

Rocky Mountain Geographic Science Center

# Sea Ice Melt Pond Study

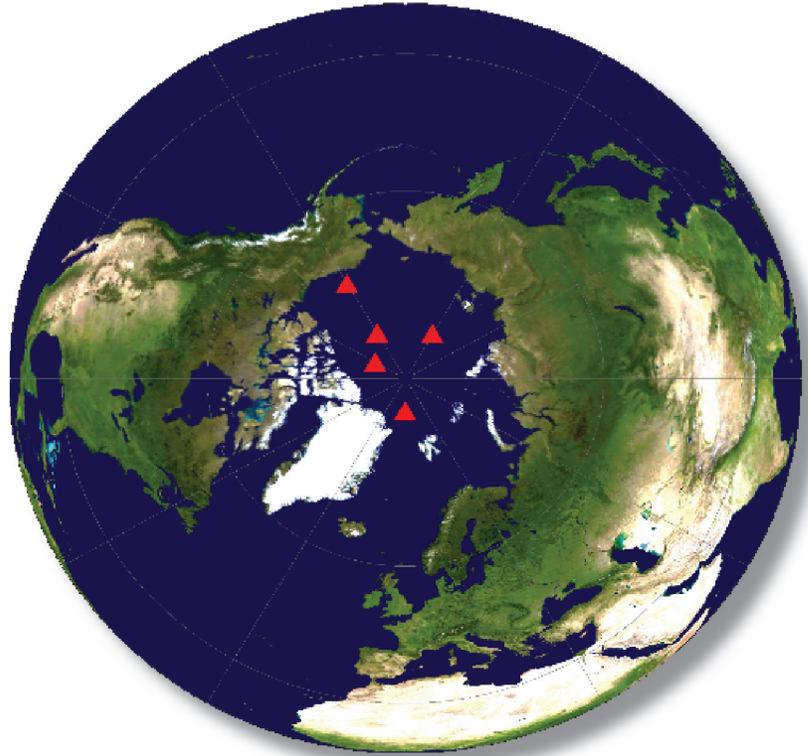
## Arctic Ocean Pond Formation

The National Snow and Ice Data Center (NSIDC) at University of Colorado (CU) in Boulder, CO, and Rocky Mountain Geographic Science Center (RMGSC) are collaborating on the use of remotely sensed information to determine the timing and extent of melt pond formation in the Arctic Ocean to aid in parameterizing ice albedo for inclusion in climate models. The objective of the work is to develop and publish a data set of melt pond coverage statistics that addresses the need for a multiyear time series from widely spaced regions. A methodology was tested, developed and implemented to distinguish melt ponds from open water and ice. Remotely sensed data were processed using supervised classification methods to develop surface types while custom methods and tools were developed to generate summary statistics showing the percentage of surface characteristics.

## Sea Ice Surface Characteristics

The objective of the project was to analyze sea ice surface characteristics using multiple remotely sensed data sources. This included research of various applications to characterize surface conditions and their impact on the net radiation balance, parameterize ice albedo and melt pond development for inclusion in climate models, and study pond development in response to temperature, cloud cover, and insolation.

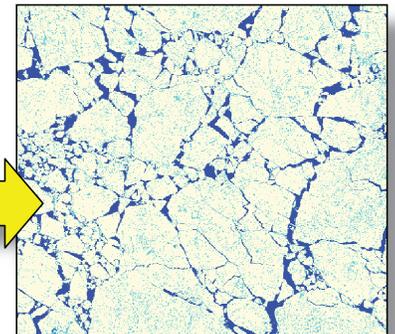
RMGSC and CU personnel developed a methodology for tracking and processing the extensive set of data. Semi-automated procedures were developed for tracking and extracting the source data used for analysis. Several hundred images were



