2020-02-18

The Atmospheric Surface Layer Response to Nonlinear Internal Ocean Waves

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AGU

Ortiz-Suslow, David G., et al. "The Atmospheric Surface Layer Response to Nonlinear Internal Ocean Waves." Ocean Sciences Meeting 2020. AGU, 2020.
http://hdl.handle.net/10945/66926

OCEAN SCIENCES MEETING | 16–21 FEBRUARY 2020 SAN DIEGO, CA, USA

AI24A-2308 - The Atmospheric Surface Layer Response to Nonlinear Internal Ocean Waves

Tuesday, 18 February 2020

16:00 - 18:00

SDCC - Poster Hall C-D

Abstract

Nonlinear internal ocean waves (NIWs) are regular features of the coastal ocean, where the hydrodynamic flow over changing bathymetry perturbs the isopycnal surfaces generating these high frequency waves. At the air-sea interface, these transient features may be characterized by quasilinear bands of smooth or rough ocean surface that propagate in the direction of the underlying NIWs. Theoretically, this roughness heterogeneity is driven by the phase-locked divergence and convergence of the NIW orbital motions. This NIW action modulates surface wavelengths within the capillary and gravity-capillary band, which also hold the majority of the tangential wind stress. Understanding the spatial-temporal distribution of these small-scale surface waves is critical to constraining air-sea coupling, which is significantly complicated in the case of a heterogeneous surface. The impact NIW-driven surface roughness has on the variability and structure of the atmospheric surface layer is unknown. During a Coupled Air Sea Processes and EM ducting Research (CASPER) field campaign, the Research Platform *FLIP* was deployed for five weeks in a coastal area with a suite of near-surface oceanographic and meteorological measurements, as well as near-field remote sensing of the surface using both radar, infrared, and optical visualization. This confluence of measurement capability from an ideal platform, enabled us to simultaneously identify and track NIWs while characterizing the variance and structure of the kinematic and thermodynamic state on either side of the interface. NIWs were regularly observed from *FLIP*, with their characteristic surface banding observed nearly every day of the campaign. Our analysis into one case revealed that NIWs exert a distinct and significant impact on the mean wind gradient, as well as the air-sea momentum flux (i.e. wind stress) on both the scale of individual wave fronts and an entire NIW packet. In particular, the MASL flow adjusts instantaneously to the smooth-rough transitions of individual bands, thereby enhancing the wind stress over the surface. Our presentation will focus on summarizing these findings, as well as highlighting additional NIW events observed during the CASPER campaign from *FLIP* to discern any underlying or general pattern in the nature of NIW-atmosphere interactions.

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Global Estimates of Near-Inertial Internal Wave Generation

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Airborne Remote Sensing of Surface and Internal Wave Processes on the Inner Shelf

***Luc Lenain**[1], Nick Statom[1] and Wallace Kendall Melville[2], (1)Scripps Institution of Oceanography, La Jolla, CA, United States, (2)Univ California San Diego, La Jolla, CA, United States*

Observations of mean and wave orbital flows in the upper centimeters of the ocean surface layer

***Nathan Laxague** and Christopher J Zappa, Columbia University, Lamont-Doherty Earth Observatory, Palisades, NY, United States*

Ocean surface boundary layer response to abruptly changing wind direction

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