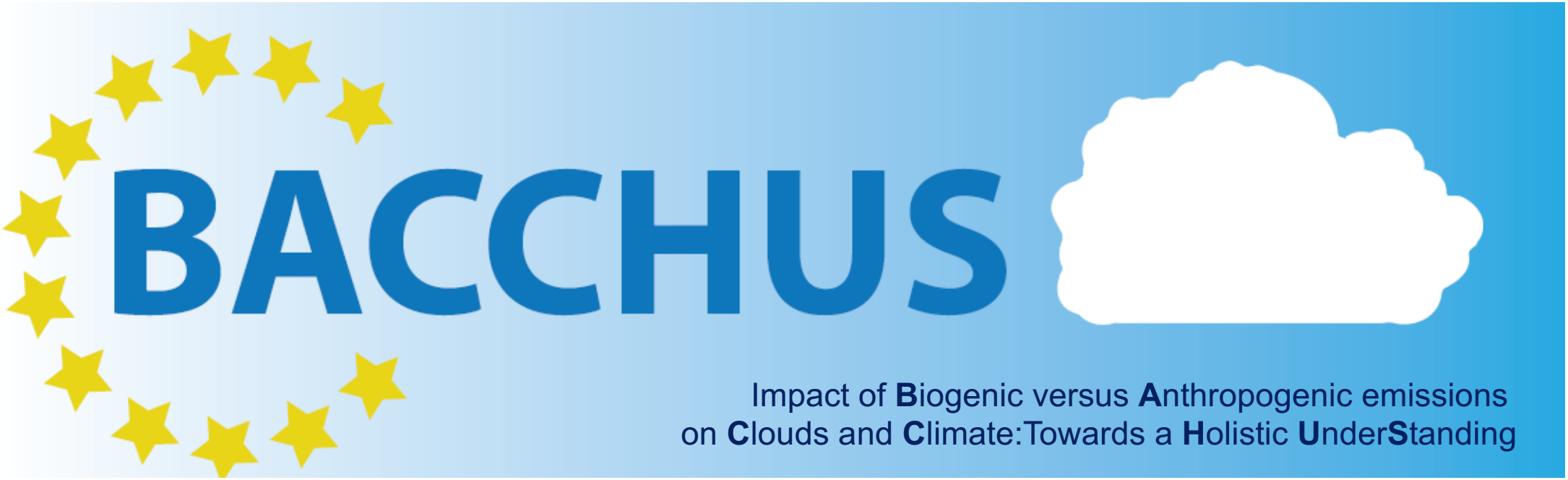


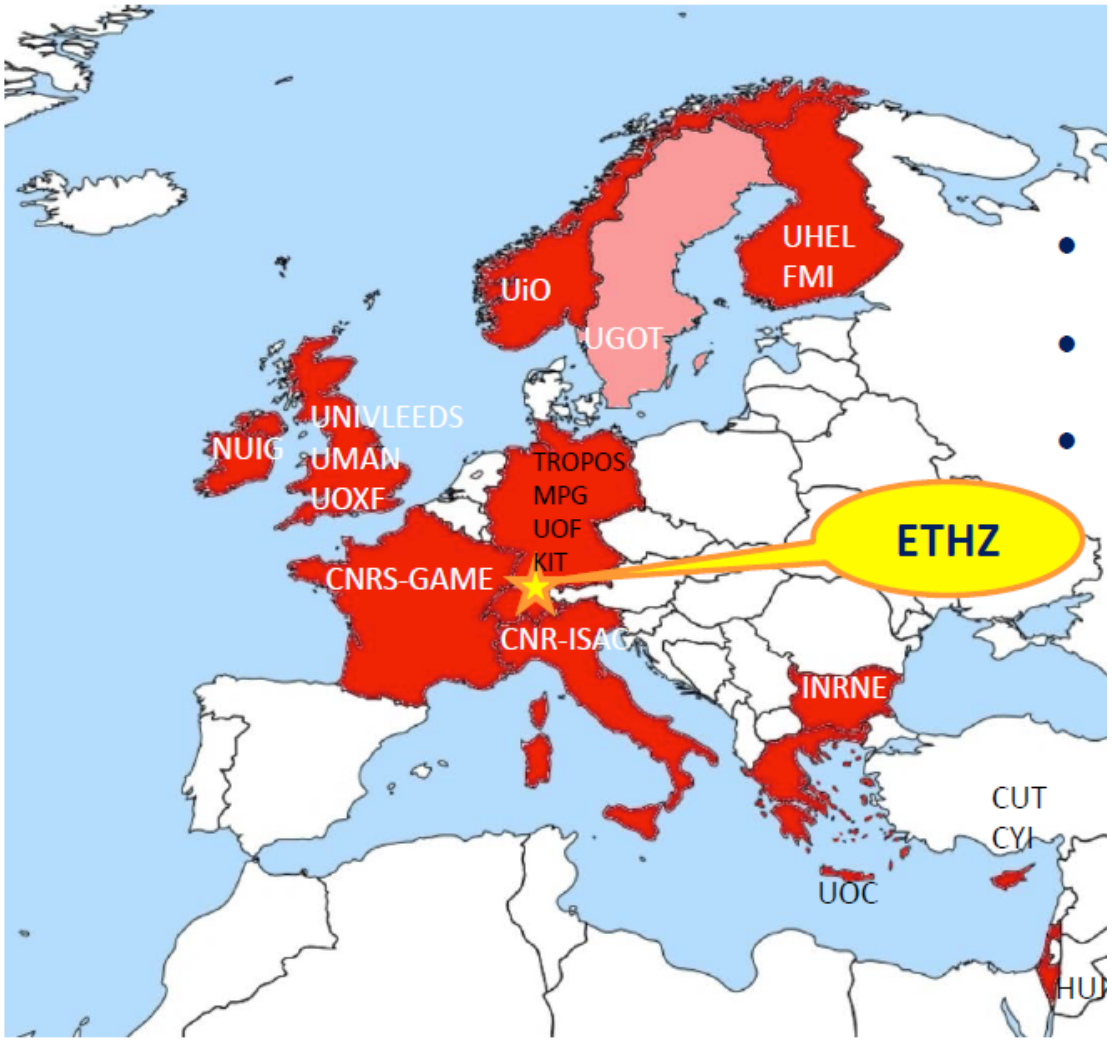
Overview and highlights from the BACCHUS project

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Ulrike Lohmann, Brussels, Nov 15, 2018

