Global wind regimes in ecogeographical rules of evolution

As our planet faces the unmistakable challenges of unprecedented climate change, delving into the interplay between animal evolution and particular components of climate becomes more pressing than ever. In the vast kingdom of animals, two fundamental ecogeographical rules, known as Bergmann's and Allen’s rules, describe how body size and shape adapt as a response to shifting thermal environments. Bergmann’s rule states that animals tend to grow larger when moving from hot to cold environments, while Allen’s rule proposes that they elongate appendages when transitioning from cold to hot environments. Both of these rules trigger alterations in the body-surface-area-to-volume ratio, impacting the efficiency of heat exchange with the surroundings, and both have been confirmed by the observations via rigorous statistical approaches.

However, in the vast majority of studies on the above ecogeographical rules, there's one aspect that has been strikingly overlooked—wind. Surprisingly absent from empirical studies, wind is poised to become an even more critical factor in the face of ongoing climate change, potentially introducing rapid heat losses alongside temperature fluctuations. This pioneering project aims to introduce wind speed as a vital component of these well-established ecogeographical rules. Leveraging modern phylogenetic methods and well-established ecological and evolutionary approaches, our investigation is set to unravel the role of wind in shaping the evolution of bird and mammalian species, with particular focus on their body sizes, beaks, limbs, and tails.