# MOSAiC

## *Multidisciplinary drifting Observatory for the Study of Arctic Climate*


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***On behalf of many…..***

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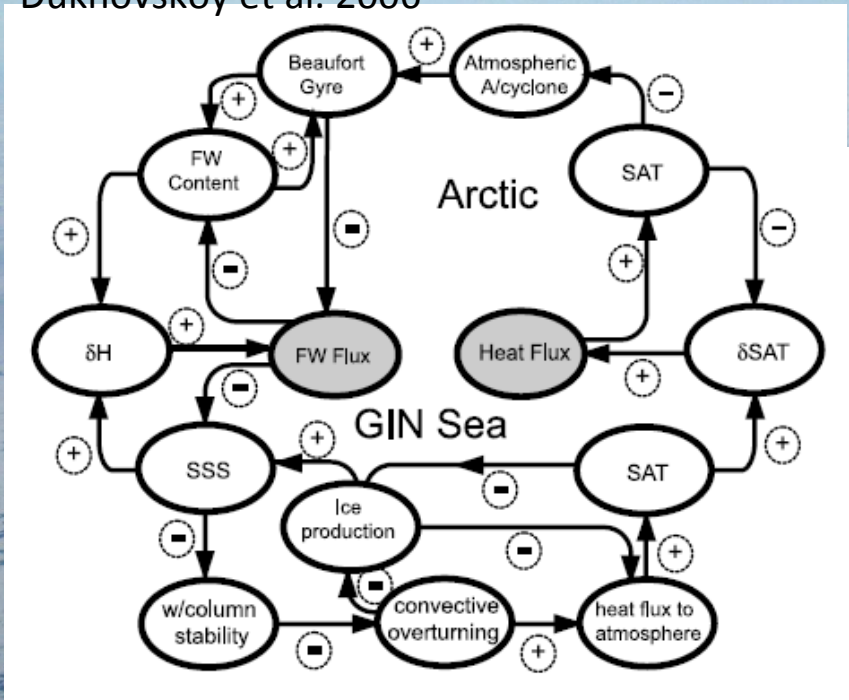
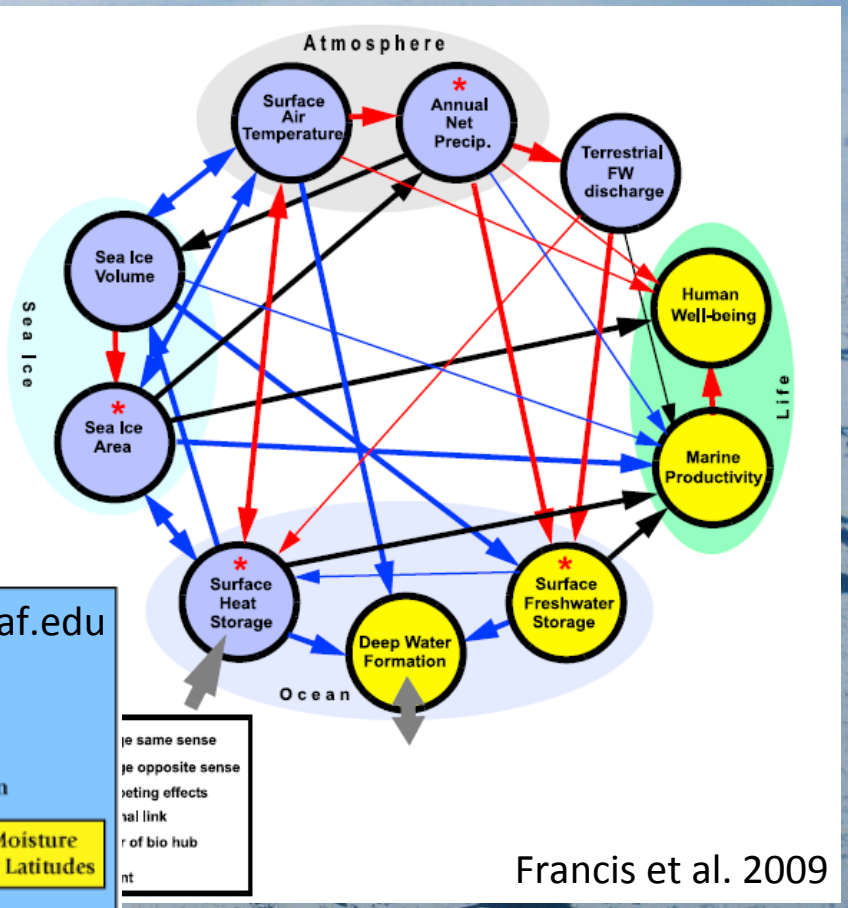
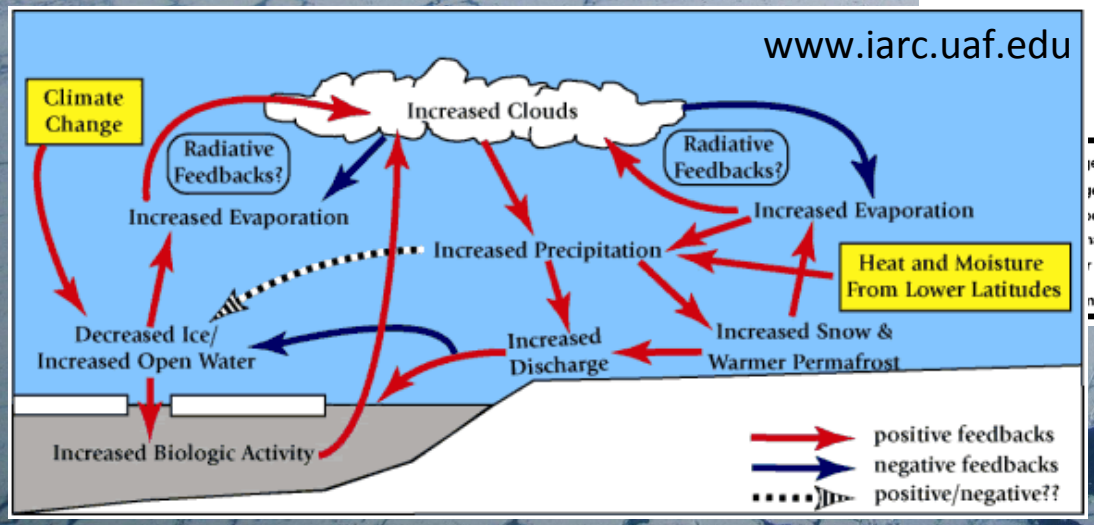
Dukhovskoy et al. 2006

