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The existence of longitudinal vortices in the flow of air above an air/water interface[1] J. KOU, J.R. SAYLOR, Clemson University — Many researchers have observed the formation of longitudinal vortices in boundary layers developing over heated solid surfaces. In the present work, such vortices were observed in an air boundary layer developing over a heated water surface. The existence of these vortices was documented via infrared imaging of the water surface, which showed a consistent pattern of hot and cold streaks, coinciding with the vortex position. These vortices were also visualized through smoke injected into the air-side flow. The onset position X_c and lateral vortex spacing λ were investigated for a range of wind speeds (0.1 - 1 m/s) and air/water temperature differences (26 - 42 °C). Plots of X_c/λ versus the Reynolds number exhibit power-law behavior similar to that of prior work on boundary layers over heated solid surfaces. However, plots of X_c/λ versus the Grashof number show significant differences from the power-law behavior observed for heated solid plates. A theory explaining the similarity and difference between the present results and those for heated solid plates is discussed which is based on differences in the thermal boundary conditions.

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