UNIVERSITÄT LEIPZIG

Faculty of Physics and Earth Sciences

Transregional Collaborative Research Center 172

ArctiC Amplification: Climate Relevant Atmospheric and SurfaCe Processes and Feedback Mechanisms (AC)³

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http://ac3-tr.de

1 Overview

A German research consortium to investigate the changing Arctic climate

- Transregional Collaborative Research Center (TR 172) funded by Deutsche Forschungsgemeinschaft (DFG)
- Phase I (January 2016 – December 2019)
- Focus on atmospheric and surface processes
- Combination of observational and modeling studies to improve future projections of Arctic climate

Overarching scientific objectives:

- Identify, investigate, and evaluate key processes contributing to Arctic Amplification
- Improve understanding of major feedback mechanisms, and
- Quantify their relative importance for Arctic Amplification

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2 Arctic Amplification

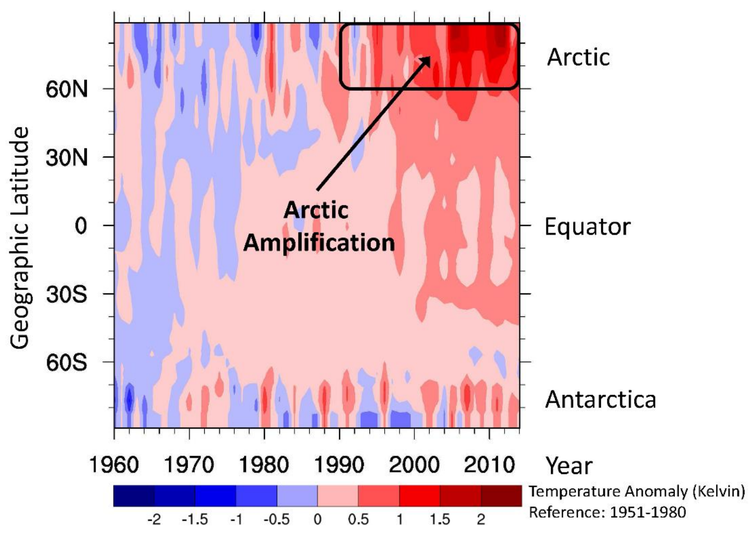


Fig. 1: Temperature anomaly (in Kelvin, zonal and annual mean) with respect to 1951-1980 mean. Data are provided by NASA Goddard Institute for Space Studies Team.

- Remarkable increase of near-surface air temperature in the Arctic within last 25 years which exceeds global warming by a factor of 2-3
- Arctic sea ice has declined intensively and its thickness is shrinking
- Coupled regional and global models do not yet reproduce unambiguously drastic changes in Arctic climate parameters

Peculiarities and feedback processes in the Artic – A Complexity to be Understood

- Surface albedo effect is already well-explored (red)
- Meridional atmospheric and oceanic transport and related vertical turbulent exchange of energy between ocean and atmosphere (blue)
- Occurrence of water vapor and clouds, caused by the warming ocean surface (black)
- Abundance of aerosol particles (green)
- Biological activity in ice-free ocean (purple) resulting in increased amounts of phytoplankton and thus more absorption of solar radiation

