

Political Meteorology:

Weather, climate and the contest for Antarctic sovereignty, 1939-1959

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Antarctica is the coldest continent in the world. It is the continent with the most ice, but the least precipitation. Within the global atmospheric system Antarctica functions as a massive heat sink, cooling the air and regulating global temperature. Its deep ice sheets provide archives into the world's climatic past, and they hold one of the keys to the world's climatic future. However, as late as the middle of the twentieth century, none of this was known with any degree of certainty. Various meteorological theories existed, many dating from the heroic era of Antarctic exploration at the beginning of the twentieth century (Fogg 1992). But these theories tended to rest on scant data and there were rarely enough observations to substantiate them.

Between 1939 and 1959, meteorologists from a number of different countries made significant advances in their understanding of the weather and climate of Antarctica. From the Second World War onwards, various countries made systematic attempts to observe and understand the continent's weather and climate (Rooy 1957; Rubin 1966). These efforts culminated in the work of the International Geophysical Year (IGY) of 1957-58 (Lamb 1961). In particular, meteorologists sought to understand the ways in which Antarctica's weather influenced the surrounding oceans and continents. In asking this question, they debated whether a South Polar Front functioned in a similar fashion to the Polar Front in the northern hemisphere, first outlined by the Bergen school of dynamic meteorology (Friedman 1989). By the end of this period, many questions remained unanswered, and there was certainly no consensus. But, by 1959, sufficient data existed to resolve the basic questions of Antarctic meteorology.

These advances in Antarctic meteorology took place concurrently with important developments in the political history of Antarctica. Between 1939 and 1959, Great Britain, Argentina, and Chile actively contested the sovereignty of the Antarctic Peninsula, directly to the south of South America. Great Britain named the region the Falkland Islands Dependencies and claimed it as the part of its worldwide empire (Beck 1986; Dodds 2002). Argentina and Chile argued that the Antarctic Peninsula was a geological extension of South America and that Britain's claims overlapped with fundamental parts of their national territories (Howkins 2006).

As the Antarctic dispute progressed it became increasingly caught up in Cold War rivalries between East and West (Moore 2004). The United States and the Soviet Union both maneuvered to exert their influence throughout the southern continent. This super-power rivalry climaxed during the IGY of 1957-58, ostensibly a worldwide endeavor of scientific co-operation. Rather than leading to an extension of the Cold War, however, the IGY offered an opportunity to resolve, at least partially, the vexed question of sovereignty. In 1959, the twelve countries that participated in IGY Antarctic research signed the Antarctic Treaty. This treaty created a limited international regime for Antarctica, brought an end to the active phase of the Anglo-Argentine-Chilean sovereignty dispute, and relaxed political tensions throughout the continent.

This paper presents a “political meteorology” that examines the dynamic interaction between politics and meteorology. It does not attempt thoroughly to delineate the competing meteorological and climatic models that developed during the 1940s and 1950s. Rather, it seeks to understand the ways in which the politics of the Antarctic sovereignty dispute and the Cold War shaped the development of Antarctic meteorology, and how meteorological developments influenced the course of the sovereignty dispute. Between 1939 and 1959, Antarctic meteorology and Antarctic politics were “co-produced,” meaning that the science of meteorology helped to shape the political context within which it developed (Jasanoff 2004). As environmental historians have pointed out, it is one thing to assert vague connections between the environment, science, and politics; it is another thing to demonstrate how these connections actually functioned (White 1990). Through an examination of these interconnections, this paper presents Antarctica as an ideal location for such an endeavor, due to the relative simplicity of its human-nature interactions.

This paper argues that political tensions in Antarctica acted as a powerful catalyst to the development of Antarctic meteorology. The Antarctic sovereignty dispute stimulated the construction of bases and the conduct of scientific research throughout the Antarctic Peninsula region. This research in turn supplied the data needed to test and validate climatic and meteorological theories. During the 1950s, the escalating rivalry between the USA and the Soviet Union further stimulated meteorological research, in particular by opening up the interior of the continent. On a broad scale, the argument that political conflict stimulates scientific research is nothing new. But such an assertion runs counter to the dominant paradigm of Antarctic historiography: namely, that peace and co-operation have been the principle stimulus to scientific advance (Berkman 2002). This argument therefore functions as a corrective to an over-idealized and teleological reading of Antarctic history that equates science with international co-operation.

