant
- Unprecedented rate of radiative forcing (heating) of the biosphere).

Today	0.8°C

- Cryocap leaking methane
- Ocean surface microbes -methane
- Sea floor sediment - methane
- Thawing permafrost - nitrous oxide
- Thawing permafrost - methane
- Warming wetlands - more methane

- Arctic snow and summer sea ice melt down - loss of albedo cooling



COMMITTED ARCTIC FEEDBACK PLANEARY EMERGENCY

Today's worst case emissions scenario (A1F1)
Excludes Arctic methane feedback emissions that will
boost rate of warming faster

Terrestrial biosphere switches from carbon sink to source
Recognized high risk of feedback runaway climate change

Arctic switches from carbon sink to carbon source

N. hemisphere climate disruption harms crops

Acceleration Arctic – global warming
Irreversible disruption N. Hemisphere

GWP methane 20 years 72 X CO2
GWP methane 10 years 100 X CO2

GWP N2O 20 years 190 X CO2

Global temperature increase °C from preindustrial

2000 2020 2040 2060 2080 2100

Committed global temperature increases and amplifying feedbacks lead to runaway

11
10
9
8
7
6
5
4
3
2
1

8.5°

Today's emissions- upper risk range
Today's emissions + Arctic feedbacks 7.0°

Today's emissions scenario by 2100 5.5°

Policy commitment from combined formal UN national proposals by 2100 4.5°

Ocean heat lag IPCC 0.5°C by 2100 3.1°

Possible increase by 2050 3.0°C
Climate Prediction net , upper range Met Office

Rapid emissions cut to stable atmospheric CO2: 40 years +0.8°C 1.6°

Today 0.8°

Feedbacks are added warming commitments

- All Arctic feedbacks for committed runaway climate change are operant
- Unprecedented rate of radiative forcing
(heating of the biosphere)

NB. Till zero carbon target warming is unlimited

Full eventual committed (equilibrium) warming after 2100 - almost double the warming by 2100
Global warming lasts 1000s of years.
(NRC Climate Stabilisation Targets 2010)

Most of planet uninhabitable due to intolerable heat humidity and desertification

Today's worst case emissions scenario (A1F1)
Excludes Arctic methane feedback emissions that will boost rate of warming faster

Most of the human population will not survive
Professor Kevin Anderson

All crops all regions declined

Terrestrial biosphere switches from carbon sink to source

Recognized high risk of feedback runaway climate change

Arctic switches from carbon sink to carbon source

N. hemisphere climate disruption harms crops

Acceleration Arctic – global warming

- Arctic snow and summer sea ice melt down
Loss of albedo cooling

- Warming wetlands emitting more methane
- Thawing permafrost emitting methane
- Thawing permafrost emitting nitrous oxide
- Sea floor sediment emitting methane
- Ocean surface microbes emitting methane

