Journal of Historical Geography 51 (2016) 29–39

Contents lists available at ScienceDirect

Journal of Historical Geography

journal homepage: www.elsevier.com/locate/jhg

For an empire of 'all types of climate': meteorology as an imperial science

Martin Mahony*

School of Geography, University of Nottingham, UK

ARTICLE INFO

Article history:
Received 4 June 2015
Received in revised form
10 November 2015
Accepted 16 November 2015

Keywords:
History of meteorology
Geography of science
Climate
Empire
Internationalism
Conferences

ABSTRACT

This article explores the relationship between meteorology, British imperialism and evolving forms of scientific internationalism in the twentieth century. Focussing on a series of imperial meteorology conferences begun in 1919, it is shown how the British Empire was positioned in the interwar period as a corrective to skewed forms of scientific internationalism which were emerging in meteorology, with standards and data formats biased towards Northern climates. Possessed of an empire of 'all types of climate', British meteorologists identified themselves as a counterbalance to a perceived eurocentrism in international meteorology. The Empire was thus a convenient shortcut to a truly 'global' science, while meteorology itself emerged as a potentially powerful new resource as aviation and agricultural developmentalism took hold. The paper contributes to debates about the spatialities of scientific practice, offering the imperial as an interstitial space where a new globalism might be reconciled with the Empire's diversity of climates and meteorological techniques. It argues that empire was an important way in which meteorology became global – both in its subject matter and in its practices.

Those concerned with science's geographies have insisted that the powerful globalism of disciplines like meteorology lies not simply in their truth-production but in their ability to master space.[1] The making of knowledge which can transcend the local circumstances of its production demands the spatial extension and mobility of tools, techniques and ideas. Creating authoritative knowledge of space requires the replication of place – the laboratory or the observatory – in and through networks tethered to coordinating 'centres of calculation'.[2] The emergence in the second half of the twentieth century of the climate as an intrinsically global system attests to the successful construction of a global calculative apparatus, facilitated by what Paul Edwards calls 'infrastructural globalism'.[3] This globalism has a particular historical depth, rooted in the internationalist ambitions of early twentieth-century European meteorologists, but brought to maturity in part through the power of Cold War-era American scientific diplomacy.[4] With the post-World War II rise of the governmental World Meteorological Organization (WMO), cooperative internationalism could bear fruit in the form of newly global visions of the atmosphere. Current historical work on meteorology has narrated this triumph of the global, which culminated in the rise of global predictive modelling.[5]

This paper explores the period before the triumph of Edwards' infrastructural globalism. The first half of the twentieth century was a period of faltering internationalism in meteorology, as the voluntarism of the International Meteorological Organization (IMO, the WMO's non-governmental predecessor) struggled to unite the world's meteorologists around a shared calculative apparatus in the face of diverse standards, data formats, practices and interests. Katharine Anderson has argued that 'the meaning of global science needs to be investigated through … shifting contemporary

* School of Geography, University of Nottingham, Sir Clive Granger Building, University Park, Nottingham NG7 2RD, UK
E-mail address: martin.mahony@nottingham.ac.uk.

[1] See, for example, A. Barry, The history of measurement and the engineers of space, *British Journal for the History of Science* 26 (1993) 459–468; D.N. Livingstone, *Putting Science in Its Place: Geographies of Scientific Knowledge*, Chicago, 2003.

[2] B. Latour, *Science in Action: How to Follow Scientists and Engineers through Society*, Cambridge, 1987; S. Naylor, Nationalizing provincial weather: meteorology in nineteenth-century Cornwall, *British Journal for the History of Science* 39 (2006) 407–433.

[3] P.N. Edwards, Meteorology as infrastructural globalism, *Osiris* 21 (2006) 229–250; see also M. Heymann, The evolution of climate ideas and knowledge, *Wiley Interdisciplinary Reviews: Climate Change* 1 (2010) 581–597.