SEVENTH FRAMEWORK PROGRAMME

BACCHUS Team

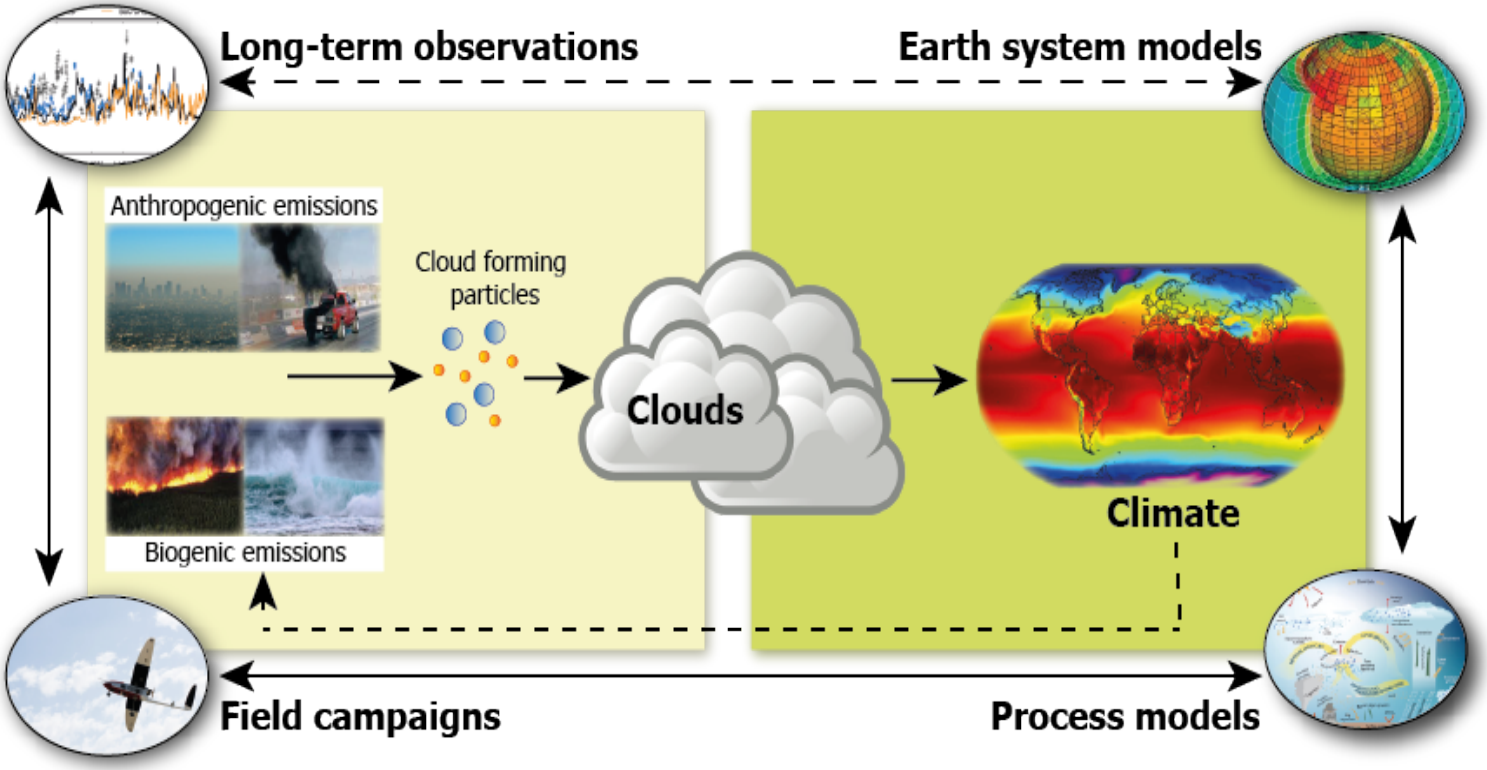


1st December 2013- 31st May 2018

21 research institutions from the European Union, Switzerland, Norway, and Israel worked closely together to better understand **key processes in aerosol-cloud interactions**

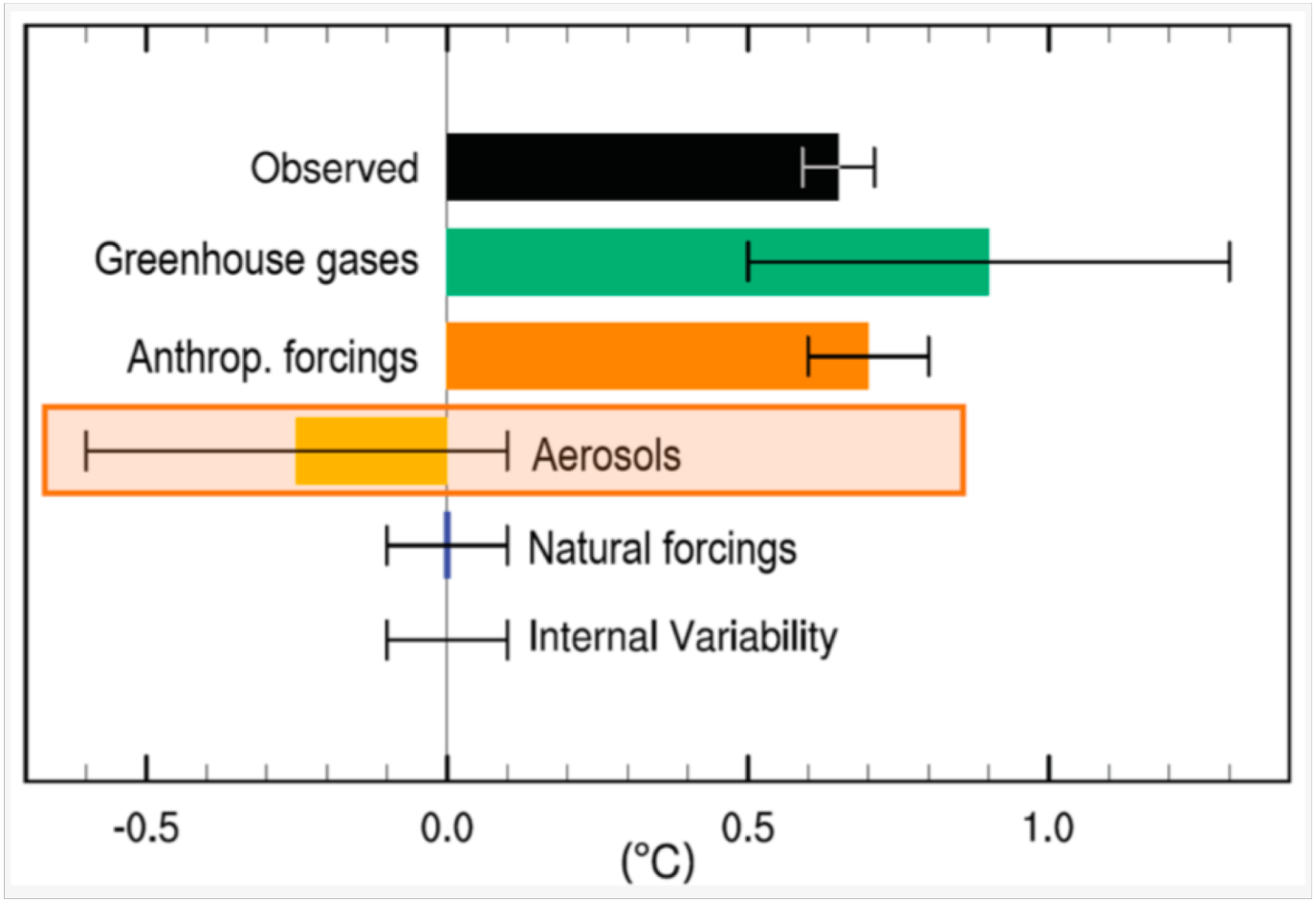
Coordinator: **Ulrike Lohmann**, ETH Zurich

Objective



BACCHUS proposed to quantify key processes and feedbacks controlling aerosol-cloud interactions (ACI), by combining advanced measurements of cloud and aerosol properties with state-of-the-art numerical modelling.

