Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Emerging Arctic Ocean turbulence revealed by rotating sea ice floes. ROSALINDA LOPEZ[1], University of California Riverside, GEORGY E. MANUCHARYAN[2], University of Washington, MONICA M. WILHELMUS[3], University of California Riverside — Mesoscale eddies are hypothesized to be a crucial component of the dynamics of the Beaufort Gyre (BG). Yet, comprehensive observations of these structures are currently missing. In this talk, we reveal the strong relationship between the rotation rates of non-interacting sea ice and the critical parameters of the underlying ocean eddy field. To this end, we used our recently developed sea ice Lagrangian tracking algorithm to automatically process daily satellite remote sensing optical imagery. We quantified the rotation rate and interannual variability of over 20,000 non-interacting ice plates, with length scales ranging from 4 to 80 km, between the summers of 2003 and 2019. We demonstrate that the observed statistical dependence of the ice plate rotation rates on their sizes can be accurately reproduced using an idealized quasigeostrophic eddy field to drive the evolution of the ice plates. Leveraging the robust relationship between sea ice rotation and the turbulent eddy field, we provide the first observational evidence of the monotonic relation between the strength of the large-scale mean flow of the BG and the corresponding eddy field. Our findings, therefore, directly support the hypothesis of the pertinence of eddy-mean flow interactions in the BG.

[1]Department of Mechanical Engineering
[2]School of Oceanography
[3]Department of Mechanical Engineering

Rosalinda Lopez
University of California, Riverside

Date submitted: 04 Aug 2020 Electronic form version 1.4