[4] C.A. Miller, Scientific internationalism in American foreign policy: the case of meteorology, 1947–1958, in: C.A. Miller, P.N. Edwards (Eds), *Changing the Atmosphere: Expert Knowledge and Environmental Governance*, Cambridge, 2001, 167–218.

[5] F. Nebeker, *Calculating the Weather: Meteorology in the Twentieth Century*, London, 1995; K. Harper, *Weather by the Numbers: The Genesis of Modern Meteorology*, Cambridge, 2008.

http://dx.doi.org/10.1016/j.jhg.2015.11.003
0305-7488/

characterizations of meteorology as global, national, or local science'.[6] This essay responds to this challenge, but seeks to add another spatiality to Anderson's triptych: meteorology as imperial science. In meteorology, intersections of atmosphere and empire are suggestive of spatialities which trouble Anderson's hierarchy of global, national and local.[7] As Helen Tilley has argued, imperial scientific institutions 'occupied an interstitial space that was neither national nor international', while Joseph Hodge has described imperial science as a site where the pursuit of universalist aims (such as 'development') occurred through new ways of dealing with local specificities.[8] In the case of British Empire meteorology, it is argued here, this interstitial space was defined in both scientific and governmental discourses as one of great climatic diversity, of a kind which posed challenges to an emerging globalism in meteorological practices while also presenting opportunities for new kinds of economic exploitation. By examining the work done by this idea of diversity in the interstitial space of empire, we can further understand, in meteorology, 'the ways in which ideas and techniques moved across nations, empires, and international bureaucracies'.[9]

This paper investigates the role of empire in meteorology's shuttling between the local and the global, the national and the international. Imperial meteorology emerges here as a science steeped in evolving national interests and imperial priorities, but also positioned as a corrective to a biased internationalism and a waypoint on the road to a truly global science. Taking the British Empire as an example, the focus is a series of meetings convened between 1919 and 1989 known as the Conference of Empire (later Commonwealth) Meteorologists (CEM or CCM). In their negotiation of emerging international standards and practices in the face of imperial climatic diversity, the conferences present a means to examine how a global calculative apparatus was being constructed *through* empire. However, this was far from a post-national, post-ideological notion of scientific internationalism.[10] Rather, this is also a story of the construction of a calculative apparatus *for* empire, as meteorologists responded to pleas for greater contributions to economic and military projects. The paper focuses especially on the meetings which took place in 1919, 1929 and 1935. By focussing on discussions of aviation meteorology, the suitability of international data codes for colonial climates and the possibilities of agricultural meteorology, it is shown how imperial meteorology was positioned as a calculative apparatus adapted to shifting global and local conditions.

As well as being an age of imperial revival and flux, the interwar period saw rapid change in meteorology as the technologies of the aeroplane and wireless telegraphy, along with new theories of air masses and fronts, transformed the possibilities and expectations of weather prediction.[11] The argument is that narratives of twentieth-century meteorological internationalism which fail to account for imperial structures and their infrastructural residues miss an important set of building blocks in the socio-technical construction of a modern scientific discipline with a distinctly international (albeit greatly uneven) geography and a conspicuously global field of vision. In more recent years this global vision has produced concerns about anthropogenic climate change, and Commonwealth Meteorologists Conferences have accordingly shifted their focus from geographic diversity to temporal change. But the chief claim of the paper is that, through efforts to reconcile an emerging globalism with the climatic diversity of Empire, early twentieth-century British imperial meteorology was a key, yet heretofore neglected, element of how meteorology became global – both in its subject matter and in its practices.