Motivation



IPCC, AR5, 2013

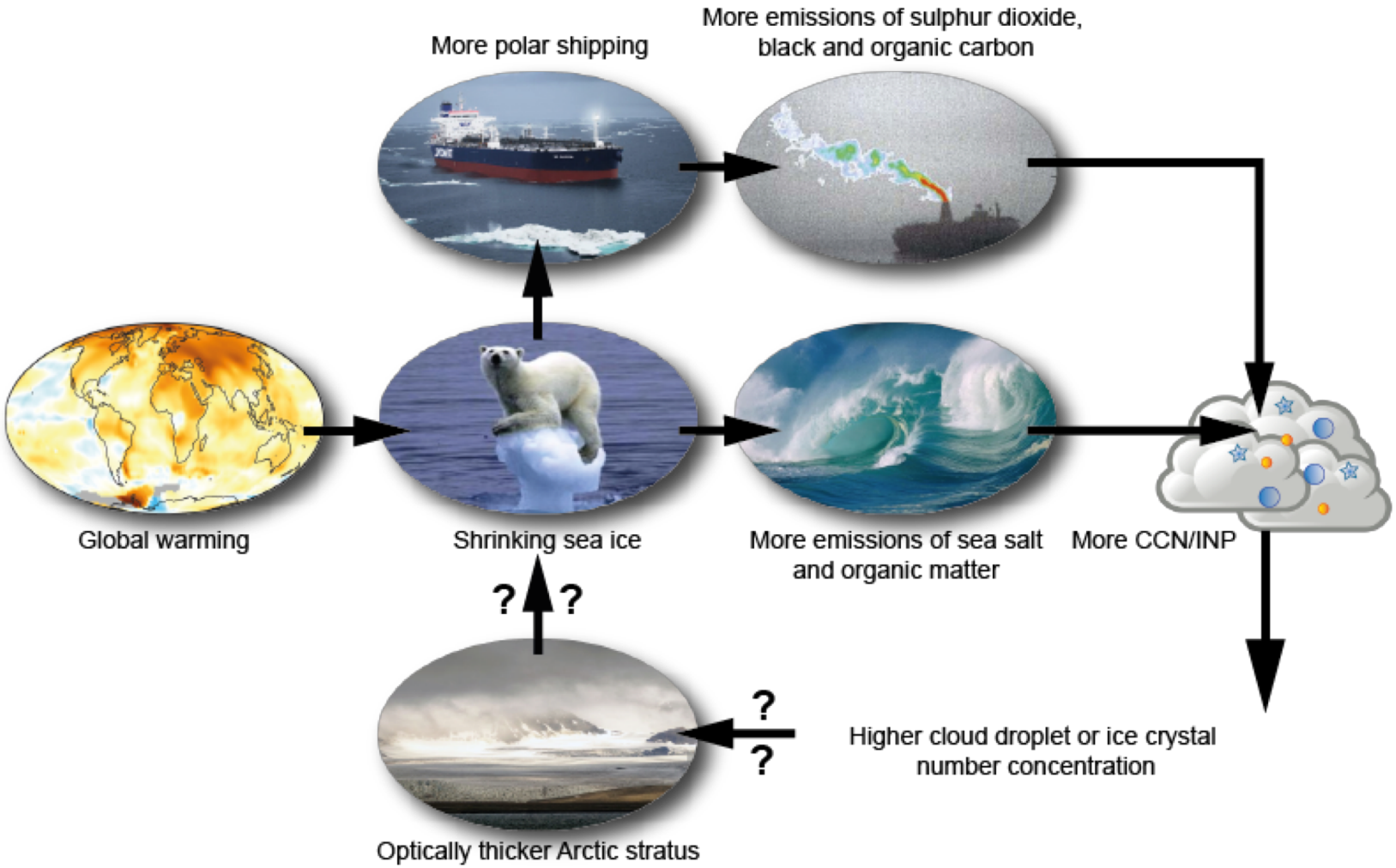
Highlights

- Measurements and data collection during BACCHUS (Julia Schmale)

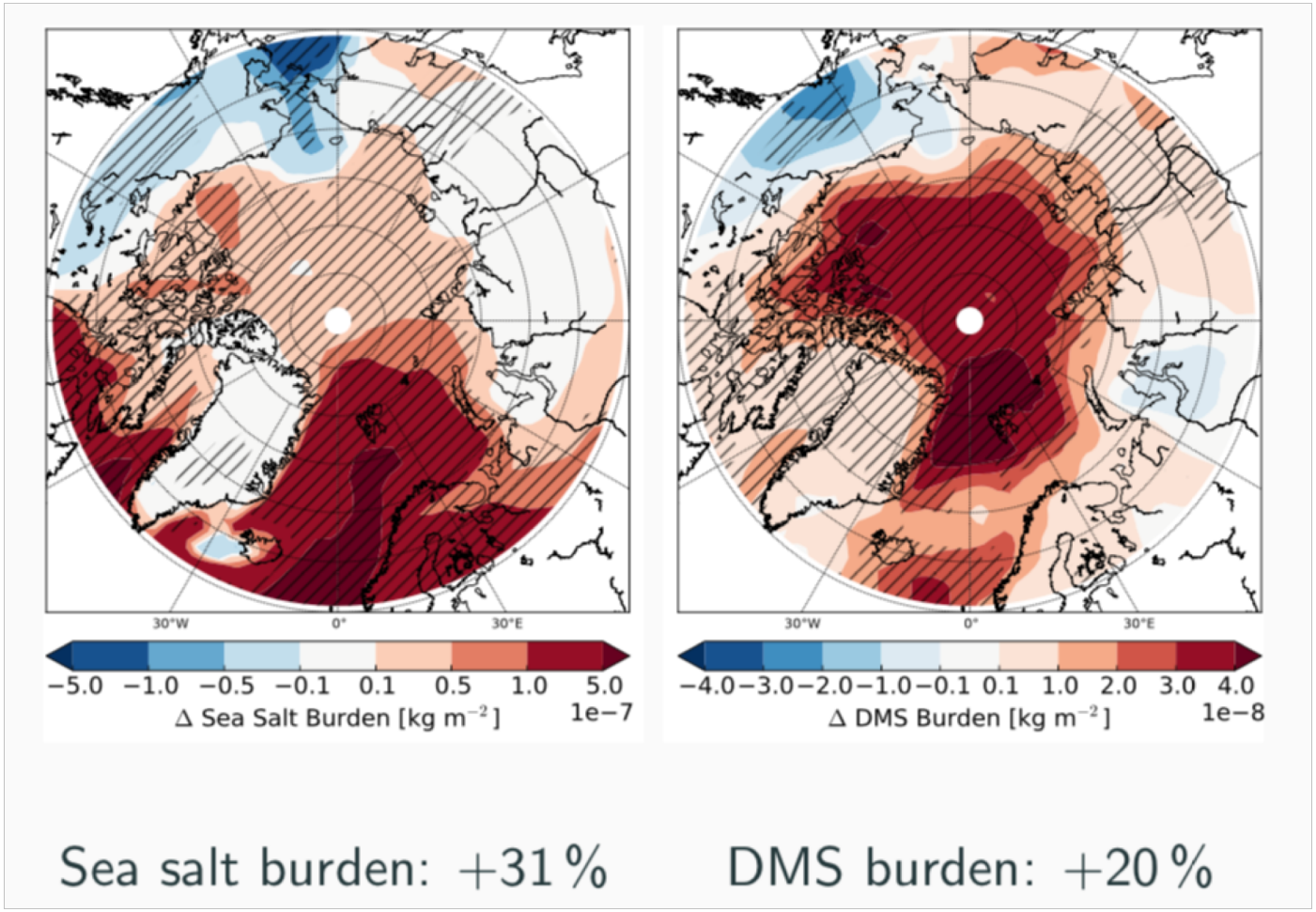
- The Arctic environment and atmosphere-biosphere interactions (this talk)

