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# Consequences of the Large-Scale Subsidence Rate on the Stably Stratified Atmospheric Boundary Layer Over the Arctic Ocean, as seen in Large-Eddy Simulations

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Abstract for the American Meteorological Society's  
**17th Symposium on Boundary Layers and Turbulence**  
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San Diego, CA

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**Abstract**

The analysis of surface heat fluxes and sounding profiles from SHEBA indicated possible significant effects of subsidence on the structure of stably-stratified ABLs (Mirocha et al. 2005). In this study the influence of the large-scale subsidence rate on the stably stratified atmospheric boundary layer (ABL) over the Arctic Ocean during clear-sky, winter conditions is investigated using a large-eddy simulation model. Simulations are conducted while varying the subsidence rate between 0, 0.001 and 0.002  $\text{ms}^{-1}$ , and the resulting quasi-equilibrium ABL structure and evolution are examined. Simulations conducted without subsidence yield ABLs that are deeper, more strongly mixed, and cool much more rapidly than were observed. The addition of a small subsidence rate significantly improves agreement between the simulations and observations regarding the ABL height, potential temperature profiles and bulk heating rates. Subsidence likewise alters the shapes of the surface-layer flux, stress and shear profiles, resulting in increased vertical transport of heat while decreasing vertical momentum transport. A brief discussion of the relevance of these results to parameterization of the stable ABL under subsiding conditions in large-scale numerical weather and climate prediction models is presented.

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