A central feature of the political disputes in Antarctica was a contest over scientific authority. Great Britain’s sovereignty claims to the Falkland Islands Dependencies rested on assertions of scientific legitimacy. The British Empire had first laid a formal claim to the Antarctic Peninsula region in 1908, in an effort to tax the nascent Antarctic whaling industry (His Majesty’s Stationary Office 1920). In justifying their claim British officials argued that their motives were “purely unselfish”:

The only true wealth that this area contains, so far as we know today, is still as in the past its marine wealth – its whales and seals; these, as we have noted earlier, could readily be exterminated by indiscriminate killing and it was the recognition of this danger which decided His Majesty’s Government to bring these industries under control and lead to the establishment of British sovereignty over the area now known as the Falkland Islands Dependencies. *The motive was a purely*

unselfish one, to conserve the harvest of these seas for the benefit of mankind as a whole. (Clifford 1948a)

The British asserted that only they had the scientific and technical capabilities to regulate the Antarctic whaling industry in a sustainable fashion. This recourse to scientific authority mirrored a similar strategy throughout the colonial empire (Drayton 2000; Grove 1996; Godlewska and Smith 1994; Anker 2001). As Argentina and Chile began actively to put forward their own claims to Antarctic sovereignty on the eve of the Second World War, they sought to challenge Britain's assertions of scientific superiority. Whereas Chile continued to rely more heavily on non-scientific representations of the Antarctic environment, Argentina appropriated the rhetoric of imperial science – what J.M. Blaut has called the “colonizer's model of the world” – in order to strengthen its case for Antarctic sovereignty (Blaut 1993; Howkins forthcoming). A similar contest over scientific authority took place in the rivalry between the United States and the Soviet Union. Scientists on all sides were generally willing to play their part in these political rivalries, realizing that this was a good way to win support for their scientific labors.

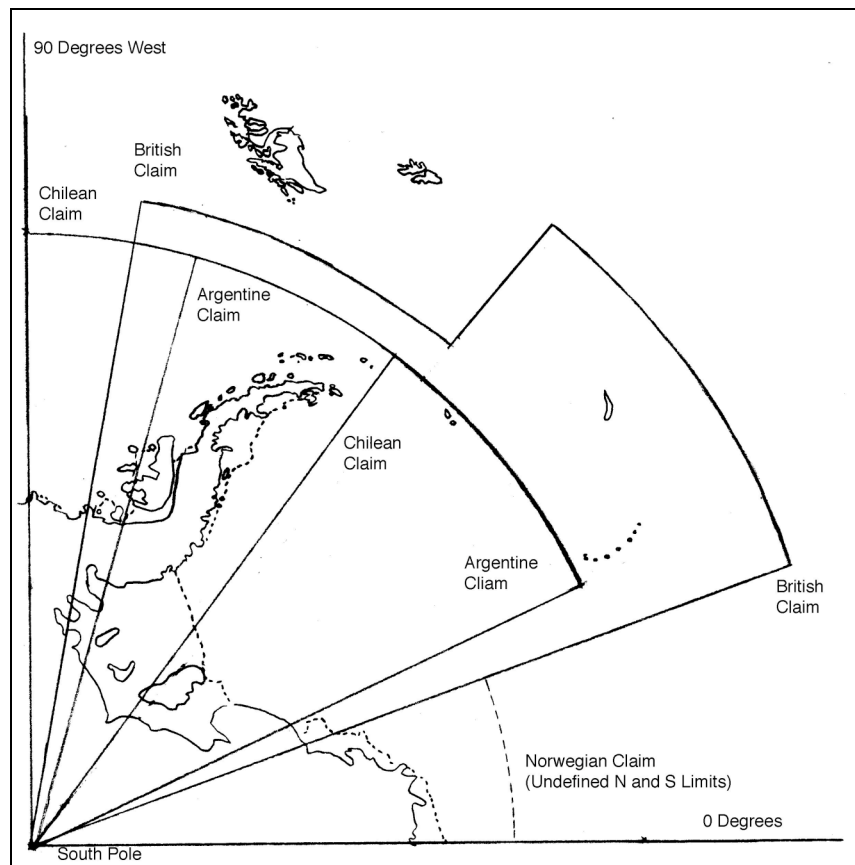


Fig. 1: Sketch Map to show sovereignty claims in Antarctic Peninsula region.