- Importance of pre-industrial aerosols for the anthropogenic aerosol radiative forcing (Ken Carslaw)

The Arctic environment



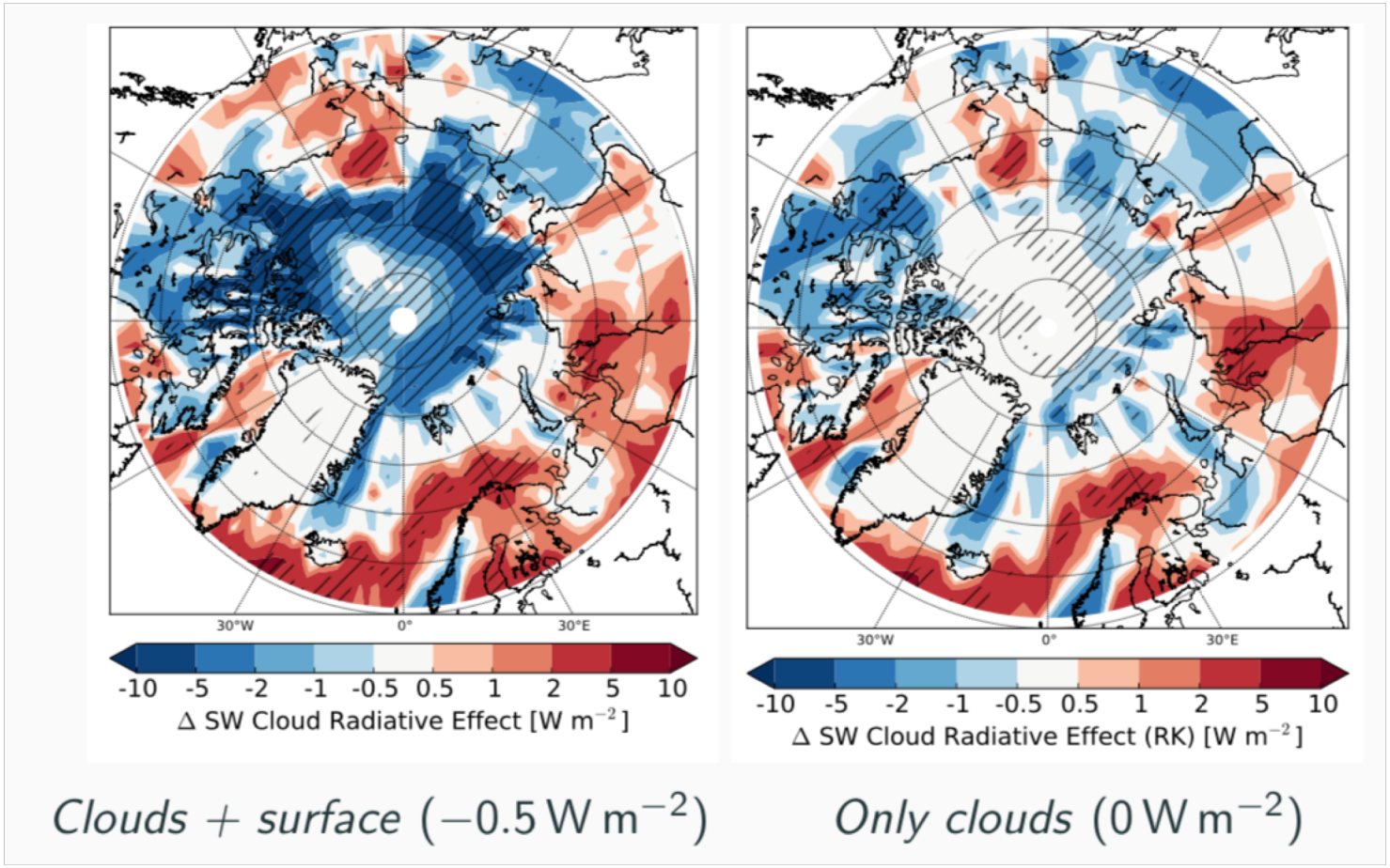
Increases in oceanic aerosols & precursors

