



## Effect of atmospheric circulation on spring arrival of long-distance bird species: a case study from Latvia and Estonia

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We studied the effect of atmospheric circulation on spring migration of birds in Estonia and Latvia. For that, we used first arrival dates of 24 long-distance migrants in three observation points, Kuressaare, Tartu (both in Estonia) and Snēpele (in Latvia) during the time period 1958-2002. The atmospheric circulation data were obtained from the catalogue 2.0 of COST 733 Action, where two domains (Baltic Sea and Europe) were selected. The atmospheric circulation classifications we chosen represent optimization method family (CAP, CKM, NNW, PXK, SAN and SOM) and contain nine circulation types. We sorted out circulation types that occurred on the arrival period (i.e. the first arrival date, on the preceding day and on the following day) to detect circulation conditions for bird migration.

In addition, we used general linear model (GLM) and Mann-Kendall test to detect possible long-term trends both in the arrival of bird species and climatic variables. Also, differences in trends between three observation points were analyzed.

Our results show that in general, long-distance migrants preferred anticyclonic conditions, i.e. windless, more or less clear sky, no rain and eastern or south-eastern wind condition. They tended to avoid those atmospheric circulation types in whose case cyclones dominated.

Results of GLM and Mann-Kendall tests showed that there are no substantial differences between Tartu, Kuressaare and Snēpele for the majority (17 species) of species.

Three selected points are situated relatively close to each other and the long-distance migrants using the same migration route for arrival to those locations. On the whole, 14 bird species out of the 24 had a negative trend in the first arrival date, i.e. their spring arrival has statistically significant ( $p < 0.05$ ) advance in Kuressaare (9 species), Snēpele (5 species) and Tartu (6 species). The results indicate that methods of synoptic climatology are useful for studying phenology of spring arrival of long distance bird species, especially at a large scale.

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