# Processing and Analysis of SCICEX-2000 CTD Data

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http://boreas.coas.oregonstate.edu/scicex/scicex.html

## LONG-TERM GOALS

The long-term goal of this project is to understand variability in the heat and salt content of the upper layers of the Arctic Ocean.

## SCIENTIFIC OBJECTIVES

The specific objectives of this project are to process and analyze XCTD data from the fall 2000 trans-Arctic cruise of the submarine USS *L. Mendel Rivers*, and to compare these data to earlier data from the Arctic Ocean to identify changes occurring in the upper layers.

## APPROACH

The approach is to compare the upper ocean distributions of heat and salt from the fall 2000 cruise to both the distributions observed on cruises throughout the 1990's, including icebreaker cruises and the SCICEX submarine cruises of the period 1995-1999, and the climatological distributions, as represented by the EWG summer and winter atlases (EWG, 1997). The emphasis in this analysis is on the nearly identical cross-basin transect conducted in years 1995, 1998, 1999, and 2000.

## WORK COMPLETED

XCTD data from the fall 2000 cruise have been processed and posted to the web site http://boreas.coas.oregonstate.edu/scicex/scicex.html. This website is also a repository for XCTD data and figures from the 1995-1999 SCICEX cruises. Presentations have been made at several scientific meetings (TOS, April 2001; ARCUS, May 2001; IAPSO, October 2001), and a manuscript has been submitted for publication in Geophysical Research Letters.

## RESULTS

Observations from the Arctic Ocean in the early-to-mid 1990's revealed that water in the Atlantic layer was significantly warmer and penetrated much farther into the Canadian Basin than in previous observations. During the same period the halocline, the region of large vertical salinity gradient that isolates the warm Atlantic water from the surface, retreated from the Amundsen Basin (Steele and

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**The long-term goal of this project is to understand variability in the heat and salt content of the upper layers of the Arctic Ocean.**

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Boyd, 1998). Comparison of the fall 2000 XCTD data to 1995-1999 XCTD data and 1991 CTD data has revealed that the Amundsen Basin halocline has returned to the condition observed in 1991 after weakening in the mid-to-late 1990's. The horizontal distribution of salinity at the top of the halocline, which is indicative of the salinity gradient across the halocline because the salinity below the halocline is nearly constant, reveals a weakening halocline (i.e., increasing salinity) in the Amundsen Basin in 1995-1998, and a strengthening halocline (i.e., decreasing salinity) in 1999-2000 (Figure 1). Sea level pressure and ice velocity observations suggest both a return in 1999 to the anticyclonic circulation regime of the period leading up to 1987, and that the increased freshwater in the upper layers of the Amundsen Basin is due to increased advection of ice from the Laptev Sea.

## IMPACT/APPLICATIONS

These results demonstrate the value of continuing annual measurements of temperature and salinity along a repeated cross-basin transect. These observations will be of interest to others monitoring change in the Arctic and should be of value to numerical modelers of the circulation of the Arctic Ocean and adjacent seas.

## TRANSITIONS

None

## RELATED PROJECTS

None

## REFERENCES

Environmental Working Group (EWG), Joint U.S.-Russian Atlas of the Arctic Ocean [CD-ROM], Natl, Snow and Ice Data Cent., Boulder, Co., 1997.

Steele, M. and T. Boyd, Retreat of the cold halocline layer in the Arctic Ocean, *J. Geophys. Res.*, **103**, 10,419-10,435, 1998.

## PUBLICATIONS

Boyd, T. J., M. Steele, R. D. Muench, and J. T. Gunn, Partial recovery of the Arctic Ocean halocline, *Geophys. Res. Lett., submitted*, 2001.

Wijesekera, H. and T. J. Boyd, Upper Ocean Heat and Freshwater Budgets, in Encyclopedia of Ocean Sciences, J. H. Steele, S. A. Thorpe, and K. K. Turekian, eds., Academic Press, 2001.

