Blue-Action

Blue-Action: Arctic Impact on Weather and Climate

http://www.blue-action.eu

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Areas of contribution

User-aspects and verification

Oceanic processes

Modelling and forecasting

Polar-lower latitude linkages

Outreach

Policy-relevant / cultural aspects

Economic aspects

Societal and/or behavioural aspects

Summary

Faced with a changing climate, businesses, policymakers, and local communities need to access reliable weather
and climate information to safeguard human health, well-being, economic growth, and environmental sustainability. However, important changes in climate variability and extreme weather events are difficult to pinpoint and account for in existing modelling and forecasting tools. Moreover, many changes in the global climate are linked to the Arctic, where climate change is occurring rapidly, making weather and climate prediction a considerable challenge.

Blue-Action will evaluate the impact of Arctic warming on the Northern Hemisphere and develop new techniques to improve forecast accuracy at sub-seasonal to decadal scales. Blue-Action will specifically work to understand and simulate the linkages between the Arctic and the global climate system, and the Arctic’s role in generating weather patterns associated with hazardous conditions and climatic extremes. In doing so, Blue-Action aims to improve the safety and well-being of people in the Arctic and across the Northern Hemisphere, to reduce the risks associated with Arctic operations and resource exploitation, and to support evidence-based decision-making by policymakers worldwide.

**Description**

**Objectives**
Blue-Action builds on growing scientific evidence of the impact of the Arctic and its changes on the weather and climate of the Northern Hemisphere, and recognizes the need to better respond and adapt to climate changes for the benefit of society, securing safety and growth. The overarching objective of Blue-Action is to actively improve our ability to describe, model, and predict Arctic climate change and its impact on Northern Hemisphere climate, weather and their extremes, and to deliver valuated climate services of societal benefit.

This will be achieved through coordinated research and innovation activities focusing on oceanic and atmospheric processes, and feedbacks that control Arctic changes and their impact on hazardous weather and climate, thereby improve the ability to predict Arctic changes and related climatic extremes. Blue-Action boosts Blue Growth by bridging the gap between the climate prediction community and the business sectors, and will develop climate services exploiting advances in predictive capacity. Blue-Action builds ocean-climate monitoring efforts and collaboration across the weather and climate prediction communities, essential climate services and stakeholders. Blue-Action has 8 top level objectives:

**Objective 1**
Improving long-range forecast skill for hazardous weather and climate events by innovative representation of weather and climatic extremes, process-oriented diagnostic of weather systems in observations and climate simulations, and establishment of their links to Arctic changes and dominant climate variability modes (work packages WP1, WP4, WP5).

**Objective 2**
Enhancing the predictive capacity beyond seasons in the Arctic and the Northern Hemisphere by improved representation of the oceanic impacts on sea-ice formation and melting, by synthesizing observations, assessing model performance, better representing northward propagating oceanic heat anomalies in the Atlantic and Pacific, and by quantifying the impact of Greenland Ice Sheet melting (WP2, WP3, WP4).

**Objective 3**
Quantifying the impact of recent rapid changes in the Arctic on Northern Hemisphere climate and weather extremes by performing coordinated multi-model sensitivity experiments with atmospheric and climate models
and assessing their ability to represent the observed changes, and by disentangling the effect of Arctic sea-ice retreat from the influence of the main modes of climate variability in the Northern Hemisphere (WP1, WP3, WP4).

Objective 4
Improving the description of key processes controlling the impact of the polar amplification of global warming in prediction systems through skillful simulation of the stable Arctic atmospheric planetary boundary layer, implementing the effects of varying runoff into the Arctic, and establishing the impact of increasing horizontal and vertical model resolution, including in the stratosphere, needed to improve predictive skills (WP3, WP4).

Objective 5
Optimizing observational systems for predictions by delivering an optimized oceanic monitoring system based on an integrated understanding of low latitude drivers of Arctic change, and by assessing its suitability and benefit for initializing climate predictions, with a focus on recent climatic extremes (WP2, WP3, WP4).

Objective 6
Reducing and evaluating the uncertainty in prediction systems through innovative initialization techniques, by facilitating the uptake of new Earth Observations, and by assessing influences on Arctic cryosphere changes (WP2, WP3, WP4).

Objective 7
Fostering the capacity of key stakeholders to adapt and respond to climate change and boosting their economic growth by developing and delivering valuated climate services (WP5, WP8).

Objective 8
Transferring knowledge to a wide range of interested key stakeholders by engaging with the scientific community, business actors, policy and decision makers, indigenous communities, and the not-for-profit sector in a dialogue allowing exploitation of our results, and providing free and open access and re-use of all data (WP6, WP5, WP8).

How is this achieved?
By synthesizing observations and assessing model performance, by designing and performing coordinated multi-model sensitivity experiments, by developing innovative bias reduction and initialization strategies and through co-design of a series of case studies with organizations and industries that rely on accurate weather and climate forecasting. Scientific developments and improved model capacity will be embedded within international programs including Copernicus C3S, IPCC AR6 and PPP-YOPP. Specific model improvements target the representation of leads in the Arctic sea-ice cover, the stable Arctic planetary boundary layer and the oceanic exchanges with the Arctic.

Timeline
2017-01-01 - 2021-02-28
User relevant aspects

Polar Climate Services for targeted users; Arctic shipping, Arctic winter tourism, high latitude fisheries and scenario building for the Russian Arctic.

Provider relevant aspects

Engagement with policy makers (Policy Briefings)

Regional emphasis

Northern hemisphere: Yes
Southern hemisphere: No

Key project deliverables

Output and Outcomes

Blue-Action will
- Deliver an improved representation of Arctic warming and its impact on atmosphere and ocean circulation.
- Develop new methods to characterize climate conditions where hazardous weather system forms across the Northern Hemisphere and establish their link to Arctic climate change.
- Enable robust and reliable forecasting to deliver better predictions at sub-seasonal to decadal scales.
- Embed scientific developments and improved model capability within international programs through organizations including Copernicus C3S, WCRP, IPCC (AR6) and WMO & PPP.
- Co-design a series of case studies with organizations and industries that rely on accurate weather and climate forecasting.

Specific climate services address the following sectors:
1) Winter tourism centers in Finland;
2) Temperature-related human mortality in European regions;
3) Extreme weather risks to maritime activities;
4) Climate services for marine fisheries;
5) Russian Arctic resource extraction.

The project will also communicate new insights, results, and messages – as well as data, model improvements and story lines – to a community of stakeholders for whom understanding climate change and associated environmental trends and risks is imperative.
Data management

A data management plan is developed within the project.

*Is data provided to WMO Global Telecommunication System*

No

Real-time provision

Blue-Action observational efforts are focused on the Subpolar North Atlantic Ocean and on transport mooring arrays. Real-time provision of data is still a challenge. Blue-Action efforts includes optimization of systems.