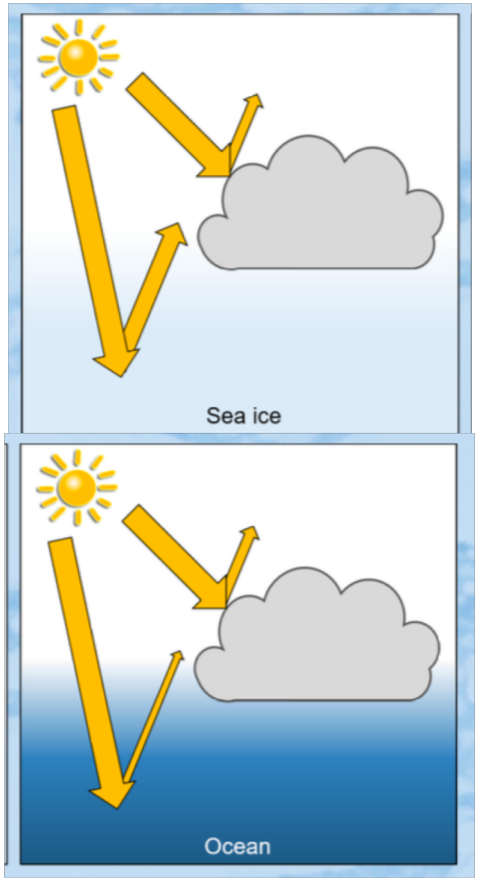


Sept/Oct

Gilgen et al., ACP, 2018

Changes in cloud radiative effects

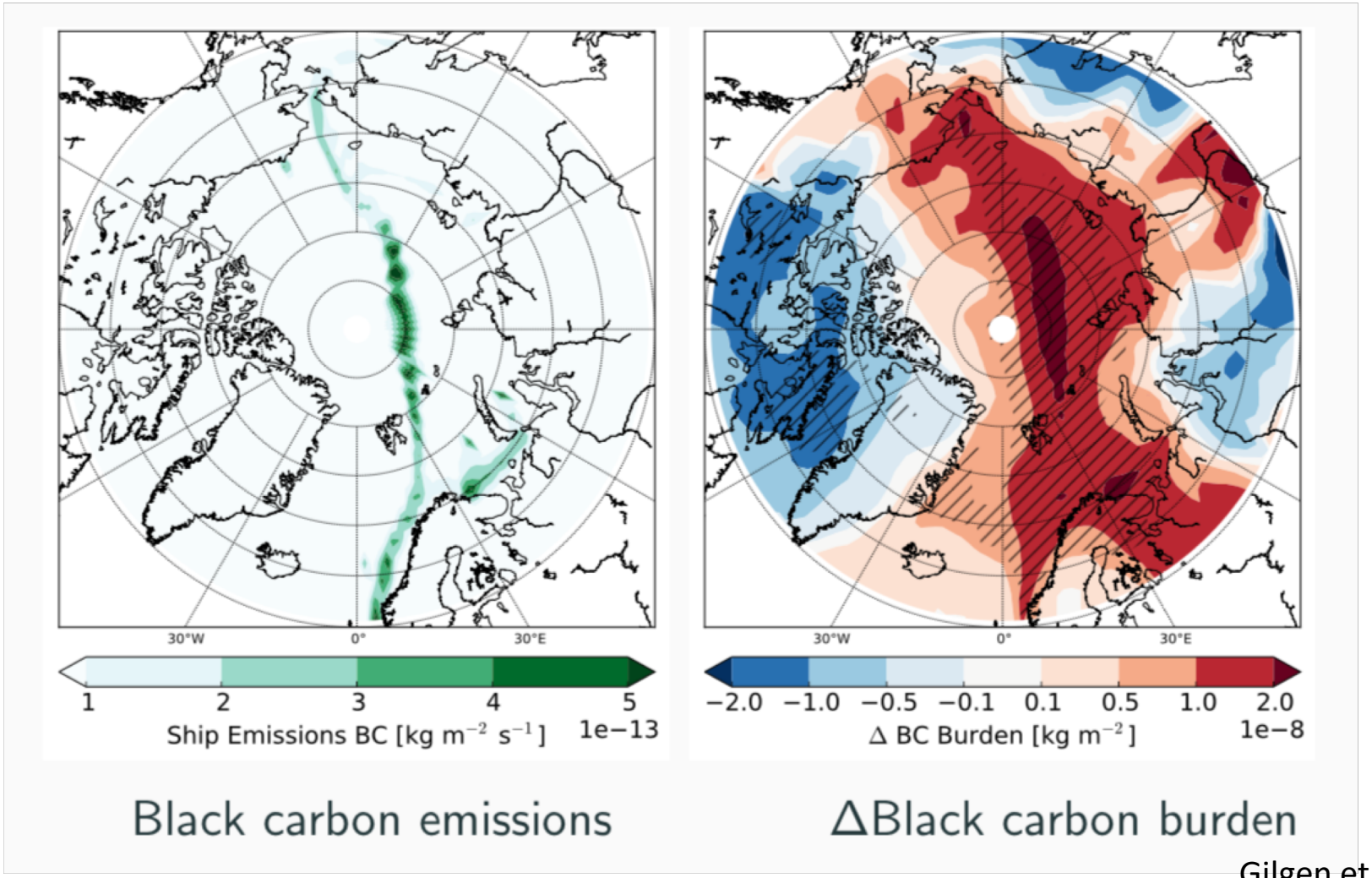




Sept/Oct

Gilgen et al., ACP, 2018

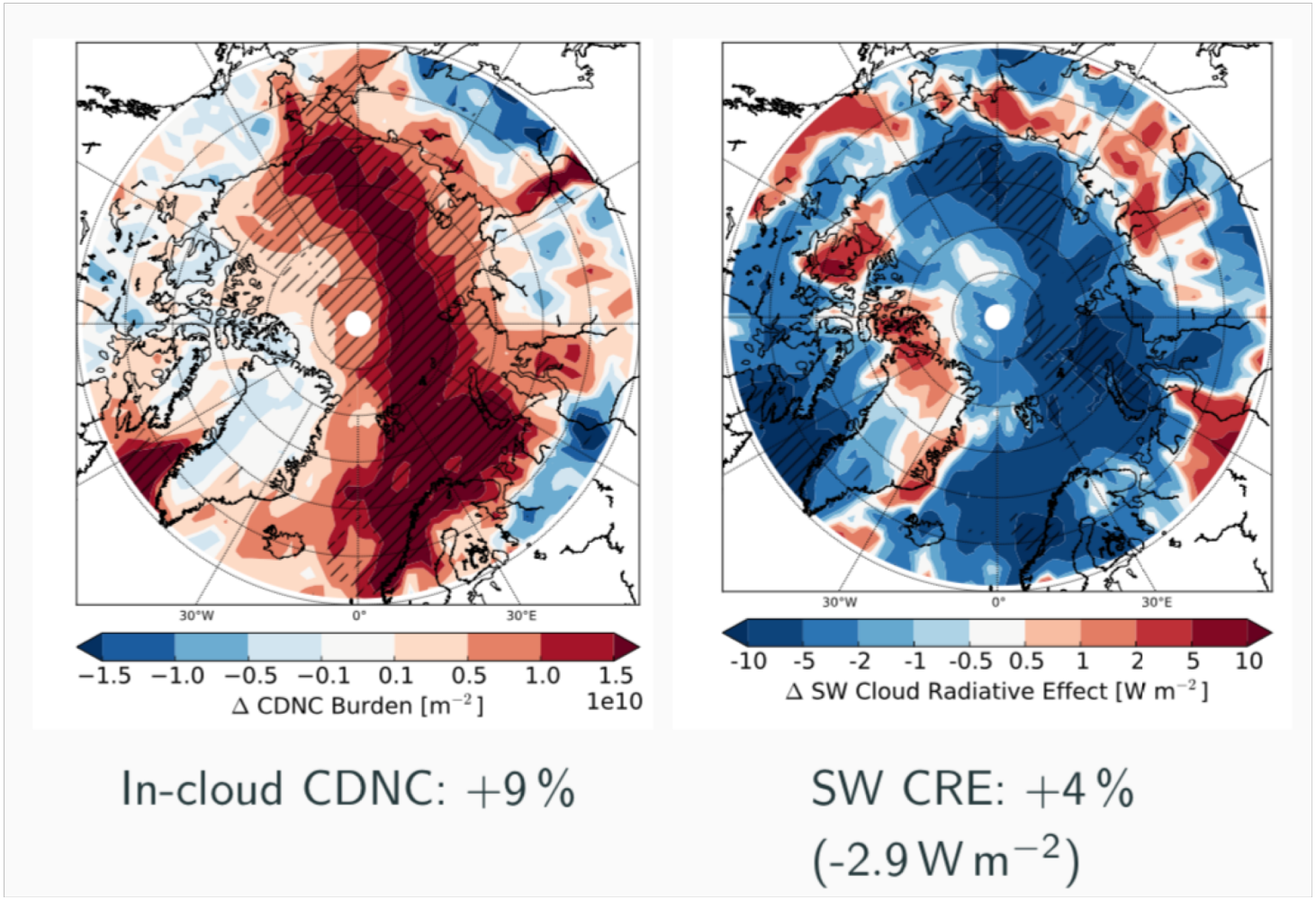
Impact of ship emissions (10 x enhanced)



