14. T. Alerstam, G. A. Gudmundsson, M. Green, A. Hedenström, Migration along orthodromic sun compass routes by arctic birds. *Science* **291**, 300–303 (2001). doi:10.1126/science.291.5502.300 Medline

15. J. F. Kelly, K. G. Horton, Toward a predictive macrosystems framework for migration ecology. *Glob. Ecol. Biogeogr.* **25**, 1159–1165 (2016). doi:10.1111/geb.12473

16. T. D. Crum, R. L. Alberty, The WSR-88D and the WSR-88D operational support facility. *Bull. Am. Meteorol. Soc.* **74**, 1669–1687 (1993). doi:10.1175/1520-0477(1993)074<1669:TWATWO>2.0.CO;2

17. D. R. Sheldon, A. Farnsworth, J. Irvine, B. M. Van Doren, K. F. Webb, T. G. Dietterich, S. Kelling, "Approximate Bayesian inference for reconstructing velocities of migrating birds from weather radar," in *Proceedings of the Twenty-Seventh AAAI Conference on Artificial Intelligence*, M. des Jardins, M. L. Littman, Eds. (Association for the Advancement of Artificial Intelligence, 2013), pp. 1334–1340.

18. T. Chen, C. Guestrin, "XGBoost: A Scalable Tree Boosting System," in *Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining* (Association for Computing Machinery, 2016), pp. 785–794.

19. F. Mesinger, G. DiMego, E. Kalnay, K. Mitchell, P. C. Shafran, W. Ebisuzaki, D. Jović, J. Woollen, E. Rogers, E. H. Berbery, M. B. Ek, Y. Fan, R. Grumbine, W. Higgins, H. Li, Y. Lin, G. Manikin, D. Parrish, W. Shi, North American Regional Reanalysis. *Bull. Am. Meteorol. Soc.* **87**, 343–360 (2006). doi:10.1175/BAMS-87-3-343

20. A. Aurbach, B. Schmid, F. Liechti, N. Chokani, R. Abhari, Complex behaviour in complex terrain—modelling bird migration in a high resolution wind field across mountainous terrain to simulate observed patterns. *J. Theor. Biol.* **454**, 126–138 (2018). doi:10.1016/j.jtbi.2018.05.039 Medline

21. S. Bauer, J. W. Chapman, D. R. Reynolds, J. A. Alves, A. M. Dokter, M. M. H. Menz, N. Sapir, M. Ciach, L. B. Pettersson, J. F. Kelly, H. Leijnse, J. Shamoun-Baranes, From agricultural benefits to aviation safety: Realizing the potential of continent-wide radar networks. *Bioscience* **67**, 912–918 (2017). doi:10.1093/biosci/bix074 Medline

22. K. G. Horton, B. M. Van Doren, F. A. La Sorte, D. Fink, D. Sheldon, A. Farnsworth, J. F. Kelly, Navigating north: How body mass and winds shape avian flight behaviours across a North American migratory flyway. *Ecol. Lett.* **21**, 1055–1064 (2018). doi:10.1111/ele.12971 Medline

23. J. Shamoun-Baranes, H. van Gasteren, V. Ross-Smith, "Sharing the aerosphere: Conflicts and potential solutions," in *Aeroecology*, P. Chilson, W. F. Frick, J. Kelly, F. Liechti, Eds. (Springer, 2017), pp. 465–497.

24. B. M. Van Doren, K. G. Horton, Dataset for "A continental system for forecasting bird migration," figshare (2018); https://doi.org/10.6084/m9.figshare.6962810.

25. K. G. Horton, W. G. Shriver, J. J. Buler, A comparison of traffic estimates of nocturnal flying animals using radar, thermal imaging, and acoustic recording. *Ecol. Appl.* **25**, 390–401 (2015). doi:10.1890/14-0279.1 Medline