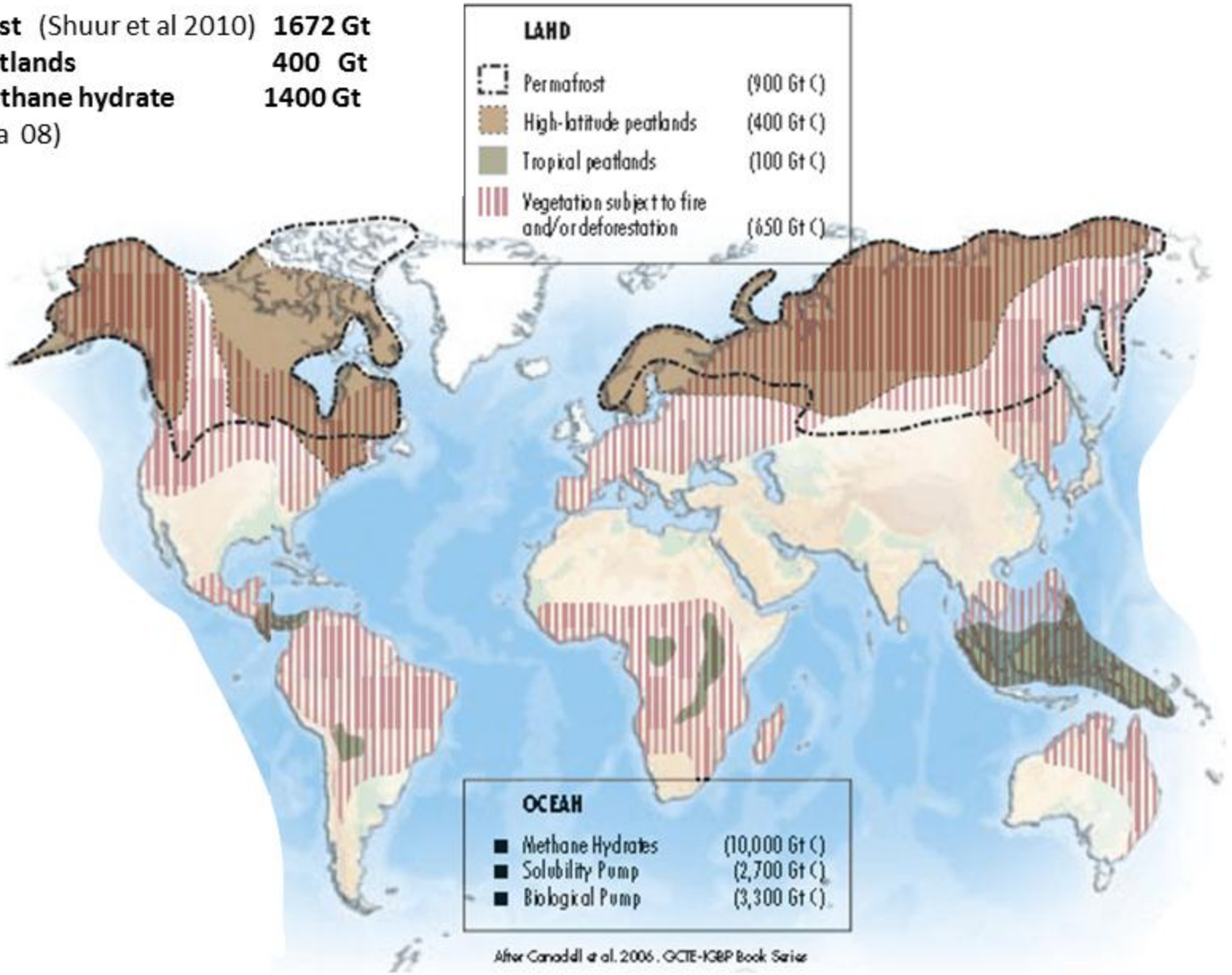
Global temperature increase °C from preindustrial