Jul/Aug

Gilgen et al., ACP, 2018

Impact of ship emissions (10 x enhanced)



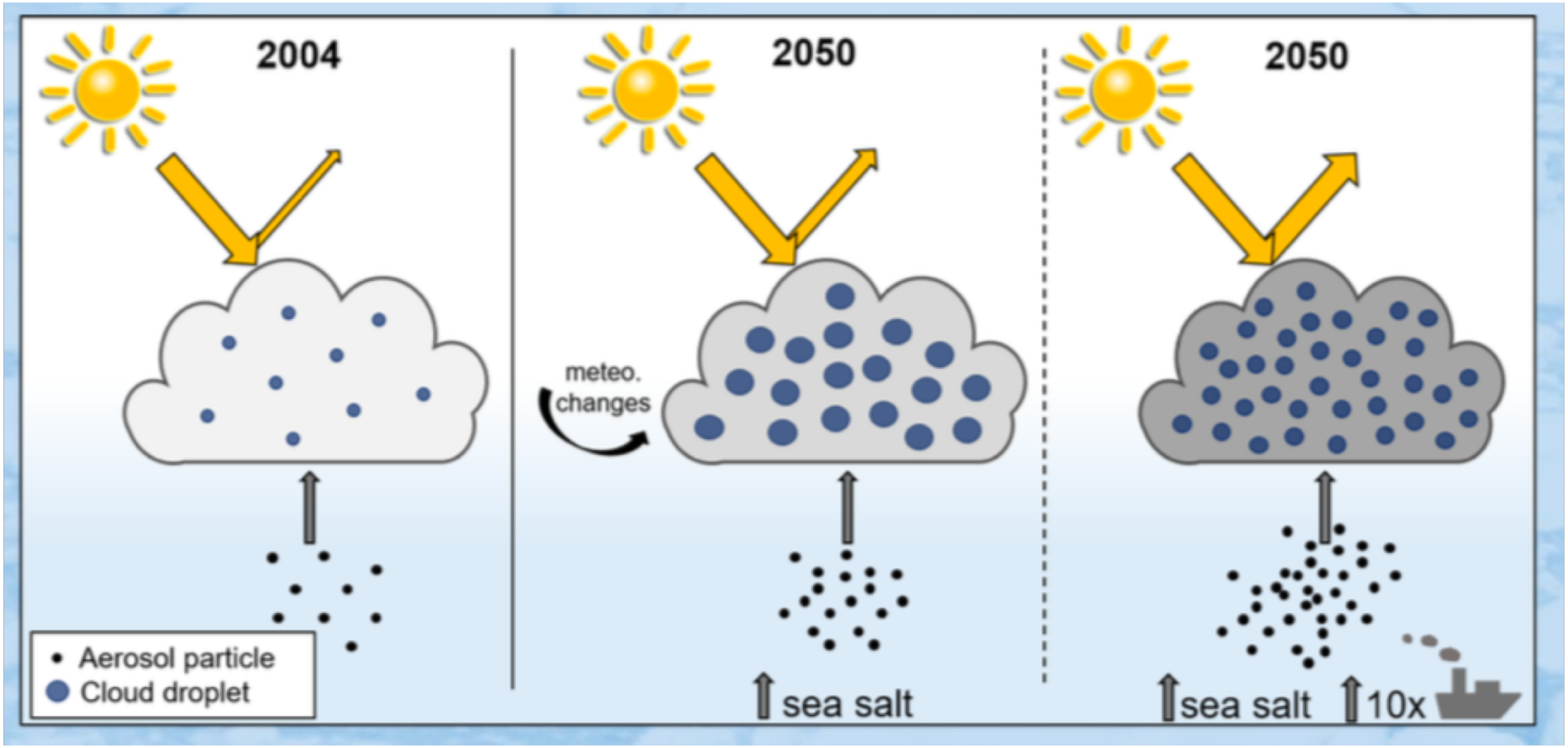
In-cloud CDNC: +9 %

SW CRE: +4 %
(-2.9 W m^{-2})

