HORIZON 2020

Climate relevant interactions and feedbacks: the key role of sea ice and snow in the polar and global climate system

Berichterstattung

Projektinformationen

CRiceS

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Projektwebsite

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Finland

Periodic Reporting for period 2 - CRiceS (Climate relevant interactions and feedbacks: the key role of sea ice and snow in the polar and global climate system)

Berichtszeitraum: 2023-03-01 bis 2024-08-31

Zusammenfassung vom Kontext und den Gesamtzielen des Projekts

Polar regions play a critical role in the Earth system, yet our understanding of the intricate interactions between polar ocean, ice, snow, and atmosphere remains limited. These processes are fundamental to driving global climate feedbacks, but their complexity challenges accurate representation in models. The EU-funded CRiceS project aims to enhance understanding of the links between rapid sea ice decline and the associated physical and chemical changes in polar oceans and the atmosphere. By analyzing new and emerging data from in-situ and satellite observations, the project quantifies the chemical, biogeochemical, and physical processes governing interactions within the coupled ocean-ice/snow-atmosphere system. CRiceS refines process-level, regional, and climate models to better capture these feedback mechanisms, ultimately contributing to improved Earth system model (ESM) performance and delivering actionable insights for mitigation and adaptation strategies.

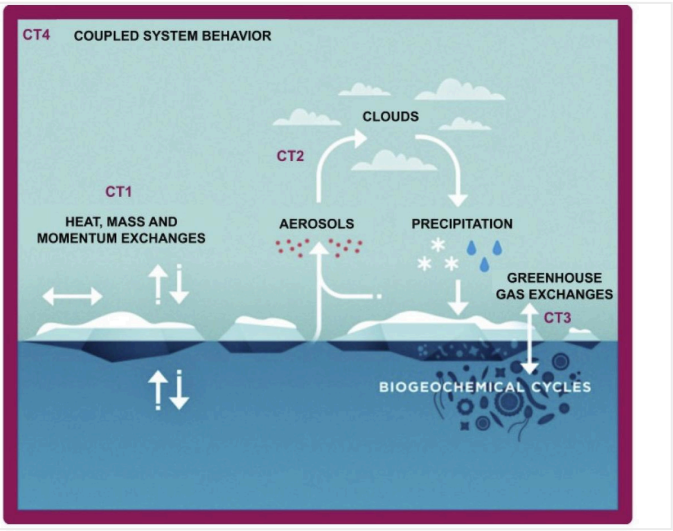
Arbeit, die ab Beginn des Projekts bis zum Ende des durch den Bericht erfassten Berichtszeitraums geleistet wurde, und die wichtigsten bis dahin erzielten Ergebnisse

CRiceS has focused heavily on analysis of observations, developing new observational products and model development, evaluation of model performance and analysis of shortcomings, and compilation of an extensive set of observations ranging from local in-situ process level to satellite observations and from targeted polar campaigns to integrated long term observations. CRiceS teams have developed methodologies to maximize utilization of observations as constraints for simulation ensembles, evaluation and validation data, or as a source of semi-empirical parameterizations or data-driven simulation approaches. These approaches have been developed for each project Core Theme: heat, mass and momentum exchanges (CT1), aerosols & clouds (CT2) and biogeochemical cycles/greenhouse gas exchanges (CT3), and CT4 which integrates our interdisciplinary understanding of ocean-ice-snow-atmosphere processes that operate together within the coupled OIA system. CRiceS has advanced the understanding of the physical, biological and chemical processes in polar and global systems, in atmosphere, sea ice and ocean. Atmospheric models have been expanded with new formulations of aerosol and cloud processes and chemical mechanisms. Biogeochemistry and related fluxes have been incorporated in several sea ice models, and the physical descriptions of sea ice itself have been revised and their limitations analysed. Several CRiceS-enhanced models are ready for quantifying future pathways of polar climate systems and their impacts within and outside polar regions.

Fortschritte, die über den aktuellen Stand der Technik hinausgehen und voraussichtliche potenzielle Auswirkungen (einschließlich der bis dato erzielten sozioökonomischen Auswirkungen und weiter gefassten gesellschaftlichen Auswirkungen des Projekts)

CRiceS has developed mechanisms for identification and quantification of hazards, as well as analysis of impacts on human and natural systems. This method will deliver the information needed to

understand how people and the environment will be impacted and to guide adaptation actions and decisions within the Arctic, Antarctic and across the globe. A specific part of the work is focusing on the Arctic to deliver a new assessment of impacts for biodiversity, fishing, seal and polar bear habitats, ship navigation, and resource extraction. The Arctic case studies are performed via literature reviews with Arctic policy stakeholder interactions. The framework has been piloted against existing model data and observations, and will be applied to CRiceS future scenarios during the last phase of the project. CRiceS has integrated itself to processes within CMIP7 (towards IPCC AR7), AMAP, CLIVAR NORP, IASC working groups and many others, to ensure that our increased understanding of polar climate systems and their role in globally is transferred to EU and international policymakers and further EU research and innovation missions.



Schematic for CRiceS Core Themes

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