## PATENTS

None

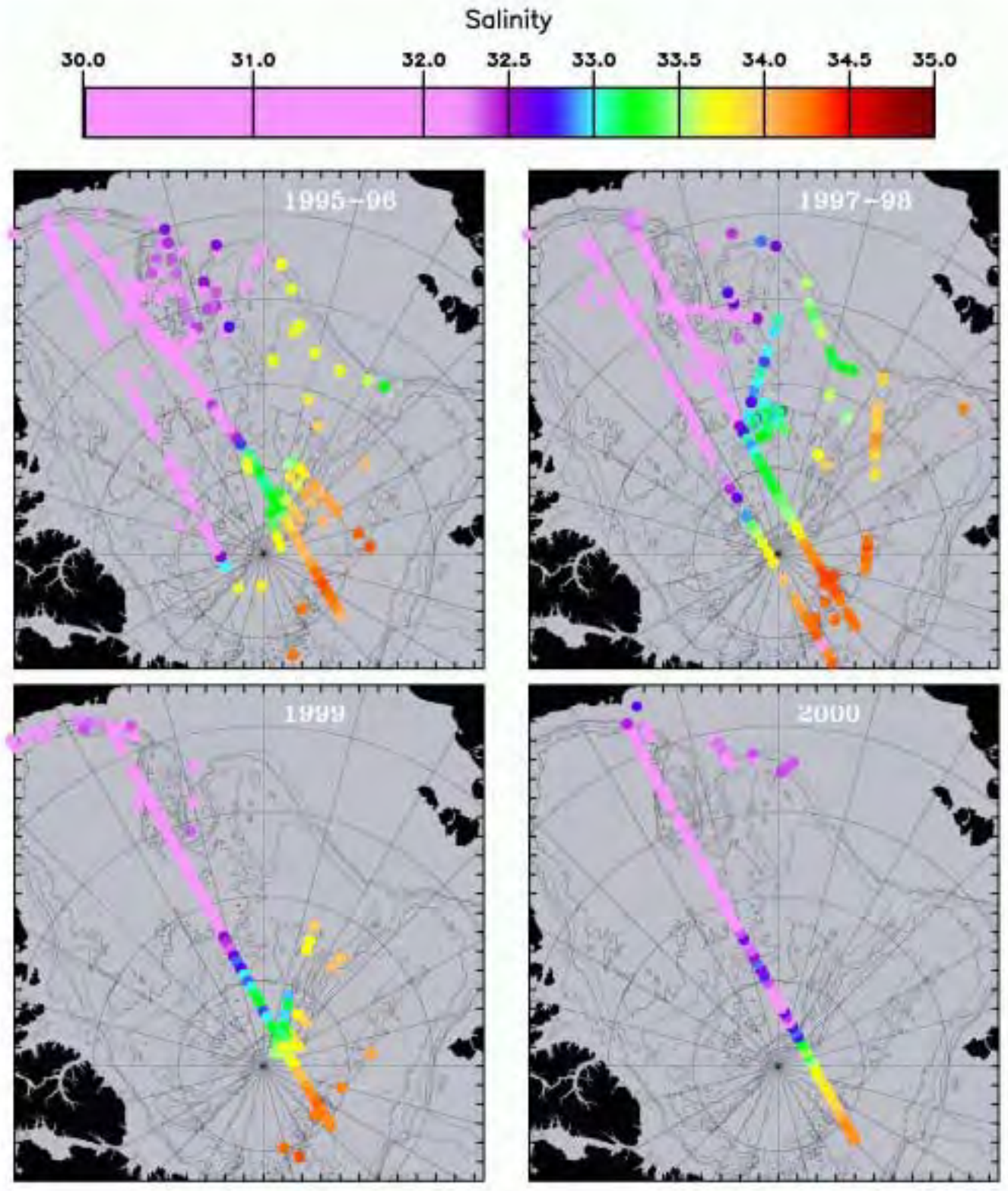


***Figure 1. Maps of 50-80m average salinity in years 1995-96, 1997-98, 1999, and 2000. [salinity in the Amundsen Basin increases from 1995 to 1998 and then decreases in 1999 and 2000.]***