2000 2020 2040 2060 2080 2100

Vulnerable Carbon Pools

ARCTIC

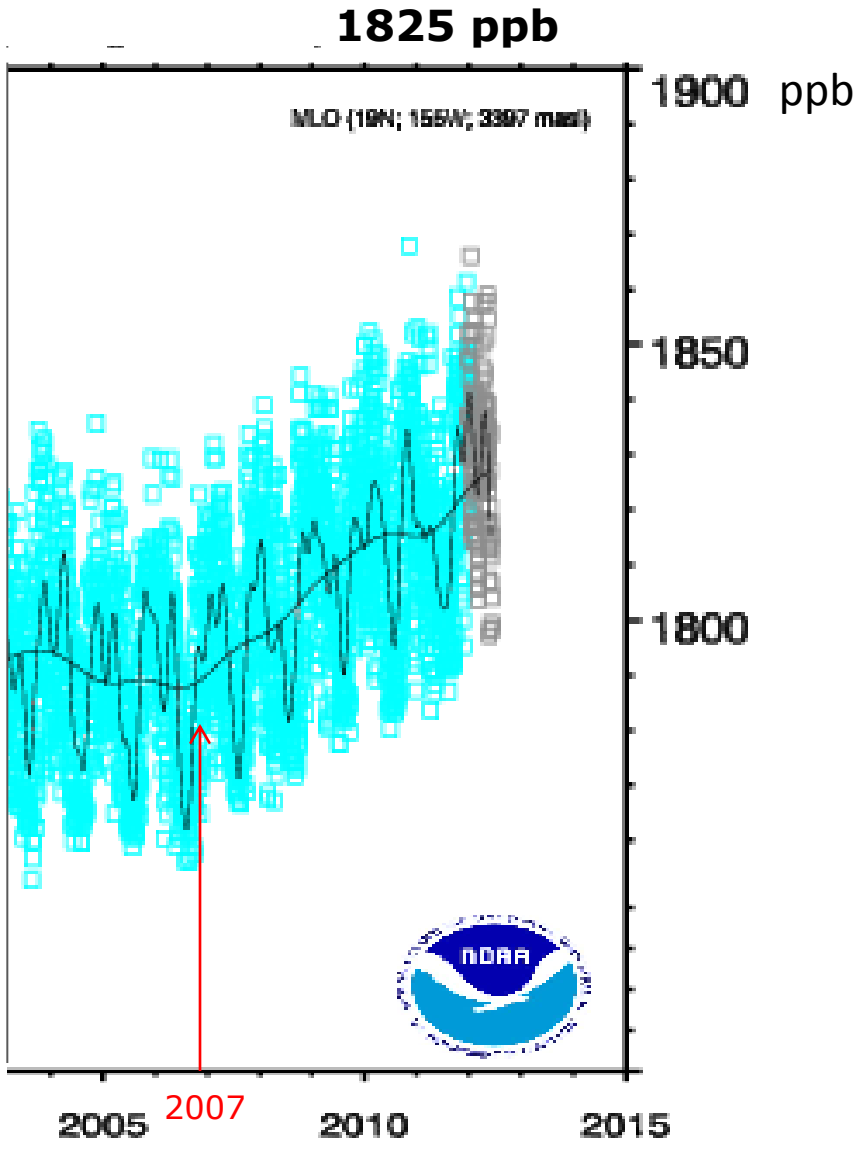
Permafrost (Shuur et al 2010) **1672 Gt**
Hi lat Peatlands **400 Gt**
Arctic methane hydrate **1400 Gt**
(Shakhova 08)



NOAA Atmospheric methane
Mauna Loa 9 June 2012

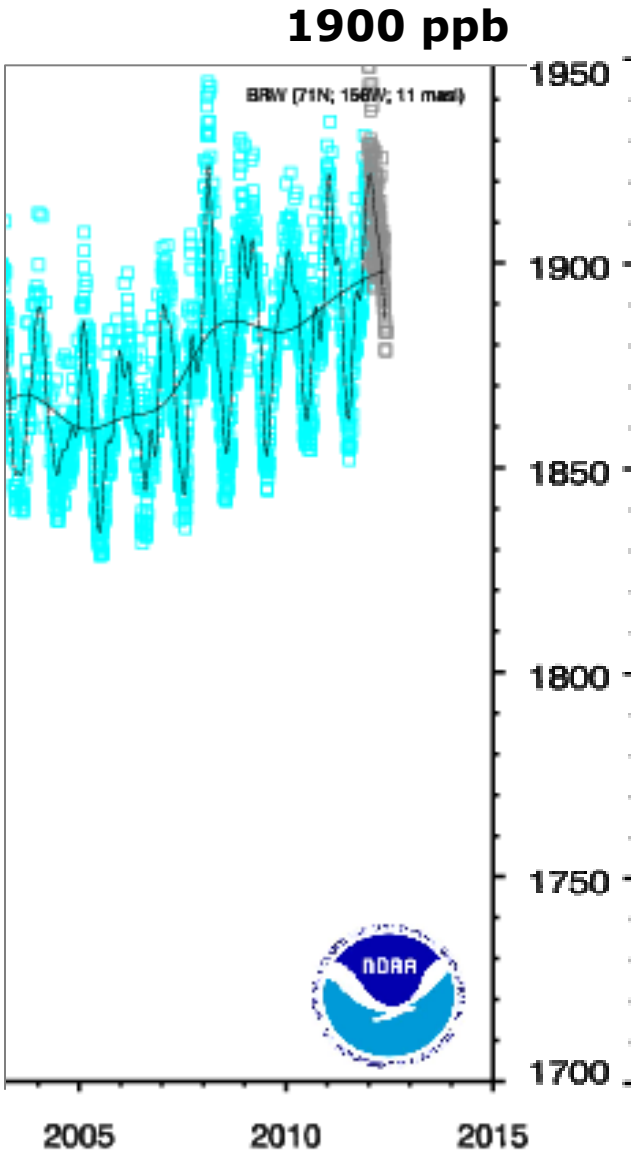
Since the sudden large drop in Arctic sea ice of 2007 atmospheric methane, which had almost stabilised after 2000, showed a renewed, and now sustained strong increase - due to methane feedback emissions.