Between 1939 and 1959, Antarctic science was much more than a rhetorical strategy. As well as producing useful knowledge for its own sake, this paper argues that the results of scientific research – including meteorology – shaped the political history of Antarctica. The performance of Antarctic science brought with it very real practical advantages. Correct weather

forecasts, for example, could help to prevent ships becoming stuck in the sea ice, and made flying safer. Weather forecasting also brought economic benefits to the whaling industry since it maximized the time whalers spent at sea. In the competitive political environment of the 1940s and 1950s, scientific advances by one country tended to stimulate further development by their rivals, since all sides feared both the symbolic and the practical consequences of being left behind. Occasionally, scientific results challenged previous assertions of scientific authority: the meteorological connections between South America and Antarctica, for example, turned out to be more complicated than first imagined. Ultimately, as scientists learned more about Antarctica, political perceptions began to change. Where previously the continent had been viewed as a frozen *El Dorado*, potentially brimming with economic possibilities, the scientific work of the late 1950s suggested that there was little or nothing of short-to-medium term economic value in the continent. This dawning scientific realization, accompanied by the impending collapse of the whaling industry, laid an important foundation for the negotiation of the Antarctica Treaty in 1959.

The paper will be divided into three sections. The first section will examine the sovereignty claims that Chile and Argentina put forward to the Antarctic Peninsula during the Second World War, and look at how Antarctic meteorology directly and indirectly influenced these claims. The second section will look at the British response to the South American challenge. It will show how political rivalry stimulated meteorological research in Antarctica. The final section will examine the Cold War rivalry between the United States and the Soviet Union and summarize the meteorological research done as part of the IGY, as Antarctic science increasingly became the currency of Antarctic politics.

Chile and Argentina

During the Second World War, both Chile and Argentina put forward claims to the Antarctic Peninsula that overlapped with the territory claimed by Britain as the Falkland Islands Dependencies. These claims were advanced for a number of reasons. Most important were nationalist pressures and mutual rivalry (Howkins 2006). Also important was the shared belief that the Antarctic Peninsula would prove to be economically valuable and strategically useful (Pinochet de la Barra 1948). This belief in Antarctica as a frozen *El Dorado* was based largely on speculation and fantasy. South American authors repeatedly quoted Admiral Byrd's report to Congress that he had discovered 147 different types of minerals in Antarctica including gold, iron, copper, magnesium, zinc, and petroleum (Pinochet de la Barra 1948: 164). They speculated that the region would be amenable to settlement, and argued that military bases in the Peninsula region would hold the strategic key to the Drake Passage should the Panama canal ever be destroyed in a future war. Among the fantasies was the idea that the climate of Antarctica was more benign, or at least could become more benign, than it actually was. In December 1940, a month after the Chilean Government had delimited its claim to the Antarctic Peninsula, Juan Bardina, a Chilean Journalist, wrote an article that enthusiastically discussed the prospects for a warming climate in Antarctica:

There was a time when the Antarctic ice did not exist, and great forests covered the continent with corpulent trees. It is possible that, with the centuries, this polar spring could return. And maybe the great grandchildren of our great grandchildren will be able to drink tea comfortably under giant palms, in order to discretely escape the polar heat. (Pinochet de la Barra 1948: 166).

While such a claim may look uncomfortably realistic today, at the time it was based more on speculation than observation. Although Bardina was correct to say that evidence of previous vegetation had been found, he offered no explanation for the possibility of a warming Antarctic continent (Fogg 1992).