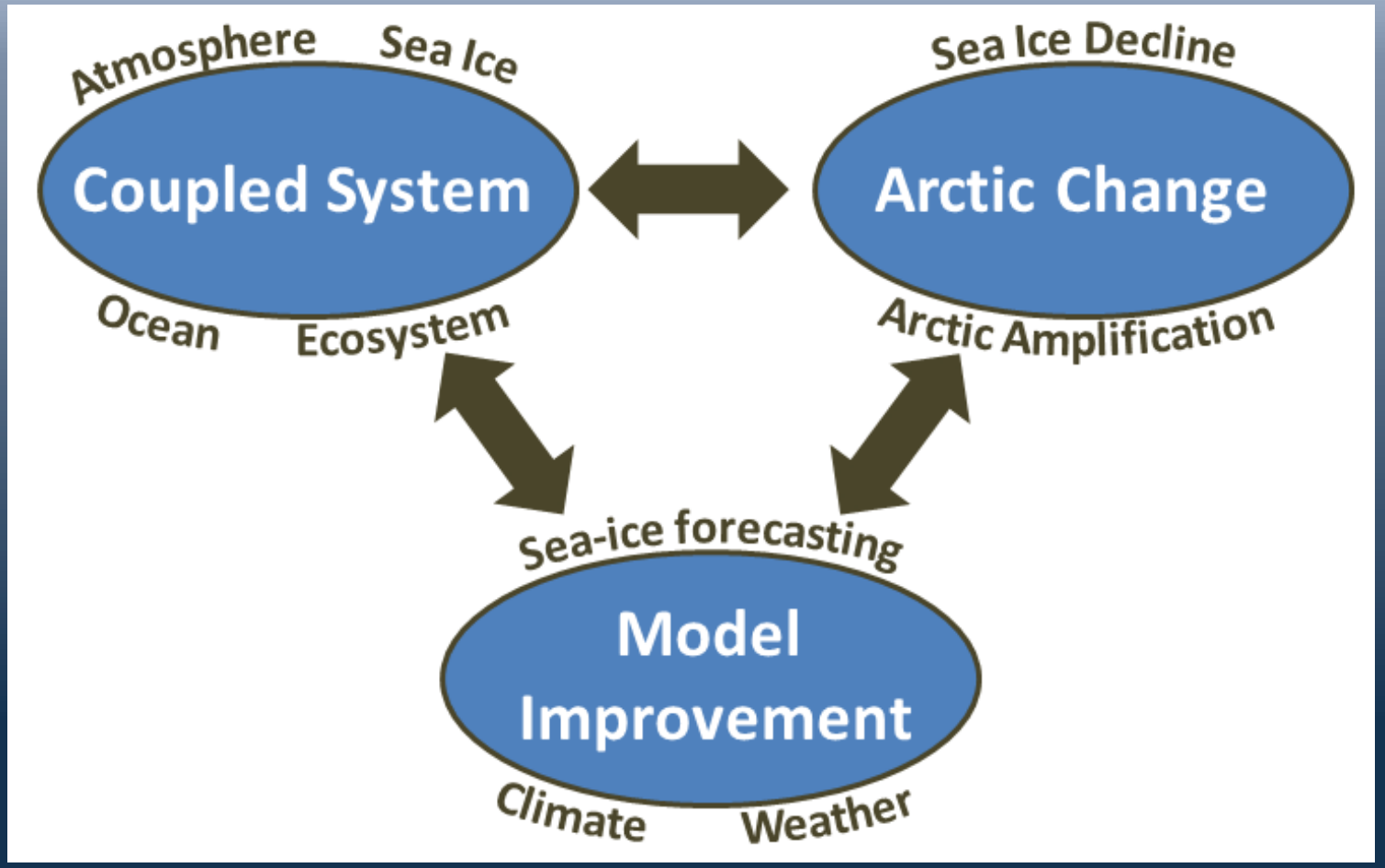


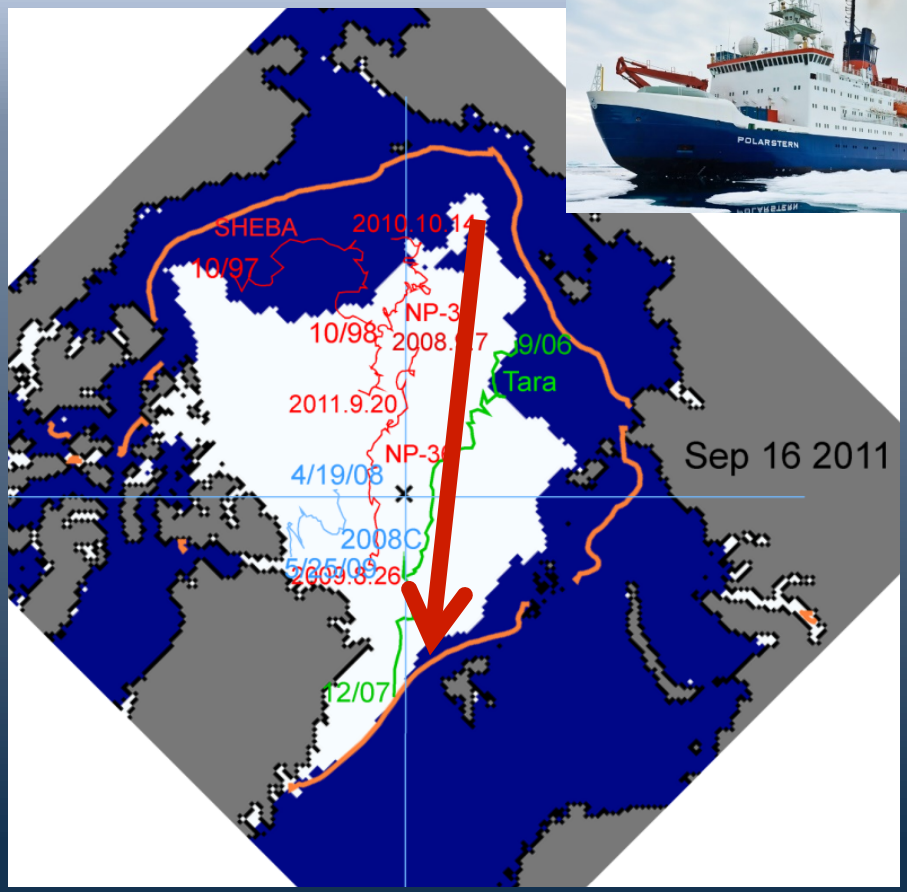

Francis et al. 2009



# Motivation


Atmosphere
Sea Ice
Coupled System
Ocean
Ecosystem
Sea Ice Decline
Arctic Change
Arctic Amplification
Sea-ice forecasting
Model Improvement
Climate
Weather