R. Sussmann Atmos. Chem. Phys. 2012



NOAA Atmospheric methane
Barrow Alaska 9 June 2012

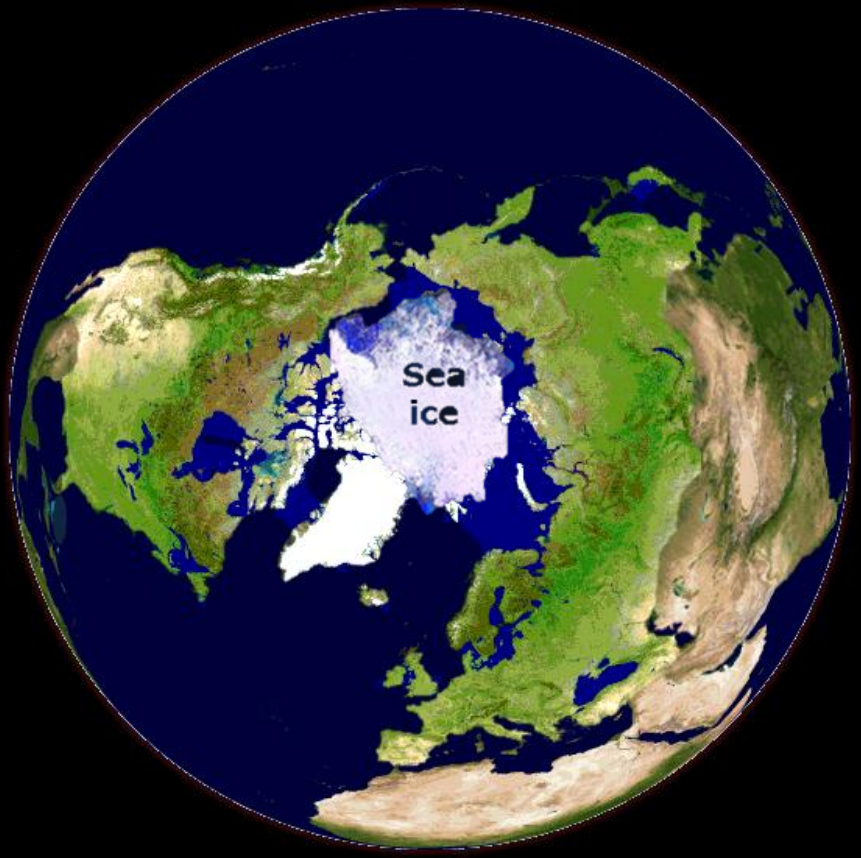
Arctic methane increase
Due to feed back emissions from the warming surface of the planet.



The effect of amplified Arctic warming by summer sea ice loss

The Arctic summer sea ice is the air conditioner of the Northern hemisphere. Loss of Arctic albedo is affecting the jet stream disrupting Northern hemisphere weather patterns.

Global warming is increasing global drought, and loss of Arctic albedo is projected to increase N. hemisphere drought, as well increase climate variability and weather extremes.

