

ICE PRODUCTION AND CONVECTIVE-MIXING IN THE ANTARCTIC  
COASTAL POLYNIA (ABSTRACT)

Shuki USHIO<sup>1</sup>, Takatoshi TAKIZAWA<sup>2</sup>, Kay I. OHSHIMA<sup>3</sup> and Toshiyuki KAWAMURA<sup>3</sup>

<sup>1</sup>*National Institute of Polar Research, 9-10, Kaga 1-chome, Itabashi-ku, Tokyo 173*

<sup>2</sup>*Japan Marine Science and Technology Center, 2-15, Natsushima-cho, Yokosuka 237*

<sup>3</sup>*Institute of Low Temperature Science, Hokkaido University,  
Kita-19, Nishi-8, Kita-ku, Sapporo 060*

Aerial observations off East Queen Maud Land, Antarctica, have verified that an open polynya exists and that frazil-ice production occurs there. From the airborne-XBT data, the mixed layer temperature of the polynya attains its freezing point. This polynya is therefore regarded as a latent-heat polynya. Thickness of the convective-mixed layer measures 350 m or more, which is much deeper than in the offshore pack ice regions. Also, the mixed layer is more homogeneous in salinity profile as compared with those under fast ice regions near Syowa Station. Such a water structure of the polynya suggests active haline convection accompanied by high ice production. Furthermore, the haline convection causes entrainment of the oxygen-poor deep water underlying the winter mixed layer. Thus, the deep-water entrainment decreases the oxygen content of the mixed layer. The average oxygen saturation of the mixed layer in the polynya is 86%, which is almost the same as that of the pack ice region in the Weddell Sea. The oxygen saturation of the deep water is also equal in both regions. However, the mixed-layer thickness of the coastal polynya is much larger than that of the Weddell Sea. This shows that the entrainment rate in the open polynya region is intense. It is estimated that the entrainment rate is three times greater than that in the Weddell Sea.

*(Received November 20, 1995; Accepted April 18, 1996)*