



The distribution of birds in the atmospheric boundary layer

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Birds are observed flying at multitude of altitudes from flights occurring within several meters of the earth surface (whether water or land) to flights reaching over 10 kilometers. Why are there such diverse altitude distributions of flight? How do different birds take advantage of atmospheric boundary layer dynamics? In this paper we present some original research results as well as a compilation of the relevant literature to try and answer these questions.

During several field studies, the Flycatcher tracking radar has been used in the Netherlands to measure the flight altitudes of different species of birds during local and migratory movements over land. For several groups of birds, the relationship between flight altitudes and local meteorological conditions has been modeled. For example, the diurnal altitude distribution of the buzzard, a bird which typically uses thermal convection for soaring flight, follows the daily evolution of the convective boundary layer. Similar results were found for the swift, a species which feeds exclusively on aerial arthropods, many of which rely on specific atmospheric conditions to remain aloft. On the other hand, nocturnal migrants appear to be most influenced by wind conditions aloft.

By combining the existing knowledge on avian flight altitudes we describe the observed vertical distributions of birds in the context of adaptation to boundary layer dynamics. We hope to stimulate interest in new multidisciplinary research forging a strong alliance between boundary layer meteorology and avian ecology.