Processing and Analysis of SCICEX-2000 CTD Data

Timothy J. Boyd
College of Oceanic and Atmospheric Sciences
Ocean. Admin. Bldg. 104
Oregon State University
Corvallis, OR 97331-5503
Phone: (541) 737-4035 fax: (541) 737-2064
email: tboyd@coas.oregonstate.edu

Award #: N00014-01-1-0161
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 summer 2001 cruise of the USS *Scranton*, 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 2000-2001 cruises to 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, and partial transect of 2001.

WORK COMPLETED

XCTD data from the summer 2001 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 1995-2000 SCICEX cruises. A journal article was published in Geophysical Research Letters (Boyd et al, 2002).

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 Boyd, 1998). Comparison of the 2000-2001 XCTD data to the data from the 1990's reveals that the stratification of the halocline in the Amundsen Basin was weakest in 1998, and has since returned to the condition observed in 1991 (figure 1). Sea level pressure and ice velocity observations suggest the return in 1999 to the anticyclonic circulation regime of the period prior to 1987, and that the increased freshwater in the upper layers of the Amundsen Basin is due to increased advection 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

Boyd, T. J., M. Steele, R. D. Muench, and J. T. Gunn, Partial recovery of the Arctic Ocean halocline, *Geophys. Res. Lett*., 29, 10.1029/2001GL014047, 2002.

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*., 29, 10.1029/2001GL014047, 2002.

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

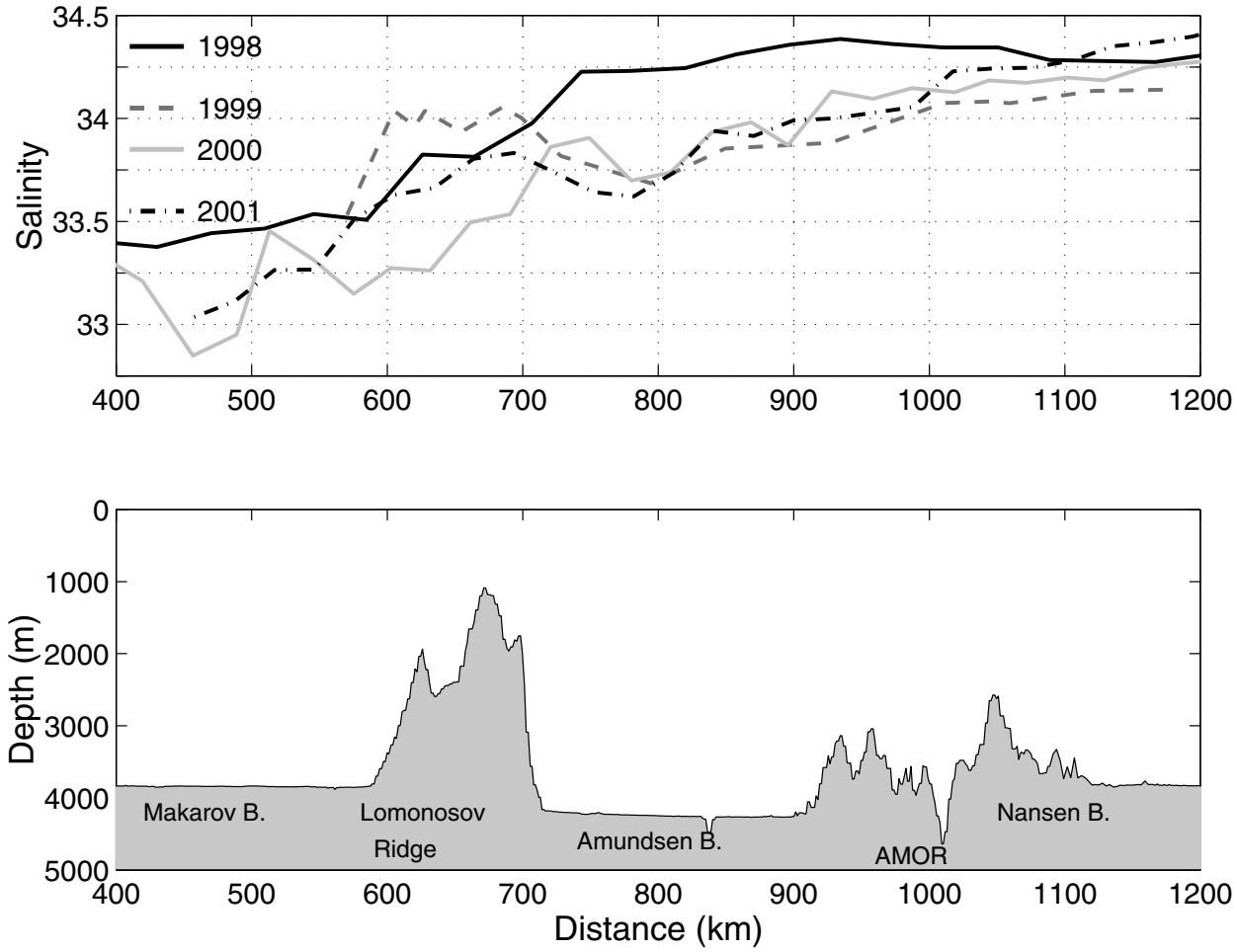

Figure 1. Salinity at 80m depth between the Makarov and Nansen basins in years 1991, 1998, 2000, and 2001 [Salinity in the Amundsen Basin increased from 1991 to 1998 and then decreased in 2000- 2001.]