# Basic Design

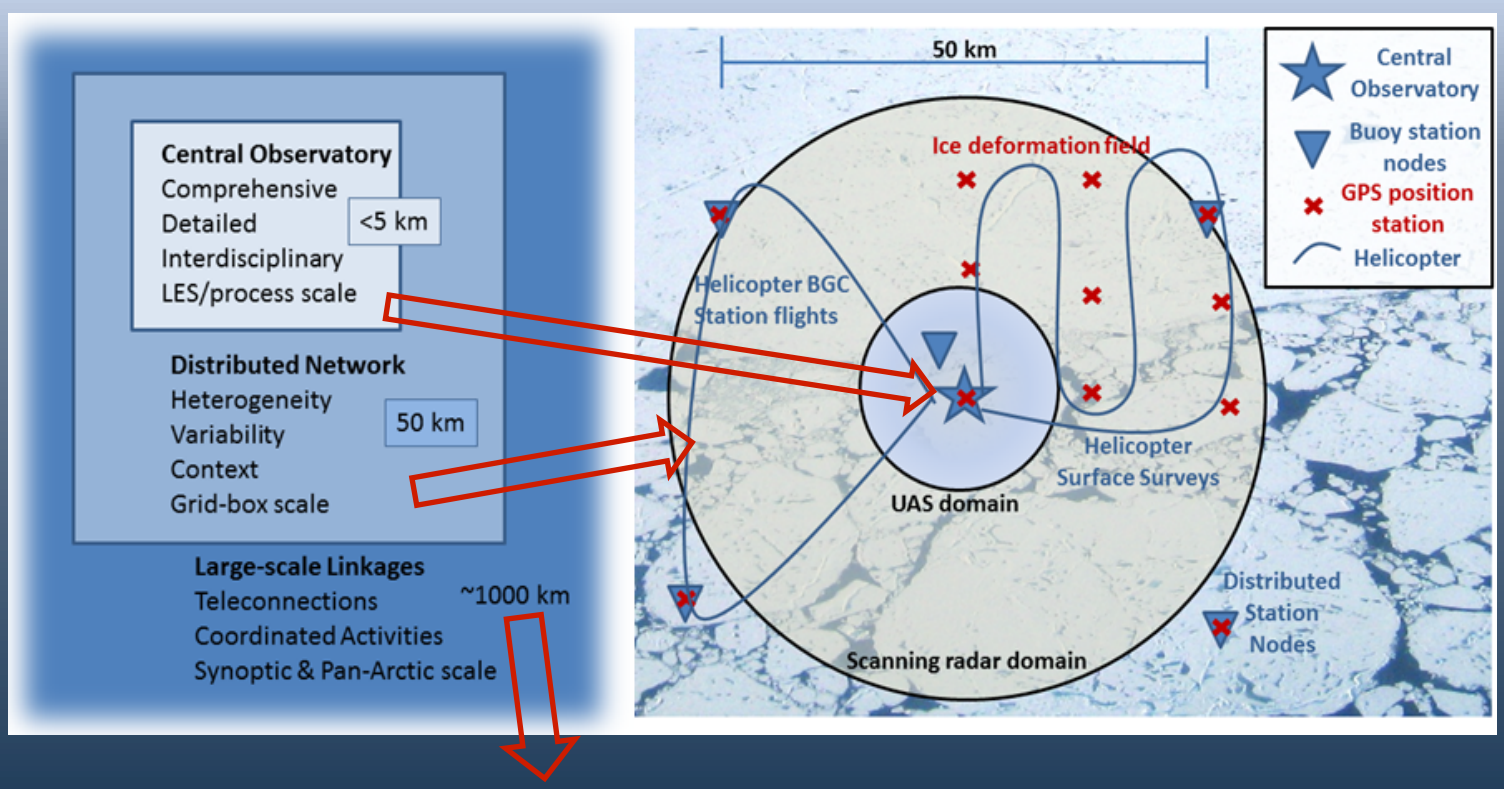



**2019-2020, annual cycle**
**Central Arctic Basin ice pack**

**Interdisciplinary process study in central Arctic 1st-year sea ice:**

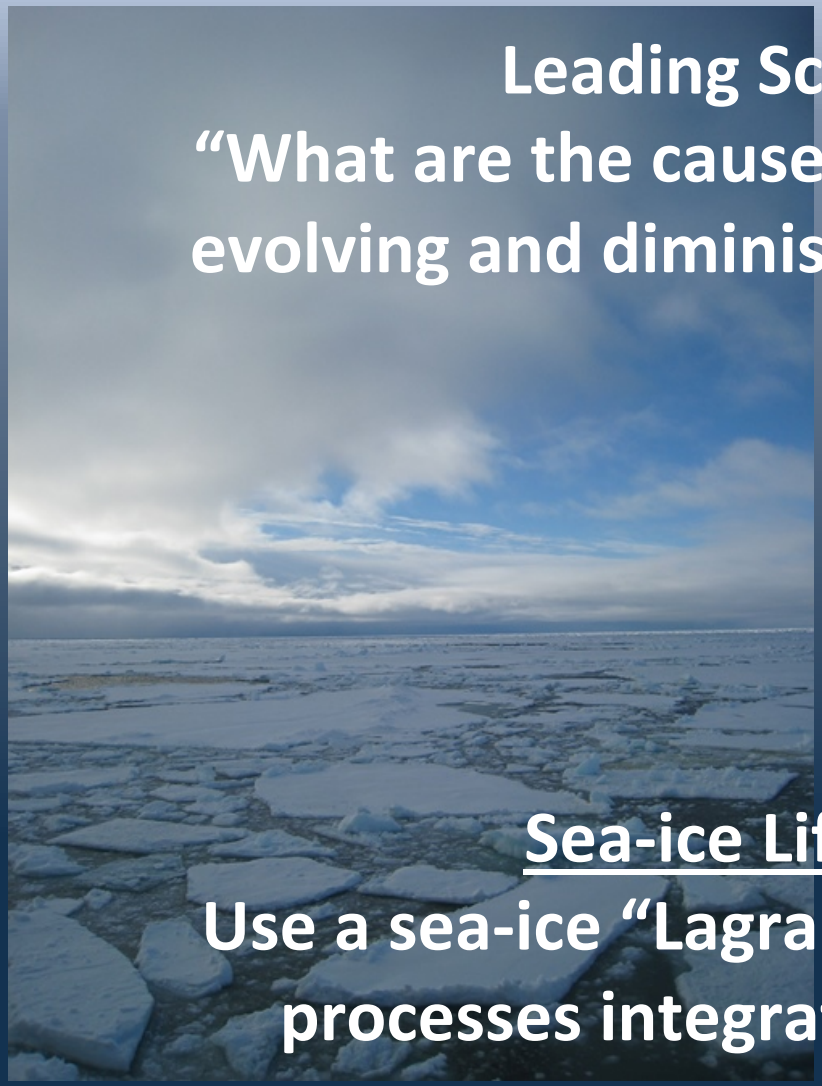
1) **Central observatory: atmos-ice-ocean-ecosystem observations**
2) **Distributed Network: Heterogeneity on model grid-box scale**
3) **Coordinated, multi-scale analysis & modeling activities, Links with YOPP**

# Basic Design: Multiscale




Other Icebreaker Missions? Japan, Sweden, Korea, China, Canada
Aircraft/UAS Missions? Germany, UK, US, Norway
Operational Satellites: CryoSat, IceSat-2, etc.
Operational Land Stations: IASOA sites
Operational Buoy Networks: IABP, etc.