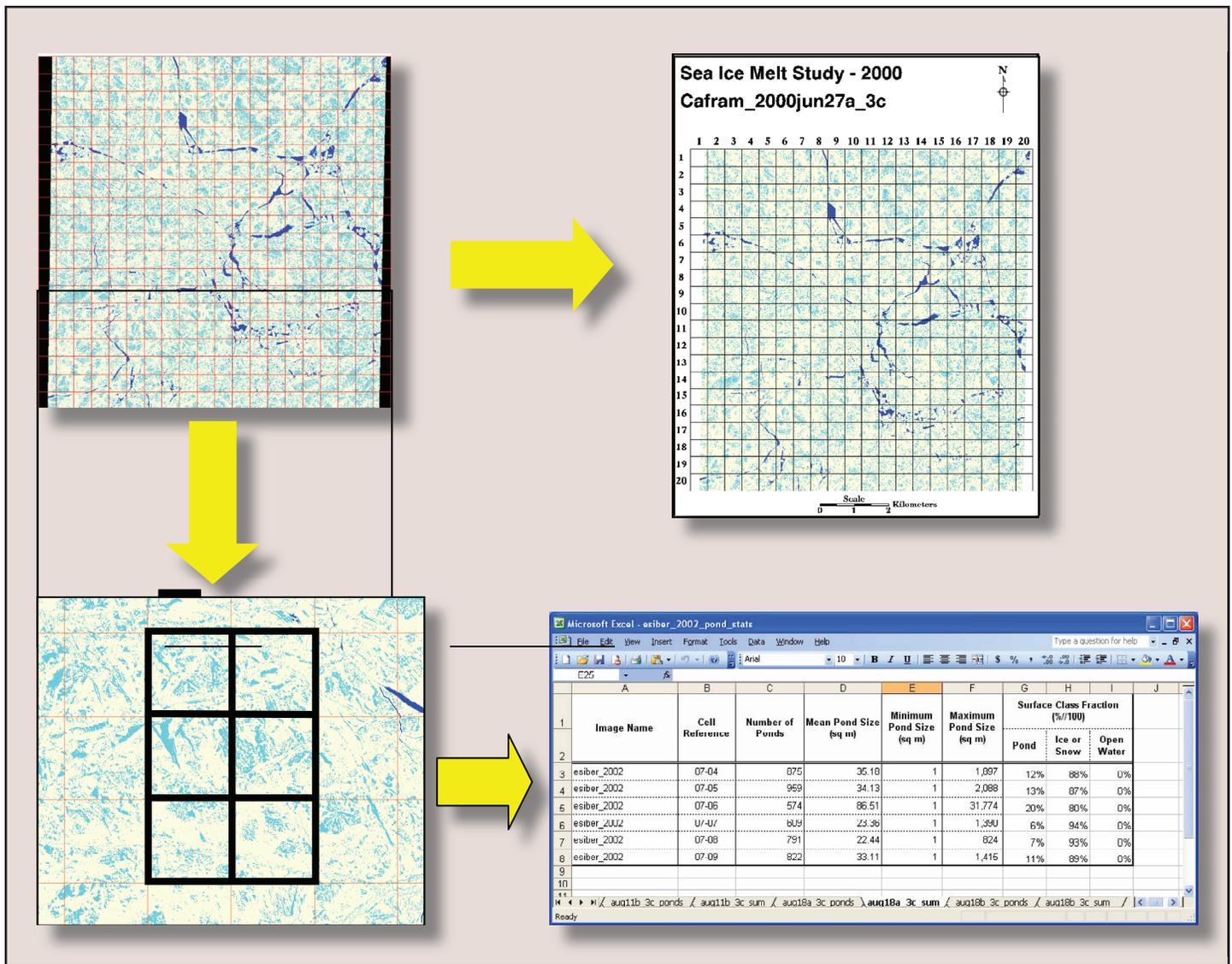
**Five melt pond study locations in the Arctic Ocean have been analyzed for sea ice surface characteristics over multiple years.**

quickly previewed and evaluated; the selected images were then pre-processed for insertion into the analysis phase. Several analysis steps were run on the selected data sets to classify open water, ice, and melt ponds. Representative

sample areas were then selected to derive melt pond coverage statistics. To date, melt pond coverage statistics have been developed for several years starting in 1999 and efforts are continuing on an annual basis.



**The aerial photograph to the left depicts an example of ice, open water and melt ponds in the Arctic Ocean. Remotely sensed datasets are processed to distinguish the melt ponds from open water and ice as seen in the illustration to the right.**



The (above) images represent the general process used to derive melt pond statistics. Datasets are characterized as ice, open water or melt ponds using supervised classification techniques. Representative sample areas are selected to generate melt pond statistics including the number of melt ponds, mean pond size, minimum and maximum pond size, and surface class fraction.

### FY06 Highlights

The project was reactivated in FY2005 to include the collection of datasets on an annual basis for long term monitoring. As part of the reactivation, new data was acquired over project areas. As a result, multiple datasets for 2005 and 2006 were queried, organized, and cataloged during the fiscal year. In addition, previously collected datasets from 2002 were processed to develop surface cover types and melt pond statistics for five project areas. Derived products depicting surface cover (ice, open water, ponds) and melt pond statistics were generated.

### FY07 Activities

The RMGSC will continue to collaborate with other civil science agencies in research and development of multiple source remotely sensed data in support

of global change monitoring. Work will focus on continued research with the National Snow and Ice Data Center for polar sea ice melt pond characterization in alignment with activities supporting the 2007-08 International Polar Year (IPY). As part of these studies, RMGSC will process derived products depicting surface cover (ice, open water, ponds), and melt pond statistics from data collected in 2005 and 2006. This will involve research of image classification techniques using feature extraction algorithms.

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