US Army Corps of Engineers®
Engineer Research and Development Center

Cold Regions Geophysical Research Facility

Purpose

The Geophysical Research Facility is an internationally unique facility used to conduct basic research on the fundamental properties and processes of sea ice. Located at the Cold Regions Research and Engineering Laboratory, the outdoor, saline ice pond bridges the gap between laboratory and field-scale measurements. It has been the site of studies focused on remote-sensing signatures, wave/ice interaction, and mechanical properties, and it regularly supports projects from other government agencies, including the National Science Foundation, the Office of Naval Research, and the National Aeronautics and Space Administration.

Specifications

The GRF contains a concrete basin, 18.25 m long × 6.7 m wide × 2 m deep (60 × 22 × 7 ft), with a removable refrigerated roof that maintains an ice cover and protects it from snow. The self-contained refrigeration system allows early season growing of ice sheets and maintains the character and thickness of established ice sheets. The basin is filled with sea water on which an ice sheet can be grown to a thickness of about 0.5 m (1.5 ft). The facility is equipped with an instrument gantry mounted on rails that extend the full length of the basin. The activation of a wave-maker allows the production of ice under agitated conditions. A separate basin at one end, equipped with hydraulic loading pistons, allows mechanical testing of large ice blocks.

Benefits

The Geophysical Research Facility provides geophysicists with controlled ice growth conditions and a technical and economical bridge between laboratory and field-scale studies. It is supported by a staff of internationally recognized experts in sea-ice research, and it is particularly well-suited for studies of young sea ice, which can be difficult to access safely in the field.

Success Stories

Studies conducted for the Office of Naval Research have enhanced the understanding of the relationship between the physical and electromagnetic properties of sea ice, leading to improved application of remote sensing assets.

Dartmouth College conducted intermediate-scale (≈ 1 m) biaxial compression testing of sea ice samples to investigate the impact of scale on the mechanical behavior of sea ice, and found that results obtained under laboratory conditions can be applied to field situations.

A wave-making device, installed to support collaborative research with Clarkson University, has enabled research on the formation and rafting of pancake ice, which is characteristic of ice in the seas of Antarctica and the marginal ice zones of the Arctic.

Point of Contact

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