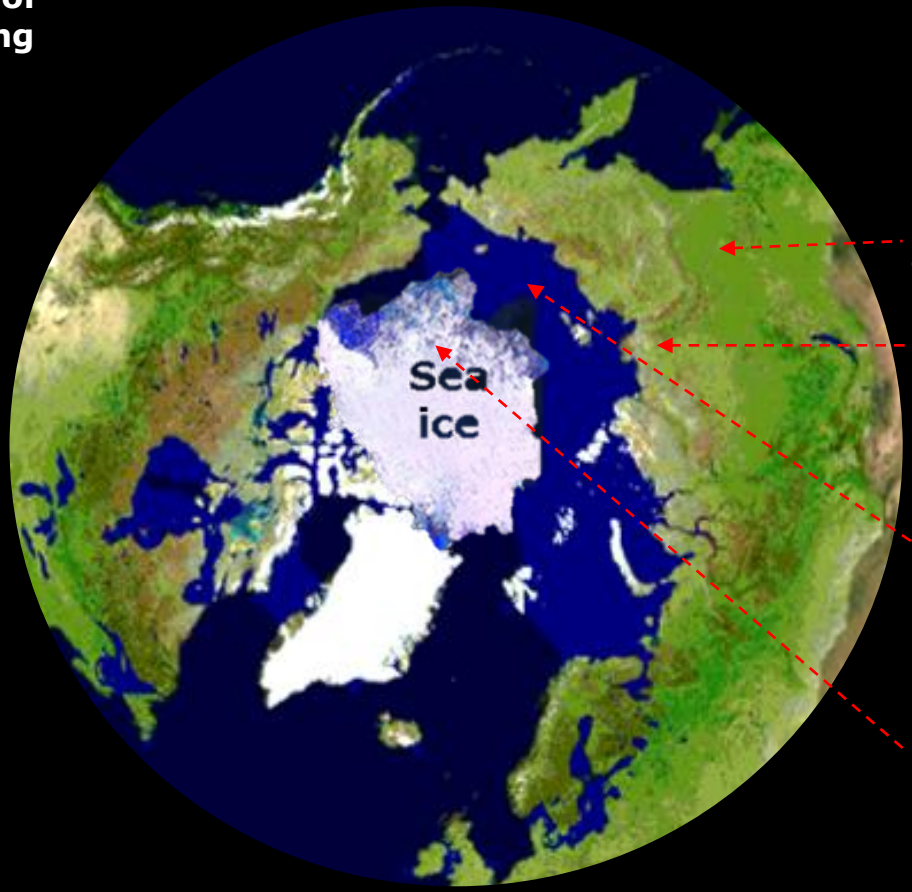


The effect of amplified Arctic warming by summer sea ice loss

Operant Arctic methane feedbacks at today's 0.8°C global warming

Methane (72X CO2's warming over 20 yrs)

Feedback emissions increase rate of global warming



Warming peat wetlands
- adding to atmospheric methane

Thawing permafrost

Sea floor methane hydrate
(N. Shakhova 2008-10)