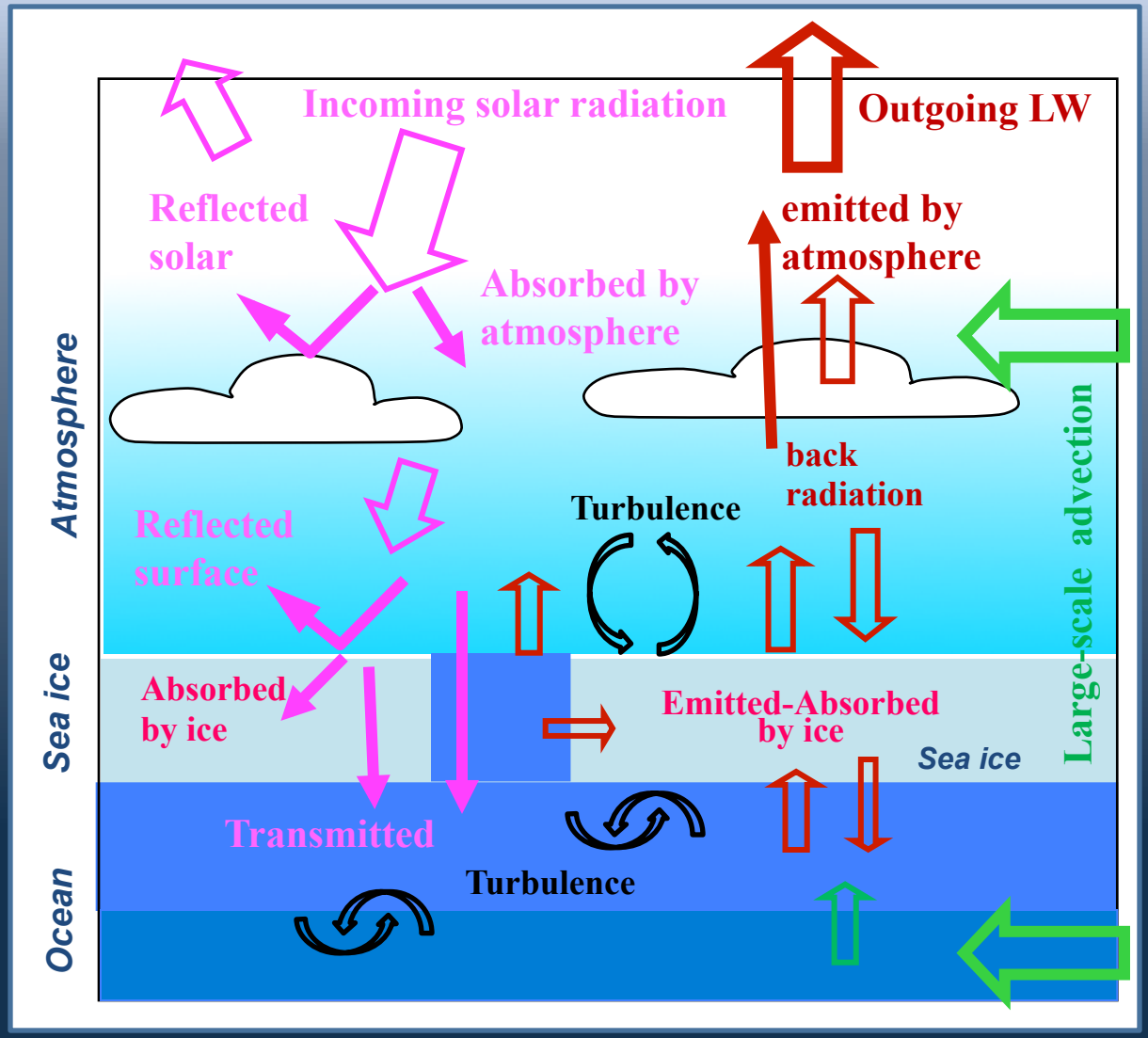
# MOSAiC Science Drivers



**Leading Science Question:**
**"What are the causes and consequences of an evolving and diminished Arctic sea ice cover?"**

