

# Optimized Northern Sea Route and Navigation Simulation

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The Arctic Ocean is covered with sea ice in the winter, but in the summer when sea ice recedes, it can pass along the coast. Arctic sea ice area has been decreasing over the long term due to global warming. It is considered that the use as a route will expand in the future.

When a ship navigates in an ice sea, it is economically advantageous to shorten the distance and required time. However, there are also dangers, for example, there is a risk of collision with sea ice and stack when pass through a narrow route or gap between islands. In order to sail safely on the Northern Sea route, it is necessary to make reasonable predictions and responses to various situations that may be encountered during the voyage.

Based on relevant research on the exploration of the Arctic Ocean route in the past, this research will take consider of series of effects about weather condition like fog, wave or other short-term effect. Under the influence of different weather conditions, planned routes may take more time and distance than previous planned routes, but will be safer or more efficient.

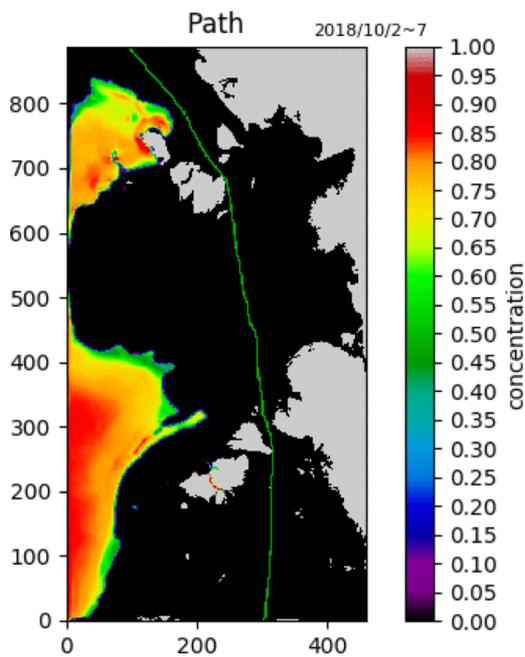


Figure 1. Route only consider the effects of sea ice.

Distances	1454.2006nm
Mean time	125.8044h

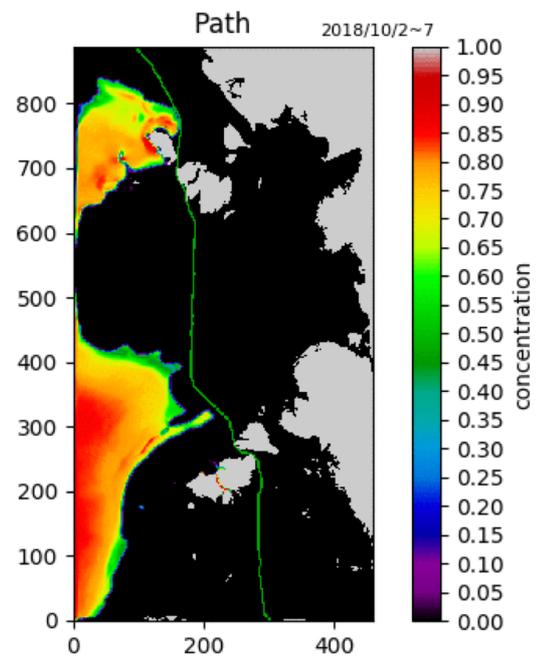


Figure 2. Route consider the effects of sea ice and wave.

Distances	1529.3329nm
Mean time	132.5745h