Having advanced their claims to the Antarctic Peninsula during the Second World War, the Governments of Argentina and Chile set about justifying them. In doing this they turned variously to history (claims made by the Spanish Empire as early as 1493), international law (the sector theory used in the Arctic), geology (the belief that the Antarctic Peninsula was a geological continuation of the Andes mountains), paleontology (similar fossils were found in Patagonia and the Antarctic Peninsula), and geography (the simple fact of nearness). Officials on both sides of the Andes also turned to the science of meteorology. Shared weather systems, they proposed, helped to demonstrate the geographical proximity of Antarctica to South America and this, in turn, demonstrated their legal rights to sovereignty. Captain Enrique Cordovez, a retired naval officer and a member of the Chilean Antarctic Commission, even went as far as identifying similarities between the snow in Patagonia and the Antarctic Peninsula, arguing that this further demonstrated Chile's "natural rights" to Antarctic sovereignty (Juliet 1947). The fact that both Argentina and Chile used similar arguments – including shared weather and climate – encouraged the two countries to forge an uneasy alliance against the British around the concept of a "South American Antarctica" (Genest 2001).

Argentina did, however, have one trump card over its South American neighbor, and also over Britain. Since 1904, the Argentine Government had maintained a meteorological station on the South Orkney Islands 400 miles to the north east of the Antarctic Peninsula (Moneta 1940). This station had been handed over to Argentina by the Scottish National expedition of William Bruce (Speak 2003). The Argentine government had accepted responsibility for the base believing that it would help to explain connections between Antarctica's weather and that of Patagonia. For forty years, *Base Orcadas*, as the observatory became known, was the most southerly place in the world to be permanently occupied. The station not only gave Argentina a good claim to fulfilling the legal requirement of effective occupation, but it also produced the longest continuous series of meteorological observations from the Antarctic region (Fogg 1992). During the Second International Polar Year of 1932-33, Argentine observations from the South Orkneys were the only contribution from the South Pole region (Fogg 1992). However, despite the good work of the Argentine base at Laurie Island, there was only so much that one base could do, away from the continent and almost entirely in isolation. As late as the early 1940s, there was still no comprehensive understanding of exactly how Antarctica's weather systems functioned. Consequently, there was only a vague notion of how the weather over Antarctica influenced the weather of the surrounding oceans and continents.

One enduring meteorological problem was that of high pressure over the Antarctic Plateau (Hobbs 1926). Pressure fell as sailors approached the Antarctic Ocean, but it appeared to begin to rise again south of 60°S. This, however, left the question of precipitation. A tremendous loss of ice could be seen through calving by anybody venturing to the periphery of the continent. But in a constant high pressure system over the interior, meteorologists questioned how enough precipitation could be generated to replace this lost ice. It appeared as if Antarctica was "too cold for snow." In 1951, A. Court summed up the existing state of the debate surrounding the Antarctic anti-cyclone in the American Meteorological Society's *Compendium of Meteorology*:

[It] exists only around the edges according to Meinardus and Shaw, is a thin layer according to Simpson, Barkow, Kidson and Grimminger, is broken up into several cells according to Land and the Navy aerologists (Operation Highjump), shrinks markedly from winter to summer according to Serra and Ratisvonna, Coyle and Gentilli, and is a major feature fed by an upper cyclone according to Hobbs, with Palmer considering the upper cyclone to be an abstraction derived from averages of widely varying conditions (quoted in Fogg 1992: 301).

A second persistent problem, dating from the observations made by George Clarke Simpson, the meteorologist on Scott's second expedition, was the occurrence of regular pressure waves without any apparent change in wind direction (Fogg 1992). Every 150 hours a pressure wave traveling at 40 mph would pass over a given point on the continent's exterior, but this would be unaccompanied by the expected change in wind direction. Meteorologists were increasing using the Bergen School's synoptic meteorology to ask questions such as whether or not there was a continuous polar front in Antarctica and what caused the origin of Antarctic cyclones. Simpson's theories about the occurrence of pressure waves added an extra layer of complexity to this problem. Going into the period 1939-1959, these and other meteorological problems remained unresolved.

Great Britain

Towards the end of the Second World War, Britain responded to the South American challenge to its sovereignty in the Falkland Islands Dependencies by sending an expedition of permanent occupation to the region (Dodds 2002). Known as Operation Tabarin, the principal objective of this expedition was to fulfill the legal requirement of "effective occupation" needed to demonstrate sovereignty if ever the case should be taken to an international tribunal. At the same time, permanent occupation of the Antarctic continent offered a tremendous opportunity for meteorologists. Lack of a continuous series of weather observations was the major obstacle in the way of an improved understanding of the Antarctic climate. When the British Government were looking for people with experience in Antarctica to advise on and participate in the expedition they turned to scientists such as J.M. Wordie and N.A. Mackintosh (Smith 2004). Despite the on-going war, these scientists saw Operation Tabarin as a way of continuing their scientific investigations in the Antarctic, and hence furthering their professional ambitions. The participation of scientists in this program of permanent occupation maintained and extended the connections between Antarctic science and politics.