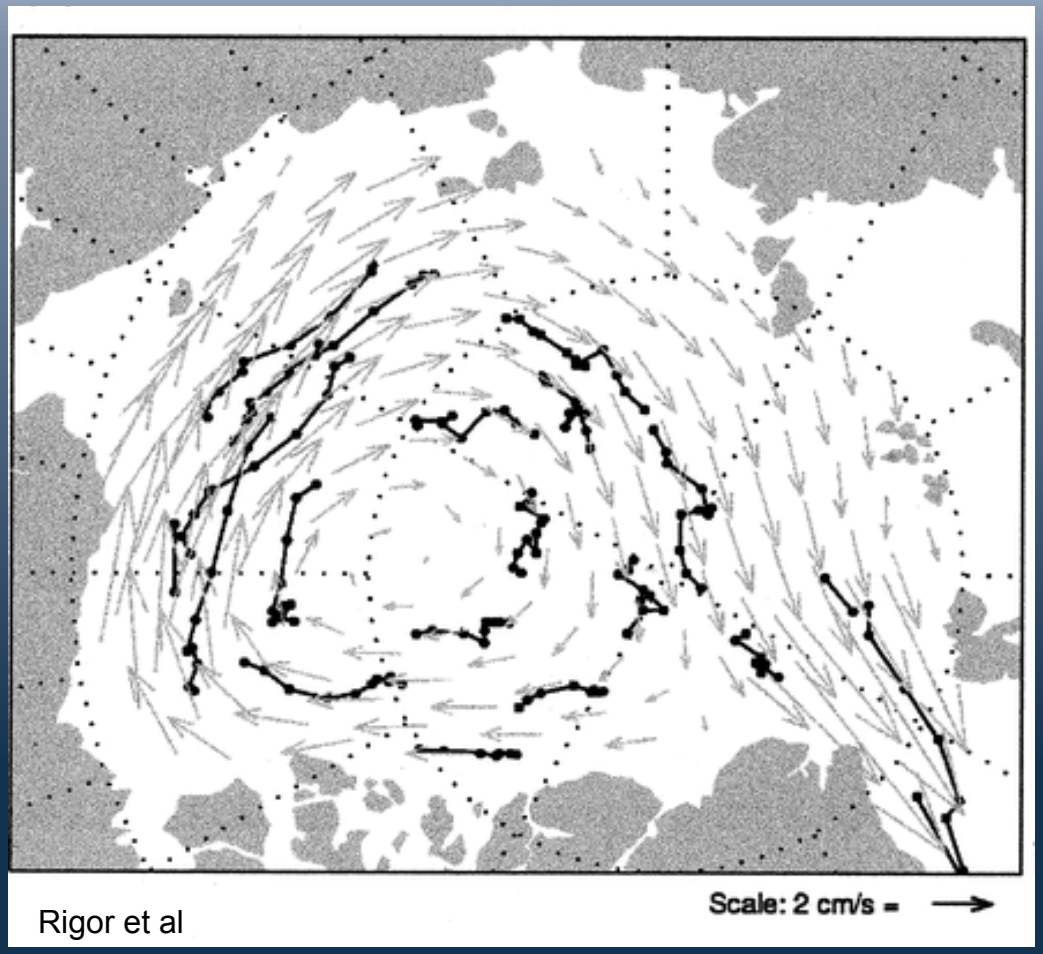
**Sea-ice Lifecycle as a Theme.**
**Use a sea-ice "Lagrangian" perspective, where ice processes integrate forcings from atmos and ocean.**

# Sea-Ice Energy Budgets




- Energy Budgets
- Radiation
- Upper Ocean Heat Storage
- Mixing Processes
- Turbulence
- Stratification
- Boundary Layers
- Momentum Fluxes

