Abstract: Understanding migration behavior and variation through time represents a complex problem for biologists. The constraints on migration may differ among seasons (spring versus autumn), as birds track resources, favorable weather or atmospheric conditions, and may have different needs at their destination (breeding versus wintering grounds). Environmental and weather conditions vary among years and seasons, and may impact the magnitude of variation in hummingbird migration routes and timing. Citizen-science projects, such as eBird (www.ebird.org), now allow researchers to track population movement of migratory species. eBird provides vast amounts of observation data and presents an opportunity to gain a population-level perspective on species movement patterns. In addition, data aggregation efforts such as Movebank (www.movebank.org) allow researchers to easily integrate environmental datasets from distributed resources to evaluate the impact of environmental and atmospheric variables on species occurrence. Because of their small body size, high metabolic rates, and dependence on nectar resources, hummingbirds may deviate substantially from other bird species in their migratory routes, timing, and response to environmental or weather factors. Using generalized additive models for location, shape, and scale (gamlss) in program R, we model 8 years of eBird data (2008-2015) from 5 North American latitudinal migrating hummingbird species. For each species we determine the environmental and weather variables most correlated with migratory route in spring vs. autumn for each year and evaluate the explanatory power of physiological constraints on hummingbird geospatial location and ability to respond to changes in environmental and weather parameters. We compare the patterns in spring vs. autumn routes, and also characterize the degree of annual variation in environmental conditions, migration route and timing.