Operation Tabarin led directly to the establishment of four British bases on and around the Antarctic Peninsula. In the years after the end of the Second World War, Argentina and Chile responded to Operation Tabarin by establishing their own bases in the region (Genest 2001). This began a "race for bases" that also included the United States – although North American interests in Antarctica were not restricted to the Antarctic Peninsula (Klotz 1990). Between 1944 and 1959, these four competing countries established over 20 bases in or around the Antarctic Peninsula, where before there had been only the Argentine *Base Orcadas* 400 miles away. Almost all of these bases conducted meteorological observations. Basic meteorological readings were relatively easy to take, and gave expeditions a veneer of scientific legitimacy. Although the quality of the observations varied tremendously, this network of rival bases provided a series of continuous data that could be used to test and develop the existing theories

of Antarctic weather. In this way, the bases that had been established as a result of the sovereignty dispute began to overcome the greatest problem hampering the development of Antarctica meteorology: the lack of continuous observations.

On the British side, responsibility for the government of the Antarctic Peninsula region fell to Sir Miles Clifford, the Governor of the Falkland Islands. Having spent most of his career as a District Officer in Africa, Sir Miles was something of an old-school British imperialist. He had no patience with Argentine and Chilean claims to the Falkland Islands Dependencies, and at one stage suggested that ice-cold water should be sprayed onto the crews of foreign ships illegally entering British waters (Clifford 1948b). His annual “administrative” visits to the Dependencies represented the highlights of an otherwise rather dull posting. Over the course of these visits to Antarctica, Sir Miles developed a definite idea about how the region should be governed: Antarctic Empire, he believed, should pay for itself.

Following the end of the Second World War, Operation Tabarin had been replaced by the civilian Falkland Islands Dependencies Survey. The primary objective was to occupy the region and fly the British flag, but an important secondary objective was to conduct scientific research. Money for the Dependency Survey came mostly from taxation of the land-based whaling companies in South Georgia. Experienced in the economic quid pro quo of British imperialism, Sir Miles felt that since whalers were paying for the scientific work, they should get some of the benefits. He therefore resolved to create a network of meteorological stations that would provide accurate weather forecasts to the whaling fleet. Such a policy revealed a clear understanding of the economic and strategic benefits of weather forecasting. In much the same way that Vilhelm Bjerknes had earlier won support for his research by appealing to the Norwegian fishing community, and other members of the Bergen School had appealed to the aviation industry, Clifford sought to placate the Antarctic whalers – many of whom were Norwegian – by providing them with useful information (Friedman 1989; Cushman 2006). Whalers, he hoped, would cease to complain about paying British taxes, and would support British sovereignty in the Falkland Islands Dependencies against the claims of Argentina and Chile.

In a meeting with Gordon Howkins, the head of the Falkland Islands Meteorological Service, Brian Roberts, an Antarctic specialist in the Foreign Office Research Department explicitly spelled out the political implications of Antarctic meteorology:

It is the wish of HMG to emphasize that the occupation of the FID should be such as to afford evidence of the exercise of sovereignty and that the programme of research and exploration should keep this in view. An active programme of research, which can be justified on scientific grounds alone, is an essential part of the preparation of a case which can be used if necessary to demonstrate to Foreign Governments or to a Tribunal that HMG is taking all reasonable steps to develop and exercise sovereignty over the area, and is not merely attempting to prevent foreign encroachments. There is no doubt that both the Chilean and Argentine Governments would like to set up meteorological stations in the Dependencies for political reasons. It is essential therefore that while we have to exclude them from doing so we must take every possible step to ensure that we do not lay ourselves open to the same charge. Whilst FIDS was political in origin, it is important to maintain it as far as possible as a normal administrative activity in which motives of research, exploration and development predominate (Roberts 1946 – original emphasis).

