

EGU21-6778

<https://doi.org/10.5194/egusphere-egu21-6778>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



## Interfacial generation of internal waves and turbulent heat flux due to enhanced inertial motion for deformed sea-ice floe: Preliminary results from MOSAiC expedition

**Yusuke Kawaguchi**<sup>1</sup>, Zoe Koenig<sup>2</sup>, Mario Hoppman<sup>3</sup>, Daiki Nomura<sup>4</sup>, Mats Granskog<sup>5</sup>, Jun Inoue<sup>6</sup>, Christian Katlein<sup>3</sup>, Marcel Nicolaus<sup>3</sup>, and the MOSAiC OCEAN Team\*

<sup>1</sup>AORI, U. Tokyo, Chiba, Japan (ykawaguchi@aori.u-tokyo.ac.jp)

<sup>2</sup>University of Bergen

<sup>3</sup>Alfred Wegener Institution

<sup>4</sup>Hokkaido University

<sup>5</sup>National Institute of Polar Research

<sup>6</sup>Norwegian Polar Institute

\*A full list of authors appears at the end of the abstract

Sea-ice drift becomes most energetic at last moment in summer when refreezing is about to onset. Perennial ice floes, surviving over all seasons, tend to experience a number of deformation events over yearlong drift, with uneven distribution in thickness. Deformed ice floes protrude tall keels into water of ice-ocean boundary, and then stir it up. Consequently, combination of fast ice drift and deformation-experienced perennial ice could be a primary source of momentum/thermal energy for upper waters through propagation of internal waves. In this study, during MOSAiC expedition, we attempted to perform direct observation of wave generation in ice-ocean boundary layer underneath a drifting ice floe in the central Arctic Ocean. Time series of turbulent signals, represented by Reynolds stress  $\langle u'w' \rangle$  and eddy heat flux  $\langle w'T' \rangle$ , were obtained by an eddy covariance system (ECS), coupling a high-frequency (34 Hz) single-point current meter and a temperature sensor. Vertical/temporal properties of near-inertial waves were obtained by a downward-looking ADCP, collocated with ECS on the same ice floe. At same time, a triangle of high-precision GPS systems tracked ice movement to represent mean drift speed, rotation and deformation about the same floe seamlessly in time. Preliminary analyses of those combined data suggested that pronounced signals of inertial motion occurred in early September of 2020 as shear ice keels dragged underlying waters, stratified by accumulation of melt water. It then allowed occurrence of near-inertial internal waves that tend to be trapped within the interfacial boundary layer, located within top 20 m. At the conference, we will present latest and quantitative knowledges from the MOSAiC expedition.

**MOSAiC OCEAN Team:** Jacob Allersholt, AWI; Marylou Athanase, LOCEAN-IPSL; Chris Basque, WHOI; Dorothea Bauch, GEOMAR; Till Baumann, UiB; Dake Chen, SIO; Silvia Cole, WHOI; Sam Cornish, U Oxford; Lisa Craw, U Tasmania; Andrew Davies, WHOI; Dmitry Divine, NPI/HAVOC;

Francesca Doglioni , WHOI ; Falk Ebert , Herder-Gymnasium Berlin ; Carina Engicht , AWI ; Ying-Chih Fang , AWI ; Ilker Fer , UIB ; Mats Granskog , NPI/HAVOC ; Rainer Graupner , AWI ; Hailun He , SIO China ; Yan He , FIO ; Céline Heuzé , U Gotheburg ; Mario Hoppmann , AWI ; Markus Janout , AWI ; David Kadko , FIU ; Torsten Kanzow , AWI ; Salar Karam , U Gothenburg ; Yusuke Kawaguchi , Uni. Tokyo ; Zoe Koenig , UIB ; Bin Kong , FIO ; Rick Krishfield , WHOI ; David Kuhlmeier , AWI ; Ivan Kuznetsov , AWI ; Musheng Lan , PRIC ; Ruibo Lei , PRIC ; Tao Li , OUC ; Long Lin , SIO ; Hailong Liu , SJTU ; Na Liu , FIO ; Xiaobing Ma , FIO ; Rosalie MacKay , NTNU ; Maria Mallet , AWI ; Robbie Mallet , UCL ; Wieslaw Maslowski , NPS ; Christian Mertens , Uni Bremen ; Volker Mohrholz , IOW ; Matthias Monsees , AWI ; Morven Muilwijk , UiB ; Jeff O'Brien , WHOI ; Algot Peterson , UIB ; Pierre Priou , U Powered by TCPDF (www.tcpdf.org) Newfoundland ; Benjamin Rabe , AWI ; Julia Regnery , AWI ; Jian Ren , SIO ; Natalia Ribeiro Santos , U Tasmania ; Janin Schaffer , AWI ; Ingo Schuffenhauer , IOW ; Kirstin Schulz , AWI ; William Shaw , NPS ; Timothy Stanton , NPS ; Mark Stephens , FIU ; Jie Su , OUC ; Natalia Sukhikh , Uni Bremen ; Arild Sundfjord , NPI/HAVOC ; Sandra Tippenhauer , AWI ; John Toole , WHOI ; Pedro Torre , NTNU ; Jutta Vernaleken , AWI ; Myriel Vredenburg , AWI ; Hangzhou Wang , ZJU ; Lei Wang , BMU ; Yuntao Wang , SIO ; Bai Youcheng , SIO ; Jinping Zhao , OUC ; Meng Zhou , SJTU ; Jialiang Zhu , OUC