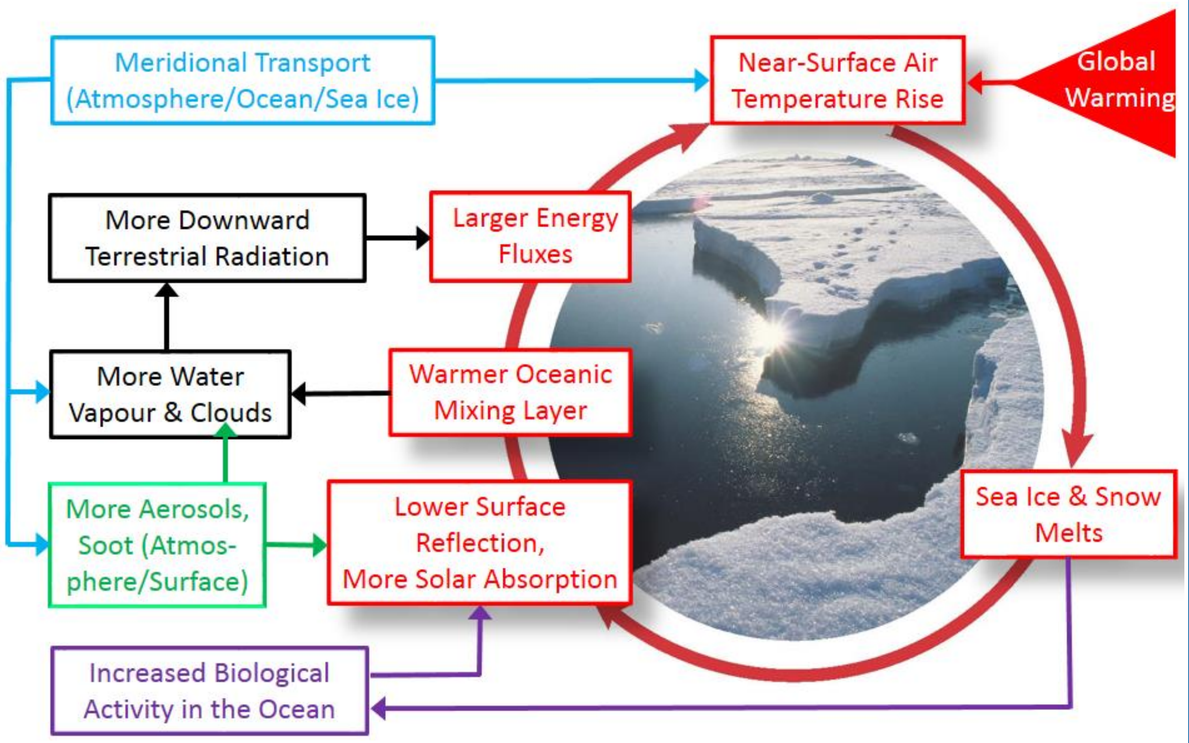


Fig. 2: Examples of feedback processes amplifying the initial near-surface air temperature rise.