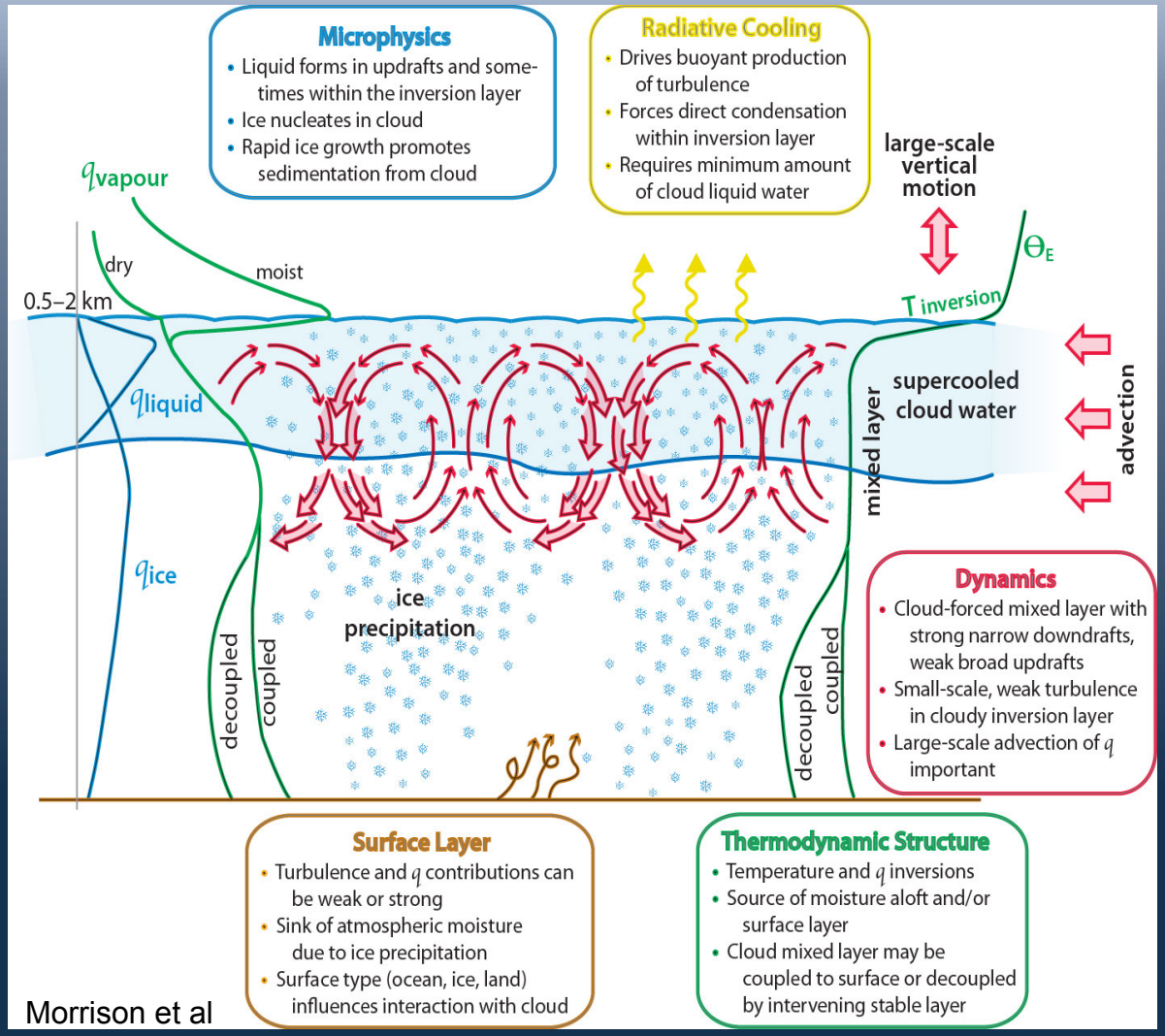
# Ice Motion / Deformation




Rigor et al

- Ice Age
- Ice Thickness Dist'n
- Floe Size Dist'n
- Ridging / Leads
- FYI Roughness / Drag
- Dynamics / Velocity
- Ice –Wave Interactions

