



Advected boundary layer rolls over the Baltic Sea

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Two cases of boundary layer rolls over Sweden and the Baltic Sea are studied using the WRF (Weather Research and Forecasting) model and SAR (Synthetic Aperture Radar) images. The boundary layer rolls are seen as wind streaks in SAR images over the stably stratified sea surface, and show good agreement with model results. From the model results following conclusions can be drawn: The rolls are created over the Swedish mainland during slightly convective conditions, and are persistent throughout the day. They are most likely caused by thermal instability. The rolls are advected with the mean wind out over the Baltic Sea, where there is a decrease in strength and increase in wavelength. The rolls are maintained over the stable sea surface for several tens of kilometers, despite the lack of thermal forcing from the ground. Over land the rolls are confined inside the boundary layer, and the height to which they reach stays approximately constant even when the rolls are advected out over sea surface. This means that rolls extend into the residual layer above sea. The study shows that advection of a boundary layer phenomenon can be important for coastal areas, when conditions upwind differ from the conditions at the site of interest. This needs to be taken into account in models, and can possibly have an effect on offshore wind energy.