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Evidence of a Shear Driven Gravity Wave within the formation of a Stable Boundary Layer

Douglas Keller · Sneha Ramakrishnan · Dishi Thomas · Elsa Dieudonné · Antonio Donateo · Natalie Brett · Brice Barret · Roman Pohorsky · Slimane Bekki · Jean-Christophe Raut · Julia Schmale · Kathy S. Law · Steve R. Arnold · William R. Simpson · Stefano Decesari · Gilberto Javier Fochesatto

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D. Keller
Laboratoire de Météorologie Dynamique, École Polytechnique, Institute Polytechnique de Paris, Palaiseau, FR
E-mail: dg.kllr.jr@gmail.com

S. Ramakrishnan
Department of Atmospheric Sciences, University of Alaska Fairbanks, Fairbanks, Alaska, USA

D. Thomas
Department of Atmospheric Sciences, University of Alaska Fairbanks, Fairbanks, Alaska, USA

E. Dieudonné
Laboratoire de Physico-Chimie de l'Atmosphère, Université du Littoral Côte d'Opale, Dunkerque, FR

A. Donateo
National Research Council of Italy, Institute of Atmospheric Sciences and Climate (CNR-ISAC), Lecce, IT

N. Brett
Sorbonne Université, UVSQ, CNRS, LATMOS, Paris, FR

B. Barret
Laboratoire d'Aérologie (LAERO), Université Toulouse III – Paul Sabatier, CNRS, Toulouse, FR

R. Pohorsky
Extreme Environments Research Laboratory. Ecole Polytechnique Fédérale de Lausanne, Sion, CH

S. Bekki
Sorbonne Université, UVSQ, CNRS, LATMOS, Paris, FR

J.-C. Raut
Sorbonne Université, UVSQ, CNRS, LATMOS, Paris, FR

J. Schmale
Extreme Environments Research Laboratory. Ecole Polytechnique Fédérale de Lausanne,

Abstract

In February 2022, during the ALPACA campaign at the University of Alaska Fairbanks, instruments captured a gravity wave embedded in a stable surface-based temperature inversion layer (SBI) during a shallow cold flow (SCF) event. Doppler lidar, microwave radiometer, and sonic anemometer data show that the SCF extended from the surface to 100 m, generating shear instability (gradient Richardson number Rg¡ 0.5) within the SBI. The main wave signal occurred near 150 m, with dominant frequencies of 0.33–0.44 mHz, [JF1] far below the local Brunt–Väisälä frequency, indicating a wave-driven process. Continuous wavelet analysis revealed maximum energy at the shear interface. Moreover, a secondary wave approaching from above (300 m) was documented, connected to unstable layers present between 750–1000 m. These observations provide new insight into wave–shear interactions in stable Arctic boundary layers.

1 Introduction

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2 Section Title

Acknowledgements These should follow the concluding section of the paper and precede the References and any appendices, if they are present. The acknowledgements section does not require a section number.

References

Sion, CH

K. Law
Sorbonne Université, UVSQ, CNRS, LATMOS, Paris, FR

S. Arnold
School of Earth and Environment, University of Leeds, Leeds, LS2 9JT, UK

W. Simpson
Department of Chemistry. University of Alaska Fairbanks, Fairbanks, Alaska, USA

S. Decesari
National Research Council of Italy, Institute of Atmospheric Sciences and Climate (CNR-ISAC), Lecce, IT

G. Fochesatto
Department of Atmospheric Sciences, University of Alaska Fairbanks, Fairbanks, Alaska, USA