These comments clearly had disparaging implications about the kind of “science” being done by the Argentines and Chileans. As both Roberts and Clifford would note, problems arose for the British when bases sited for political purposes had little or no meteorological value. One of the major practical problems facing Sir Miles Clifford and Gordon Howkins was that of the overriding influence of local conditions. As early as 1926, Hobbs had warned about the problem of assuming that observed wind direction would be prevalent over extensive regions (Hobbs 1926). In Antarctica, with its powerful katabatic winds, local weather conditions could over-ride large scale ones. The meteorological observations made at stations such as Port Lockroy, for example, had little use for understanding wider patterns. Bases located primarily for political or practical purposes, such as ease of access, did not always produce the best results.

Nevertheless, by the early 1950s, the Governor of the Falkland Islands had established a functioning network of meteorological observatories (Mansfield 1957). The establishment of this service involved the takeover of a meteorological station owned by the Argentine PESCA whaling company at Grytviken in South Georgia on 1 January 1950 (Falkland Islands and Dependencies Meteorological Service 1950). It also involved the temporary closure of some bases, such as Port Lockroy, which had little or no perceived meteorological value. By the Antarctic season 1951-1952, five British bases in the Falkland Islands Dependencies submitted weather reports to Stanley, where meteorologists constructed synoptic charts. Forecasts were then broadcast from Port Stanley and South Georgia up to three times a day at the peak of the whaling season. These reports were translated into Norwegian for the benefit of the crews of the factory ships and catchers. A major handicap to the forecasting service was the refusal of whaling ships themselves to submit weather reports for fear of giving away their position to rival companies. An attempt to encrypt these reports met with little success. Nevertheless, according to a British report, the whaling companies “expressed satisfaction with the improved services now provided” (Falkland Islands and Dependencies Meteorological Service 1951). Weather forecasting also assisted British operations in the Falkland Islands Dependencies. In early 1950 season, for example, weather forecasts assisted with the evacuation of Marguerite Bay, and in the 1953-54 season “a number of forecasts were supplied to Hope Bay and proved useful in planning sledging operations and other work” (Falkland Islands and Dependencies Meteorological Service 1954). In this way, weather forecasts gave practical advantages to British attempts to assert their sovereignty in the Falkland Islands Dependencies.

Observations from the more than twenty meteorological stations established by Britain, Argentina, and Chile in the Antarctic Peninsula as a direct result of the sovereignty dispute represented an important step forward in the history of Antarctic meteorology. The meteorological work of the Falkland Islands Dependencies Survey, for example, was summarized in a book by the British meteorologist J. Pepper (Pepper 1954). This focused on the weather and climate of the Peninsula region, demonstrating, for example how the temperature varied greatly from the cold east to relatively warm west. New theories were advanced about the weather and climate of the Antarctic continent more generally. In 1949 H.C. Willett suggested that the circumpolar cyclonic vortex repressed the transfer of heat and kinetic energy, separating Antarctica’s atmosphere from the rest of the world (Fogg 1992). This latter theory posed an indirect challenge to the Argentine and Chilean idea of meteorological connectedness. Nevertheless, large gaps remained in the meteorological understanding of Antarctica. These were caused by an imprecise knowledge of the interior of the continent. All of the major British, Chilean, and Argentine bases were located on the shoreline of the Peninsula. The high interior Plateau stretching across East Antarctica remained virtually unknown. Not until the IGY of

1957-1958 would political rivalries of a different sort mean that efforts were made to occupy the interior of the continent.

International Geophysical Year

It is tempting to think of the International Geophysical Year (IGY) of 1957-58 as some kind of *deus ex machina*, emerging independently and then resolving the political problems of Antarctica with a surge of idealistic scientific internationalism. The political context of the IGY has been discussed elsewhere (Sullivan 1961; Needell 2000). It is sufficient here to note that, almost from its very beginning, the IGY was infused with the political tensions of the 1950s, including the politics of the sovereignty dispute between Britain, Argentina, and Chile, and, more broadly, the rivalries of the Cold War. Many of the meteorological advances in Antarctica in the period 1939-1959 did indeed occur as a direct result of the IGY of 1957-58. But the IGY was not a dramatic break from the territorial rivalries of the recent past, but rather a continuation of these tensions under the umbrella of international co-operation. In this way, the meteorological work of the IGY can be connected to the previous fifteen years of Antarctic history and the moves to occupy the continent. The IGY represented an acceleration of a process that was already underway: namely the building of bases for essentially political purposes that would also have important scientific benefits.