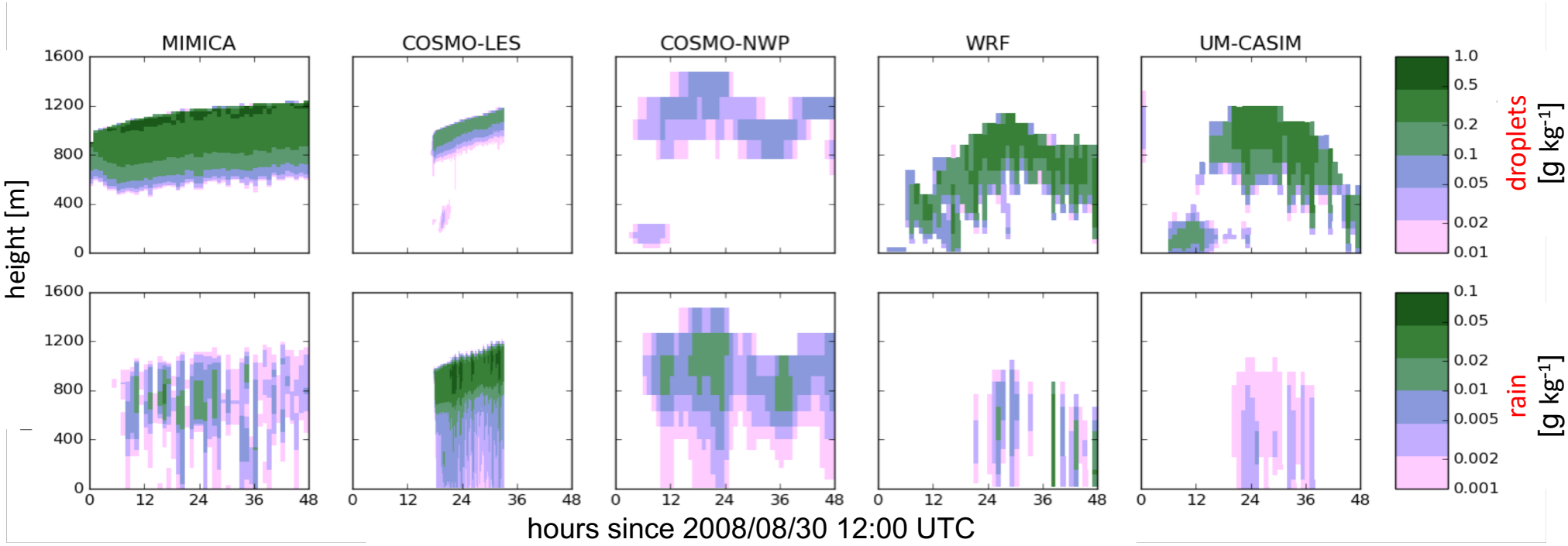
Jul/Aug

Gilgen et al., ACP, 2018

The Arctic environment



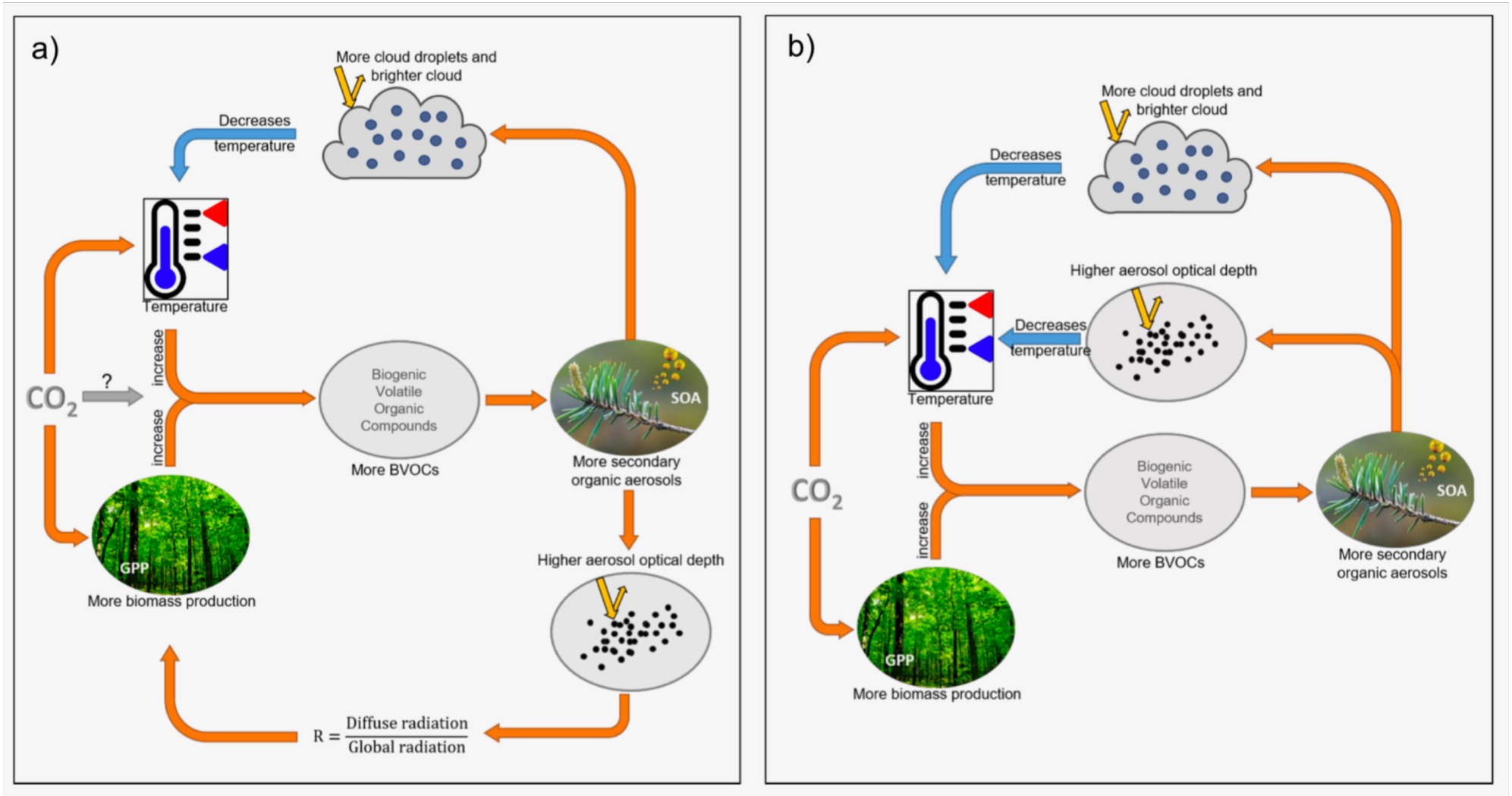
A BACCHUS Arctic cloud case study with different models



