Logistical Challenges due to Changing Environmental Conditions: Experiences from the Korean Antarctic Program 2022-23

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Information Paper submitted by Korea (ROK)

Summary

As the Antarctic continent and the Southern Ocean continues to experience the effects of climate change, the operation of research stations are directly affected by the uncertainties of the changing environment. This past 2022-23 Austral summer season, the Korean Antarctic Program has observed accelerated melting of early-summer sea ice off the shore of Jang Bogo Station. The premature thinning of sea ice has posed severe difficulty in logistics and supply mission for the station. This information paper presents the difficulties the Korean Antarctic Program has faced this season, and highlights the cooperation measures that contributed to addressing these challenges. As station operations are anticipated to be increasingly affected by climate change, we would like to encourage closer cooperation between the Antarctic Treaty Parties as a starting point for informed management actions in the future.

Background

The Antarctic Jang Bogo Station is a year-round research station located in Terra Nova Bay, and is operated by the Korean Antarctic Program ever since its establishment in 2014. The station supports up to 100 researchers during the summer season, while only a skeleton crew of 18 remains to support research and maintain the station facilities during the overwintering season.

The station receives limited quantities of supplies during the summer months, which includes materials for facility maintenance, equipment for research activities and food supply for the summer research and overwintering teams. Taking into account the volume of the cargo, including its weight and size, the Korean Antarctic Program mainy utilizes its icebreaking research vessel Araon. An additional cargo ship may be leased when there is a request for additional station supply, or when there is conflict in Araon’s cruise schedule. In the case of arrival and departure of summer field research personnel, and urgent supplies such as medical equipment, intercontinental flights are used in cooperation with the Italian program.

Sea ice is crucial in these logistic efforts, as it serves as the dock and runway for the supply missions. The sea ice is thick enough to withstand units of shipping container up until December, during which can be transported on ice via land vehicle. During the high summer season when there is no sea ice, barges may be used for unloading the cargo, although with limited capacity compared to unloading on ice. The landing of intercontinental flights from the gateway cities to Antarctica also use sea ice as runway, thus the sea ice thickness is a pivotal piece of information in the safe operation of the station.

Logistical Challenges in 2022-23

During the 2022-2023 Austral summer season, sea ice along the coastline in front of the Antarctic Jang Bogo Station were free of ice earlier than in previous seasons due to the katabatic winds in Terra Nova Bay. Original plan was to unload and transport cargo via land vehicles over the sea ice, but the plan was no longer feasible as sea ice was lost entirely. The usage of barges was reviewed as an alternative, but there were very high risk of collision with the drift ice and was determined the cargo will have to be transported next season. This has affected the field research activities this year, and adjustments were made to the overall field schedule.

In addition, the thinning of the sea ice was faster than in other years. Intercontinental aircraft requires at least 1.5 meters thick sea ice for the landing, but the thickness of sea ice was already at 1.1 to 1.4 meter in October, which the start of the Austral summer season. The Korean Antarctic program, in close cooperation with the United States and the Italian program, transported research personnels and equipment via their respective stations. Over-wintering personnels were transported using Araon. We express our gratitude to the United States and Italy for their kind cooperation.

Recommendations

This season, the Korean Antarctic Program experienced an unprecedented situation ever since Jang Bogo’s establishement in 2014. As the Antarctic Climate Change and the Environment (ACCE) report that was published by the Scientific Committee on Antarctic Research (SCAR) last year clearly states, the Antarctic environmental system is significantly affected by the climate change and will present significant risks to society in and beyond the Antarctic region. Antarctic stations and research camps may be the first to witness the impact of climate change on the Antarctic environment.

Keeping in mind the increased importance of scientific research in Antarctica, securing flexibility and expanding international cooperation in operation to respond to unexpected changes is required. Korea will continue to work closely with the station operators in the Ross Sea region, and as other countries may also face difficulties due to climate change, we would like to share our experience and encourage further information sharing among Antarctic Treaty Parties, to plan ahead and manage the impacts of climate change in Antarctica in scientific operation.