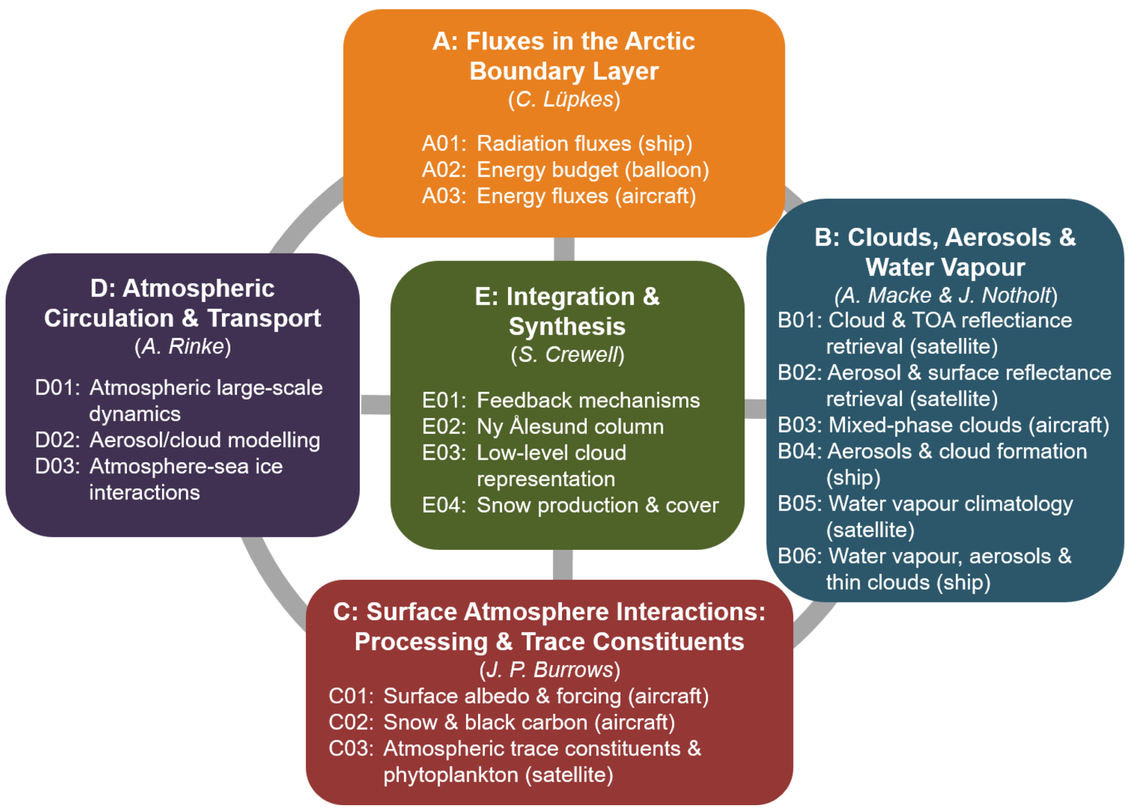
References

Wendisch, M.., Brückner, M., Burrows, J.P., Crewell, S., Dethloff, K., Ebell, K., Lüpkes, C., Macke, A., Notholt, J., Quaas, J., Rinke, A., Tegen, I., 2016: The Arctic Amplifier – Novel Science Planned in a New German Research Initiative, *EOS,* 2016, in press.

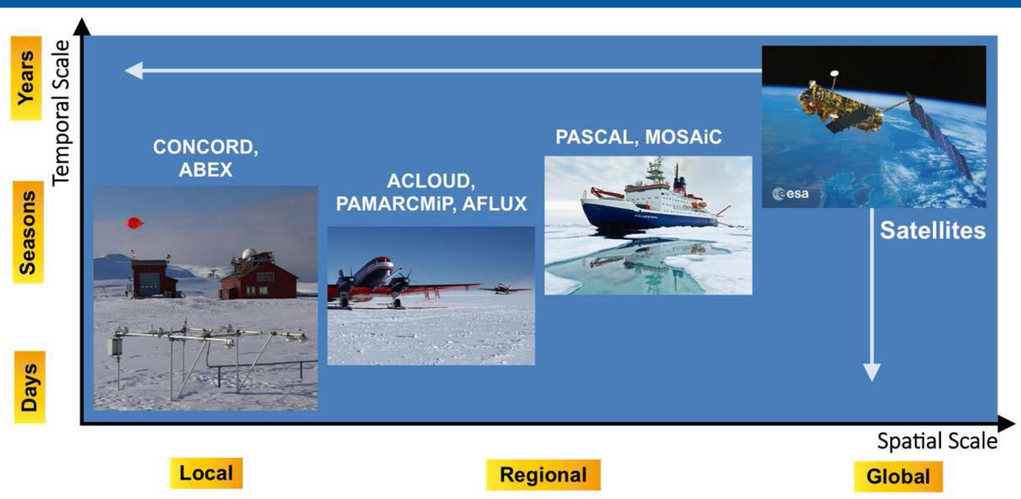
3 Project Structure

5 major scientific focus areas

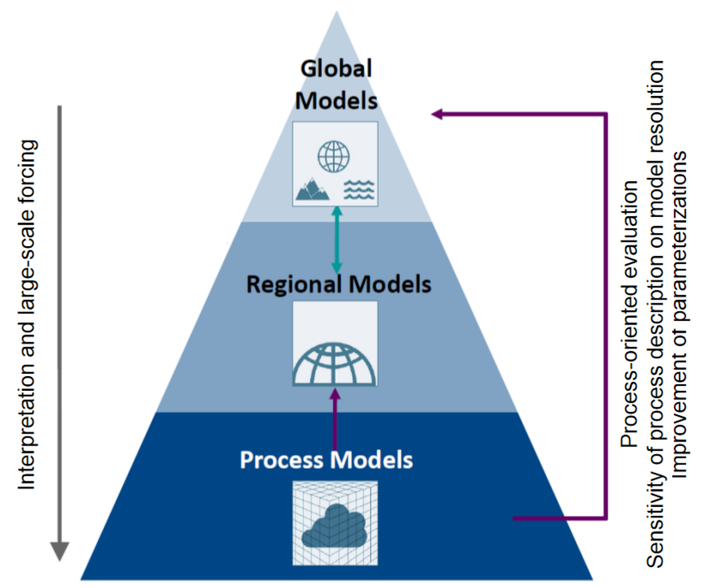
- 19 scientific sub-projects
- 29 PhD students, 11 Postdocs



4 Observations & Modeling within (AC)³



- Exploiting high-quality measurements over the Arctic Ocean with innovative technologies using powerful infrastructures
- Enhancing the predictive skills of a hierarchy of modern numerical models



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