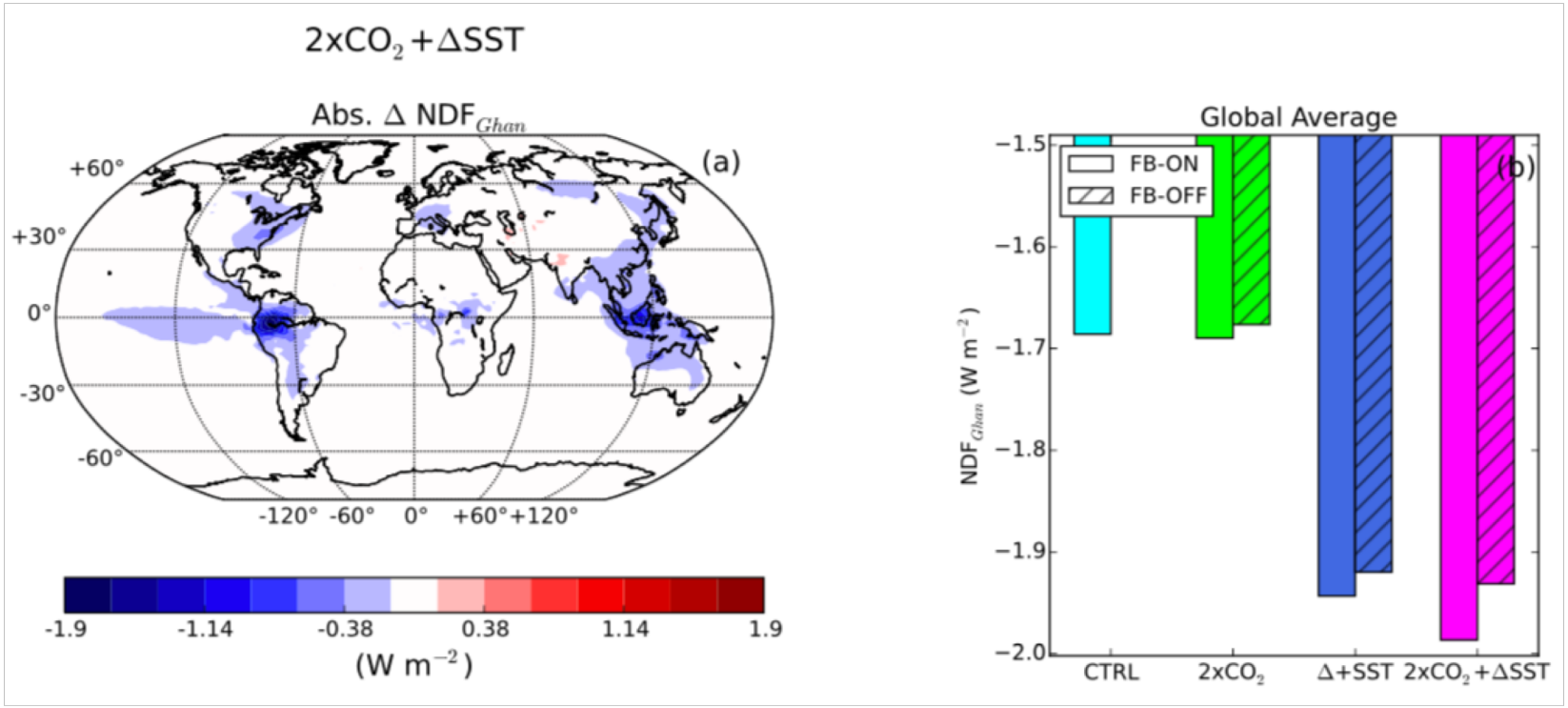
→ Significant differences in key parameters of Arctic clouds

Stevens et al., ACP, 2018

Atmosphere-biosphere interactions



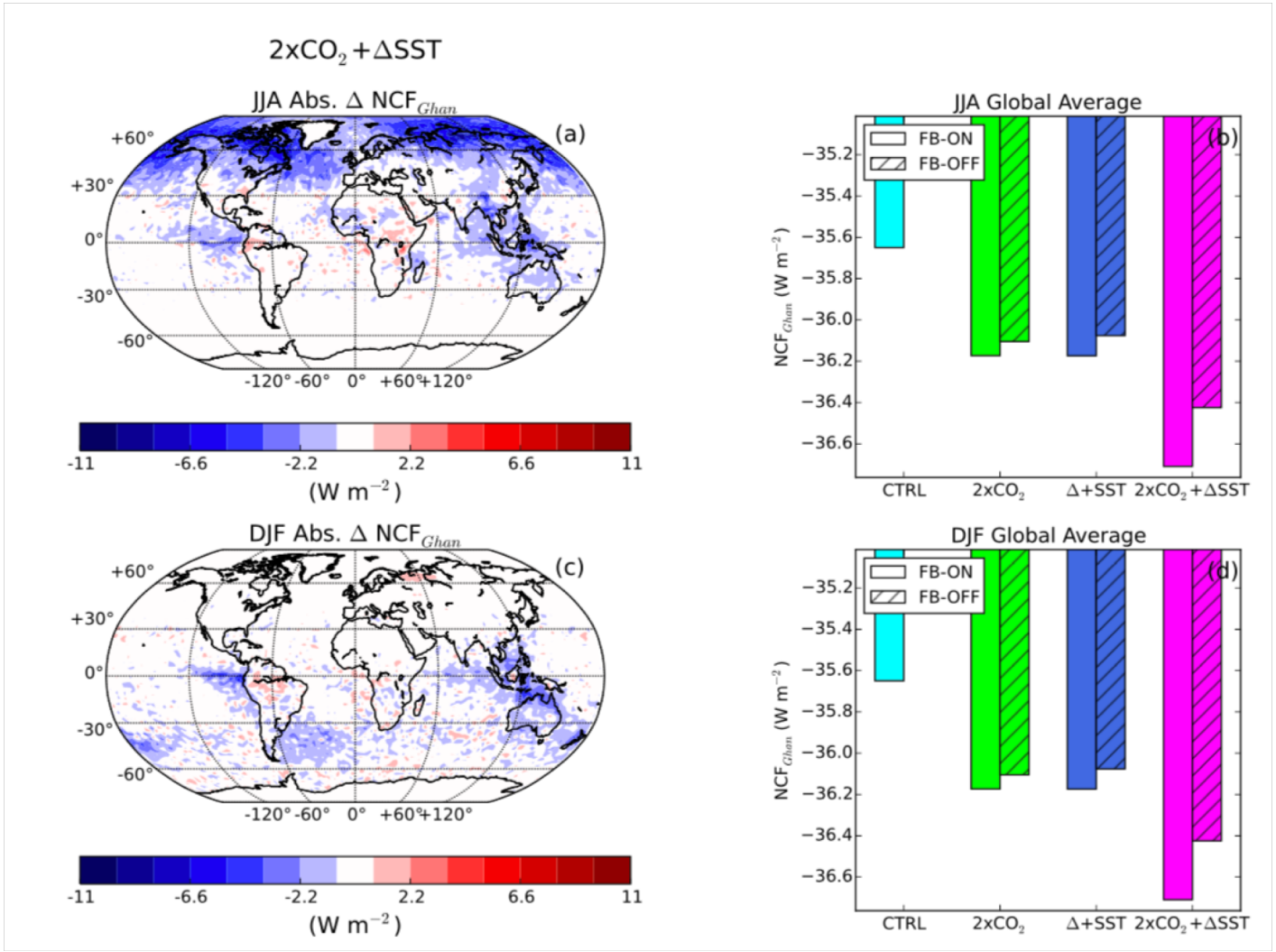
Atmosphere-biosphere interactions



Global annual mean difference in net direct aerosol forcing (NDF): -0.06 W m^{-2}

Sporre et al., ACPD, 2018

Atmosphere-biosphere interactions



Global annual mean difference in net cloud forcing (NCF): -0.43 W m^{-2}

Sporre et al., ACPD, 2018

Take-home messages

The Arctic environment:

- Polluted clouds will be thicker, but the responses of different models are very diverse
- Ship emissions are less important for the cloud radiative effect than changes in the surface albedo
- → *Key processes of Arctic clouds remain uncertain*

Atmosphere-biosphere interactions:

- Cloud changes associated with increases in secondary organic aerosols are more important than direct changes in radiation
- → *Changes in the biosphere need to be considered together with anthropogenic emissions*