



## Direct Observation of a Breaking Unsteady Lee Wave Generated by Diurnal Tides and an Estimate of its Global Occurrence

Tomohiro Nakamura (1), Yutaka Isoda (2), Humio Mitsudera (1), Shogo Takagi (3), Maki Nagasawa (4), and Shoko Abe (1)

(1) Institute of Low Temperature Science, Hokkaido University, Sapporo, Japan (nakamura@lowtem.hokudai.ac.jp), (2) Faculty of Fisheries, Hokkaido University, Hakodate, Japan, (3) School of Fisheries, Hokkaido University, Hakodate, Japan, (4) Department of Earth and Planetary Science, Graduate School of Science, The University of Tokyo, Tokyo, Japan

Diapycnal mixing caused through breaking of large-amplitude internal lee waves generated by subinertial diurnal tides, which are modulated with the 18.6-year nodal cycle, is hypothesized to be fundamental to both the intermediate-layer ventilation and the bi-decadal oscillation around the North Pacific Ocean. The first observational evidence of such wave breaking is presented here. The breaking wave observed had  $\sim 200$  m height and  $\sim 1$  km width. Its associated diapycnal mixing was estimated to be  $\sim 1.5 \times 10^4$  cm<sup>2</sup>/s, while typical values found in the open oceans are  $O(0.1$  cm<sup>2</sup>/s). Our estimate suggests that a similar mixing process occurs globally, particularly around the Pacific and Antarctic Oceans.