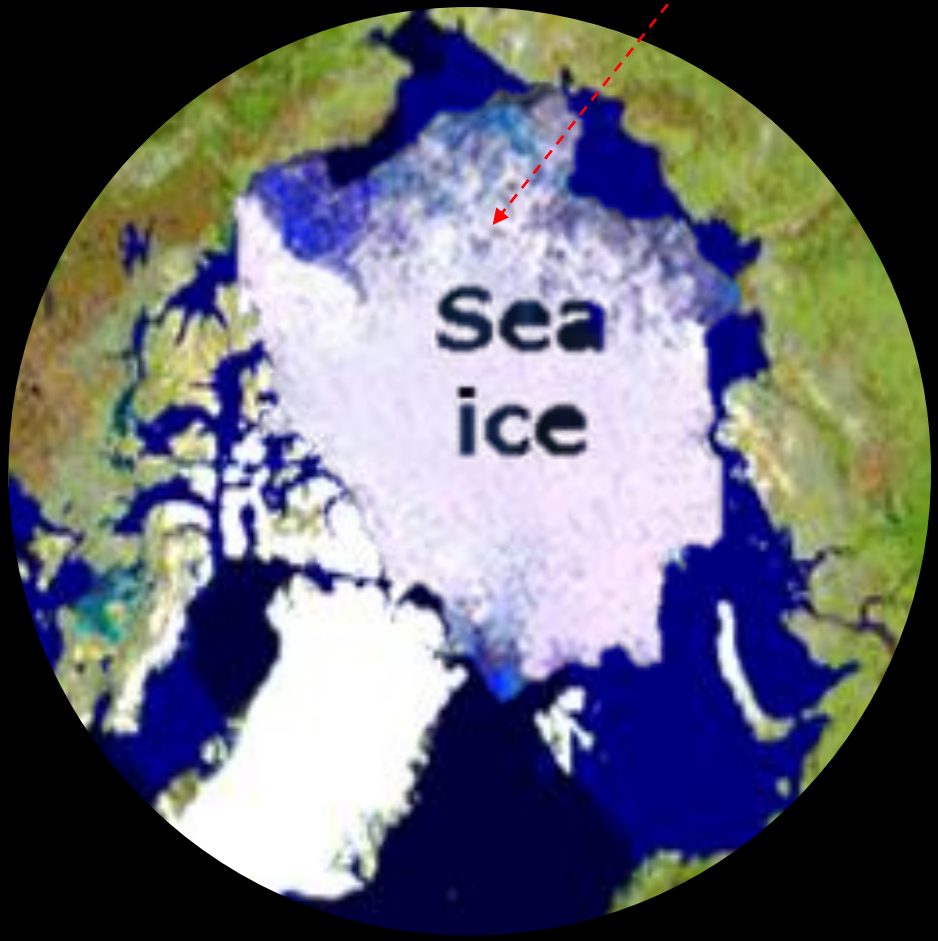
Methane (?microbial) leaking from cracks in the Arctic sea ice.

(E. Kort 2012)

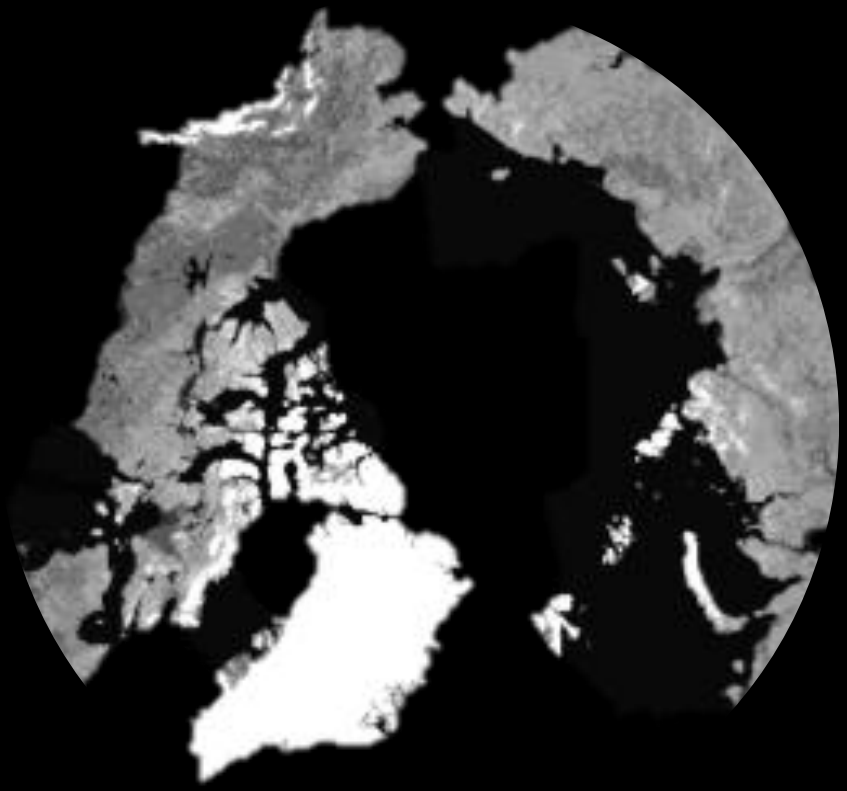
The effect of amplified Arctic warming by summer sea ice loss

Methane (?microbial) leaking from cracks in the Arctic sea ice.

(E. Kort 2012)



Methane is leaking from thinning of the Arctic cryo-cap



Katey Walter-Anthony 202