Early stirrings of an imperial meteorology

Jan Golinski concludes his study of eighteenth-century British weather knowledges by ruminating on the geographies of Enlightenment-era meteorology. The seventeenth and eighteenth centuries saw repeated attempts to perfect a Baconian system of observation and theoretical induction, with characters like Joseph Hooker, Robert Boyle and Henry Cavendish repeatedly insisting on the need for greater coordination in meteorological observation around the British Isles and, increasingly, beyond.[12] Other European elites also sought to encourage greater imperial coordination of British scientific practice. Echoing Alexander von Humboldt's pleas of 1836 for the Royal Society to make better use of the geographic expanse of British colonial possessions for scientific purposes, European meteorologists at early twentieth-century international meetings continuously referred to the importance of the publication of meteorological data from 'distant regions'.[13] For G.K. Lempfert, Assistant Director of the Meteorological Office, '[t]hese resolutions were in large measure … directed at us of the British Empire'.[14]

Lempfert's imperial self-admonition reveals anxieties about the failure of British meteorology to appropriately coordinate its imperial activities. Although meteorology had become, along with its geophysical siblings, 'a means for the scientific mastery of geographical space', it was far from a globally unified or coordinated discipline.[15] However, at the dawn of the twentieth century the practical empiricism (and even parochialism) of official British meteorology – as described by Anderson – was giving way to a new interest in worldwide 'centres of action', wherein large pressure or temperature gradients might hold the key – through carefully sited observatories – to understanding weather patterns across large expanses of the globe.[16] In India, John Eliot had come to realise, through his work on the Indian monsoon, that making sense of a space like the Indian Ocean as a whole, where weather on one side

[6] K. Anderson, *Predicting the Weather: Victorians and the Science of Meteorology*, Chicago, 2005, 290.

[7] See, for example, G.T. Cushman, The struggle over airways in the Americas, 1919–1945: atmospheric science, aviation technology, and neocolonialism, in: J.R. Fleming, V. Janković, D.R. Coen (Eds), *Intimate Universality: Local and Global Themes in the History of Weather and Climate*, Sagamore Beach, 2006, 175–222; G.T. Cushman, The imperial politics of hurricane prediction: from Calcutta and Havana to Manila and Galveston, 1839–1900, in: M. Lawrence, E. Bsumek, D. Kinkela (Eds), *Nation-States and the Global Environment*, Oxford, 137–162.

[8] H. Tilley, *Africa as a Living Laboratory: Empire, Development, and the Problem of Scientific Knowledge, 1870–1950*, Chicago, 2011; J. M. Hodge, *Triumph of the Expert: Agrarian Doctrines of Development and the Legacies of British Colonialism*, Athens, 2007.

[9] Tilley, *Africa as a Living Laboratory*, 10.

[10] R. MacLeod, Passages in imperial science: from Empire to Commonwealth, *Journal of World History* 4 (1993) 117–150.

[11] R.M. Friedman, *Appropriating the Weather: Vilhelm Bjerknes and the Construction of a Modern Meteorology*, Ithaca, 1993.

[12] J. Golinski, *British Weather and the Climate of Enlightenment*, Chicago, 2010.

[13] Report upon a letter addressed by the Baron de Humboldt to H.R.H. the President of the Royal Society and communication by H.R.H. to the Council, 9 June 1836, Royal Society Archives, London, AP/20/8.

[14] G.K. Lempfert, The Empire in relation to international meteorology, in *Report of the Conference of Empire Meteorologists*, HMSO, 1929 [hereafter *CEM* 1929], 130–131. In 1903 Austrian meteorologist Julius von Hann wrote to Napier Shaw arguing that 'We need [observational] tables from many points evenly distributed on the surface of the earth if we wish to study changes in pressure and temperature in the proper connexion. England, with its many Colonies, is especially called upon to render this service to science'. Hann to Shaw, 10 March 1903, contained in Minutes of the Meteorological Council 1900–1905, The National Archives, Kew [hereafter TNA], BJ 8/15, 177.

[15] Golinski, *British Weather*, 208.

[16] Anderson, *Predicting the Weather*; N. Shaw, *Manual of Meteorology*, Volume II, Cambridge, 1936, 338.