

本特別セッション「北極温暖化とその影響」の趣旨と 「GRENE 北極気候変動研究プロジェクト」の概要

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Aim of the Special Session “Warming in the Arctic and Its Influences” and Brief Overview of “GRENE Arctic Climate Change Research Project”

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Aim of the Special Session:

This special session has been arranged intending to introduce and discuss outcomes of our GRENE Arctic Climate Change Research Project. For this purpose, session is composed of three parts as follows.

I: Report from Research Themes (answers to the Strategic Research Targets)

"Arctic Climate Change Research Project (FY2011-2015)" within the framework of the Green Network of Excellence Program (GRENE) is now in the final year. As a result of the implementation of the project, clear messages to the community and society, “what could be concluded as a whole,” are requested, with the central axis in the Arctic warming and its influences. The project is composed of 7 bottom-up Research Themes, requested to create new research outcomes (answers) resulted for the 4 strategic research targets, set by MEXT at the funding. The presentations of the central results for the outcomes will be invited.

II: Direction of the new research projects

Then, the new directions of the next Arctic research projects will be introduced, following the recent national and international circumstances of the Arctic research.

III: Panel discussions on “Arctic warming amplification and impacts to the mid-latitude”

Finally, panel is set to discuss the Arctic warming amplification and impacts to the mid-latitude, which are the prominent topics of the GRENE project.

Overview of the Project

Recently, due to abrupt retreat in summer sea ice area associated with global warming, rapid warming in surface air temperature, reduction of glaciers, melting permafrost and many other changes, the Arctic becomes the hot topic not only just of a scientific aspect, but also of the society. We have started a Japanese initiative "Arctic Climate Change Research Project" within the framework of the GRENE (Green Network of Excellence) Program funded by the Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT), in 2011. This Project targeted understanding and projecting “Rapid Change of the Arctic Climate System and its Global Influences.” Four “Strategic Research Targets” are set:

1. Understanding the mechanism of warming amplification in the Arctic,
2. Understanding the Arctic climate system for global climate and future change,
3. Evaluation of the impacts of Arctic change on weather and climate in Japan, marine ecosystems and fisheries,
4. Projection of sea ice distribution and Arctic sea routes.

As the network of universities and institutions in Japan, this 5-year project involves more than 300 scientists from 35 institutions and universities. National Institute of Polar Research (NIPR) works as the core institute and Japan Agency for Marine-Earth Science and Technology (JAMSTEC) joins as the supporting institute. There are 7 bottom up “Research Themes” on atmosphere, terrestrial ecosystem, cryosphere, marine ecology and fishery, sea ice and Northern Sea Route (NSR) and modeling as follows:

- (1) Improvement of coupled general circulation models based on validations of Arctic climate reproducibility and on mechanism analyses of Arctic climate change and variability,
- (2) Change in the terrestrial ecosystems of the pan-Arctic and effects on climate,
- (3) Atmospheric studies on Arctic change and its global impacts,
- (4) The role of Arctic cryosphere in global change,
- (5) Studies on greenhouse gas cycles in the Arctic and their responses to climate change,
- (6) Ecosystem studies on the Arctic Ocean declining sea ice,
- (7) Projection of sea ice distribution and Arctic sea routes.

The Project will realize multi-disciplinary study of Arctic region and connect to the projection of future Arctic and global climatic change by modeling.

During 5 years of the project, pan Arctic observation has been carried out in many locations, such as Svalbard, Russian Siberia, Alaska, Canada, Greenland and the Arctic Ocean. In particular, Cloud Radar in high precision was established at Ny-Ålesund (78°55'N, 11°56'E), Svalbard, and intensive atmospheric observations were carried out. In addition, the Arctic Ocean cruises by "Mirai" and other icebreakers were conducted and also mooring buoy observations were carried out. The retrieved data were accumulated in the Arctic Data archive System (ADS) and served with interfaces for analysis. In addition, modeling study has been promoted using from fundamental physical model to general circulation model. Through these observations and research, new research results are originated.

Now is the time to finalize. Research outputs on each issue are born out and the creation of new scientific outcomes resulted for Strategic Research Targets are required. In order to produce "answers" to the Strategic Research Targets, research outcomes are examined and discussed. As a result of the implementation of the project, clear messages to the community and society "what could be concluded as a whole" are requested, with the central axis of Arctic warming amplification. This review process will also become evolutionary issues to proceed to the next step (the next Arctic Research Projects) such as ArCS (Arctic Challenge for Sustainability).

特別セッションの趣旨：

本特別セッションは、GRENE 北極気候変動研究プロジェクトの成果を紹介・議論しようとするものである。この目的で、下記の3部構成とした。第I部：GRENE 北極気候変動研究プロジェクト各研究課題ではどのような活動を行い、戦略研究目標に対してどのような成果が得られたか（どのように答えられたか）を報告する。第II部：引き続き新しい研究プロジェクトは何を目指しているのかを紹介する。第III部：パネルディスカッションとして、北極気候変動研究の中心課題である「北極温暖化増幅メカニズムと中緯度影響」を論じる。

GRENE 北極気候変動研究プロジェクトの概要：

グリーン・ネットワーク・オブ・エクセレンス事業（GRENE）北極気候変動分野「急変する北極気候システム及びその全球的な影響の総合的解明」（2011-2015）として実施された。この計画は、4つの戦略研究目標を掲げ、公募によって選ばれた7つの研究課題が目標達成を担っている。4つの戦略研究目標は：

1. 北極における温暖化増幅メカニズムの解明、
2. 全球の気候変動及び将来予測における北極域の役割の解明、
3. 北極域における環境変動が日本周辺の気象や水産資源等に及ぼす影響の評価、
4. 北極海航路の利用可能性評価につながる海氷分布の将来予測。

その解明を目指して公募された7つの研究課題が推進されている：

- (1) 北極気候再現性検証および北極気候変動・変化のメカニズム解析に基づく全球気候モデルの高度化・精緻化
- (2) 環北極陸域システムの変動と気候への影響、
- (3) 北極温暖化のメカニズムと全球気候への影響：大気プロセスの包括的研究、
- (4) 地球温暖化における北極圏の積雪・氷河・氷床の役割、
- (5) 北極域における温室効果気体の循環とその気候応答の解明、
- (6) 北極海環境変動研究：海氷減少と海洋生態系の変化、
- (7) 北極海航路の利用可能性評価につながる海氷分布の将来予測。

このように、トップダウンで示された目標に向けてボトムアップで構想された課題を進めるという大変ユニークな構成で、分野を融合し、観測とモデルを結合するプロジェクトとなっている。国立極地研究所を中心に、海洋研究開発機構（JAMSTEC）の支援を受け、全国の大学・研究機関から300名以上の研究者が結集して進める、初のオールジャパンの北極環境研究である。