In terms of meteorology, one of the most important innovations of the IGY was the establishment of observing stations in the interior of the Antarctic plateau (Fogg 1992). This was as much a political move as a scientific one. By the mid-1950s, there was fierce competition between the United States and the Soviet Union for predominance in the southern continent. Before the first IGY Antarctic planning meeting in Paris in July 1955, the United States had made clear its intentions to build a station on the South Pole (Pinochet 1994). Given the sector nature of Antarctic sovereignty claims, with all pie pieces converging at the South Pole, nothing could be better calculated to assert the United States' reserved claims over the entire continent. Such reasoning had not escaped Soviet politicians, who also reserved their rights to sovereignty over the whole of Antarctica. After arriving late at the Paris meeting, the Soviet Delegation immediately declared its intention to build a base at the South Pole. According to reports of the assembled delegates, this declaration caused a stunned silence throughout the room (Pinochet 1994). Thinking on his feet, the Soviet delegate came up with the idea of build a base at the Pole of relative inaccessibility, the place in Antarctica furthest from any shoreline. As well as being a bold political gesture, this base would also have extremely useful meteorological potential, located at the geographical center of the continent.

Another important innovation of the IGY, was a strategy of taking coordinated meteorological readings, especially by radiosonde, from across the Antarctic continent (Commonwealth of Australia 1959). These were then reported to Weather Central at the American Base Little America V. Sixteen stations used weather balloons tracked by radar, these gave coordinated readings on the designated "world days." On their return from IGY research in Antarctica, meteorologists met for a symposium on Antarctic Meteorology in Melbourne, Australia. Here they discussed the initial findings of their research. IGY research on the central plateau of Antarctic revealed that the annual temperature patterns were very different from any other place on earth. The continent had a "coreless" winter in which temperatures were not as low as expected and stayed roughly the same for around 6 months. Research also disproved Simpson's conviction that depressions were not the cause of pressure variations. The IGY

established the basic outline of Antarctic weather that we have today: a succession of cyclones around 60°S which rarely penetrate into the high central plateau, with nearly stationary continental anticyclones over Marie Byrd Land and the Pole of Inaccessibility. Katabatic winds were found to generally over-ride the cyclonic circulation. It became possible to make tentative quantitative estimates of meridional mass transport. As expected, records for low temperatures were broken, and the coldest temperature ever measured (-87.4°C) was recorded at Russia's Vostok base at the Southern Geomagnetic Pole in July 1958 (Fogg 1992). In summing up the meteorological achievements of the IGY, W.J. Gibbs wrote in the *Australian Meteorological Magazine*: "The Antarctic is no longer a large blank region on meteorological charts – now it is the oceans of the southern hemisphere which are the last remaining areas from which meteorological data are lacking" (Gibbs 1959).

Despite their preliminary nature, the initial scientific results of the IGY (including, but not limited to, the meteorological results) had an immediate impact on the politics of Antarctica. Both Britain and the United States had gone into the IGY treating it as something of an economic survey. A British Government internal report entitled *Future Constitutional Development of the Colonies*, for example, noted "[British withdrawal] might also involve the loss of strategic minerals, but this will be easier to evaluate when the results have been assessed of the work done during the International Geophysical Year" (Cabinet Office 1957). They wanted to know whether the dreams of Antarctica as a frozen *El Dorado* could be realized. If mineral resources were to be found, then Antarctica would be worth the numerous difficulties involved in asserting sovereignty claims; if there was no economic gain to be made, then it would probably not be worth the trouble. The initial findings of the IGY were unequivocal: no mineral wealth of any immediate economic potential was found. On the contrary, the various IGY scientific investigations suggested that even if such minerals had been found, the depth of the ice and the hostility of the climate would make them un-exploitable.

