

Strategic Goal 1 “Advanced observation of Arctic Environmental Change” in ArCS II Project

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Strategic Goal 1 in the Arctic Challenge for Sustainability II (ArCS II) consists of four research programs of the fields of Atmosphere, Ocean, Cryosphere, and Land to understand the Arctic environmental change by mainly observational approach. Those research subjects are 1) Atmospheric Environment and Climate Forcings in the Arctic, 2) Research and Public Dataset Production on the Arctic Marine Environment, 3) A Changing Cryosphere in a Rapidly Warming Arctic: Properties and Processes, and 4) Biogeochemical Cycling in the Arctic Terrestrial Ecosystem, Permafrost, and Periglacial Regions. The atmospheric research program aims to understand the behaviors and sources of black carbon aerosols in the Arctic atmosphere and snow/ice, as well as changes in various other Arctic aerosols (anthropogenic and natural aerosols) and their impacts on radiation and clouds. This program also aims to understand and quantify the behaviors of greenhouse gases (GHGs) by GHG isotope measurements and their numerical modeling. The ocean research program's goal is to elucidate the transport processes of water masses originated from the North Pacific and North Atlantic Oceans, respectively over the regions from seasonal to multi-year ice by combining comprehensive observation methods and the pan-Arctic sea ice–ocean modeling. This program also aims to clarify the marine environment in the marginal and multi-year ice zone which has been difficult for access. In the cryosphere research program, field observation, satellite observation, and numerical modeling will be conducted in the Greenland Ice Sheet as the primary target area to quantify the change in surface mass balance and to elucidate the past warmings and their environmental impacts. This program will also assess the effects of aerosols emitted from the seasonal sea ice area around the Greenland coast on the atmospheric chemical environment and cloud formation processes. The land research program aims to identify the response of biodiversity to global warming by field observations in the high-latitude tundra. The program also aims to identify the forest-permafrost interaction and elucidate the dynamics of the pan-Arctic terrestrial ecosystems and GHGs based on the long-term observations of the boreal forests. Furthermore, field observations and regional climate modeling will be conducted to understand the environmental changes in the permafrost and periglacial regions.