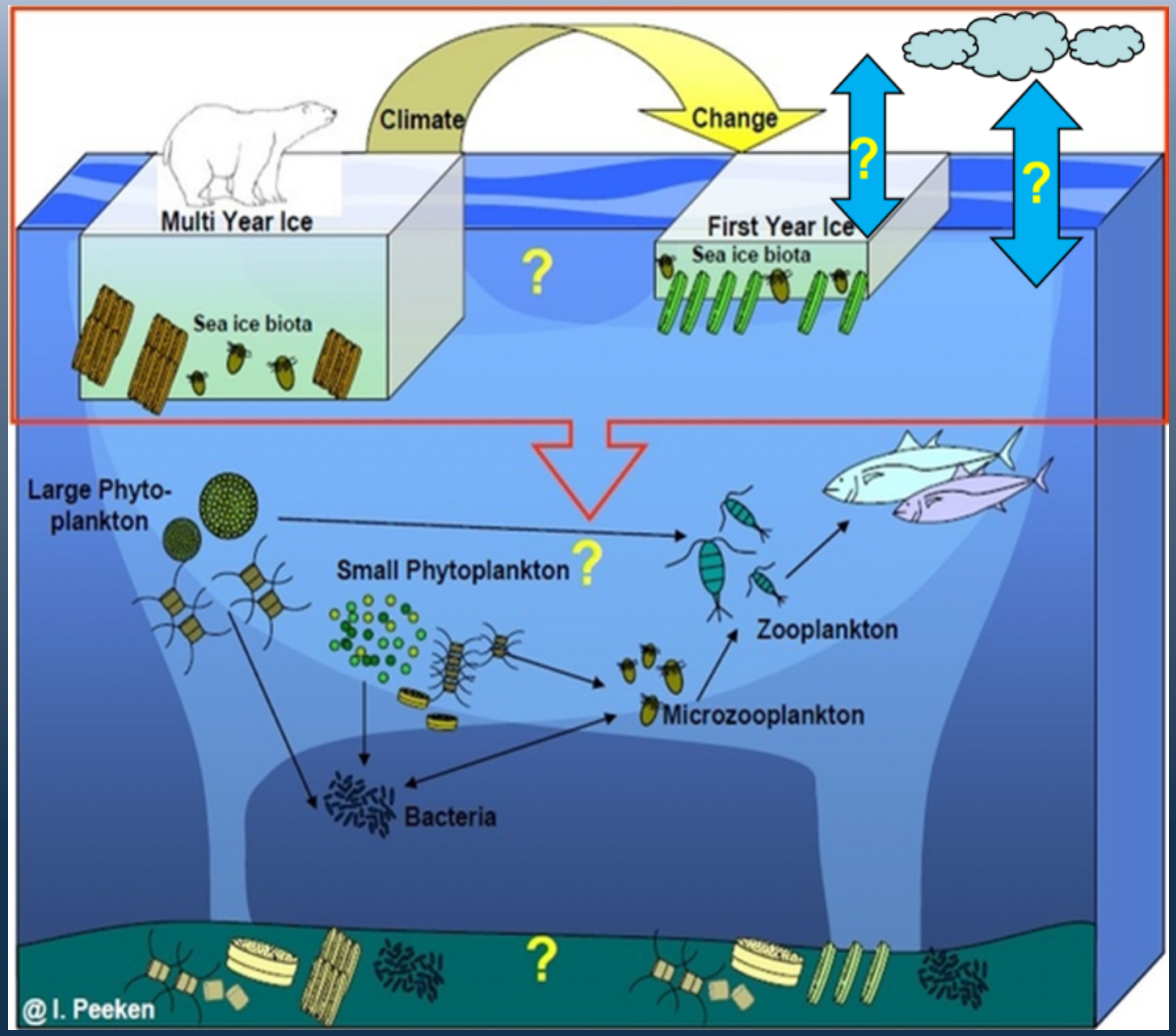
# Clouds/Precip/Aerosols




Morrison et al

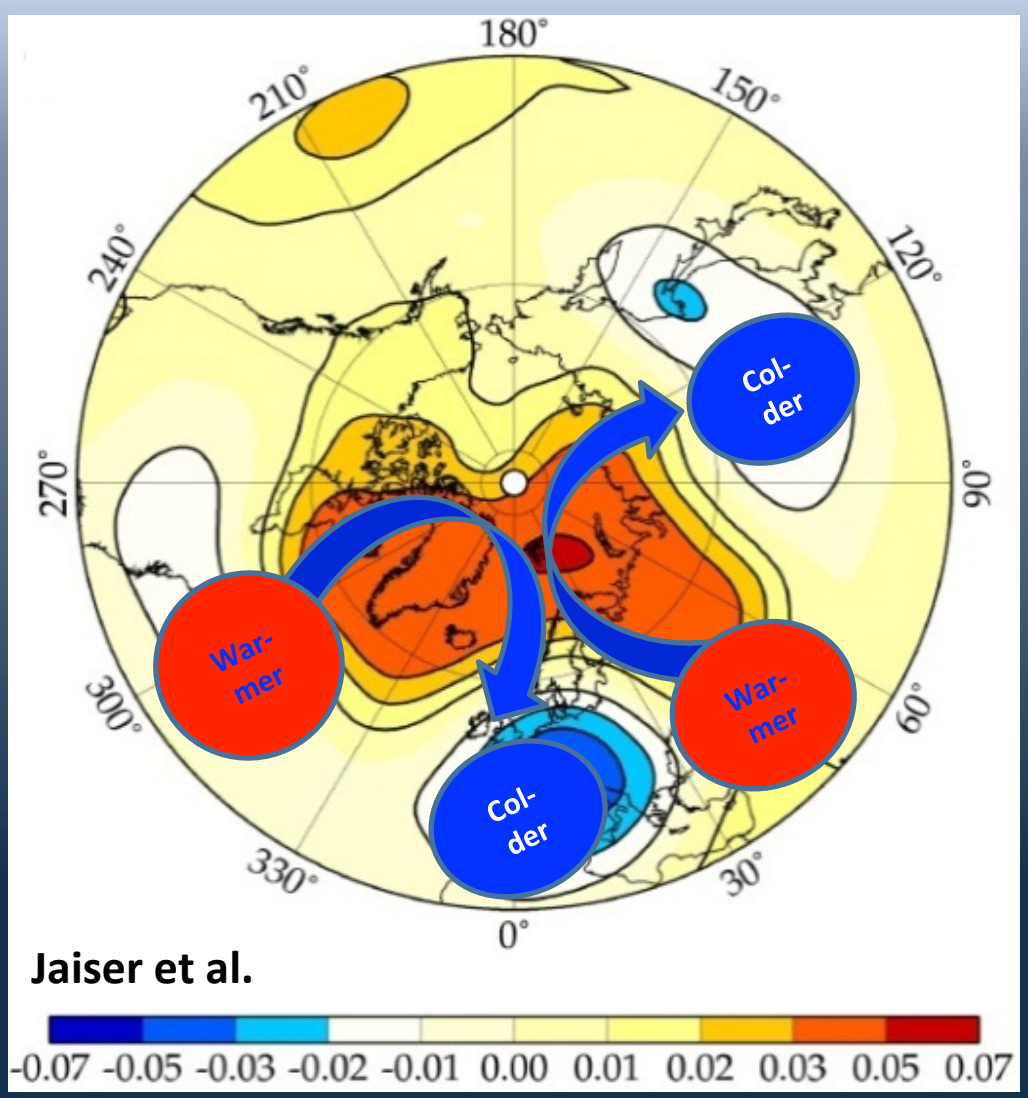
- Phase Partitioning / Mixed-phase
- Radiative Processes
- Cloud dynamics / Turbulence
- Spatial Organization
- Cyclogenesis
- Aerosol Conc. / Source attribution
- Precipitation

# Biology/Chemical Processes




- Surface Gas Exchange
- Carbon Cycle
- Nutrient Transfer
- Ice Algae / Biota
- Sea Ice Ecosystems
- Primary Productivity
- Aerosol Precursors

# Large-Scale Implications




Jaiser et al.

- Large-scale Transport
- Synoptic variability
- Linking local processes & hemispheric patterns
- Upscaling
- Implications of regional change

# MOSAiC <-> YOPP

- Coordination towards building community support
- Draw for other enhanced observations
- Model community to use observations
- Preparatory & Operational model support
- Archival of enhanced modeling products
- Data sets appropriate for model forcing
- Linking MOSAiC to large-scale

# MOSAiC into the Future

- Implementation Workshop/Plan – July 2015
- US interagency proposals – Autumn 2015?
- EU Proposals – 2016
- Numerous other proposals – 2015-2018
- MOSAiC Open Science Meeting – 2016 or 2017
- Field deployment September 2019

***Thanks!***

**www.mosaicobservatory.org**