The realization that there were no exploitable resources in Antarctica accompanied the beginning of the total collapse of the whaling industry – the continent's only economically profitable enterprise (Tønnessen 1982). Throughout the 1950s, massive over-capacity in the whaling fleet led to the decimation of the Antarctic whale population. By the end of the decade, the industry was in a self-induced crisis from which it would not survive. From the perspective of the Anglo-Argentine-Chilean sovereignty dispute, the decline of the whaling industry removed Britain's original reason for claiming and administering the Falkland Islands Dependencies. The British Treasury started to question the economic rationale for maintaining exclusive British sovereignty in the region, especially given the economic and political costs of competing with Argentina and Chile.

As a consequence of the failure to discover minerals, the collapse of the whaling industry, and a broader awareness of the hostility of the Antarctic climate, officials and politicians in Great Britain sought ways to diffuse the sovereignty dispute and internationalize the continent. In close alliance with the United States and its Commonwealth partners, the British used the scientific goodwill generated by the IGY, together with widespread fears of Soviet intentions in Antarctica, to push for limited internationalization of the continent. In a series of secret meetings held in Washington in late 1957 and early 1958, representatives from Great Britain, the United States, Australia, and New Zealand thrashed out their plans for an internationalization of the continent (Howkins forthcoming). Following a series of preliminary negotiations among the twelve nations that participated in IGY Antarctic Research – including Argentina and Chile – an Antarctic conference was held in Washington D.C. between October and December 1959. This

conference led to the signature of the Antarctic Treaty, which effectively brought an end to the active phase of the Anglo-Argentine-Chilean dispute by suspending all sovereignty claims to the continent. The Antarctic Treaty created a “continent for science,” and the British and North Americans achieved the political outcome they had come to desire.

Conclusion

Going into the period 1939-1959, the biggest problem facing Antarctic meteorology was a lack of data. The necessary meteorological stations simply did not exist and speculation exceeded observation. Over the course of this twenty-year period, scientific bases were built throughout the Antarctic Peninsula region and across the Antarctic continent. The vast majority of these bases engaged in meteorological observation, and they began to supply the data needed to test and validate the various existing theories. The demand for meteorological data, however, was not the driving force of this expansion. The competing nations built bases primarily for political purposes: to demonstrate effective occupation of the disputed territory. They conducted scientific research in an effort to legitimize their presence in the continent. Scientific data was, in many ways, a by-product of this political rivalry. Meteorological theories could be developed not despite international rivalry, but because of these tensions.

That, however, is only one side of the story. Science in general and meteorology in particular influenced the political history of Antarctica. Alongside the practical advantages gained through the conduct of meteorological research, developing scientific understanding helped to shape political attitudes towards the continent. At the beginning of this period a lack of scientific understanding permitted all sides involved in the dispute to indulge dreams of Antarctica as a frozen *El Dorado*. By the end of the period, enough was known about the reality of the Antarctic environment to undermine these fantasies. When faced with the reality of the Antarctic climate, the idea that the southern continent could become habitable within a generation or two – a belief that had helped to stimulate interest in Antarctic sovereignty in the first place – began to look ridiculous. In this way, scientific developments helped to lay the foundations for the signature of the Antarctic Treaty in 1959.

The Antarctic Treaty of 1959 signaled both change and continuity in the history of the southern continent. On the one hand, the Treaty represented a break from the recent past as co-operation came to replace rivalry as the default attitude. As this paper has suggested, this occurred, at least in part, because science had revealed that there was little worth fighting over. Today, Antarctica is held up as a model for political and scientific co-operation, and there is much to applaud about the Treaty that continues to govern Antarctica (Berkman 2002). On the other hand, there are many similarities between the pre and post Treaty periods, especially in the way that science continues to be used to justify and legitimize political influence in the continent. It is significant that the original 12 members of the Antarctic Treaty System were the countries that conducted scientific research in Antarctica during the IGY. Countries that are too poor to conduct scientific research in Antarctica continue to be excluded from the continent’s political decision making. An examination of Antarctica’s “political meteorology” in the period 1939-1959 demonstrates the complex interaction of science and politics. This in turn guards against an over-idealized reading of Antarctic history. Political rivalry could be as significant a stimulus to Antarctic science as political co-operation; actual scientific results could shape the political history of Antarctica every bit as much as the “goodwill” generated by scientific co-operation.

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