Winds of Colonisation: The Meteorological Contours of Spain's Imperium in the Pacific 1521–1898[1]

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ABSTRACT

This paper examines the relationship between prevailing weather systems and colonialism in the context of Spanish possessions in the Pacific from Magellan till the end of the nineteenth century. It argues that any historical appreciation of Hispanic colonialism and culture would be incomplete without due consideration of the role meteorological phenomena played, both at the macro-level in terms of the form and extent of empire and at the more micro-level as manifest in the daily experience of communities.

KEY WORDS

Pacific, Spain, weather, colonialism, galleons

The British Prime Minister Harold Macmillan made what has become an oft quoted speech in 1960 in which he likened the awakening of political consciousness in Africa to a 'wind of change' blowing through the continent. Like others before and after him, Macmillan spoke metaphorically, equating the diffusion and dissemination of human ideas to the strength of the breeze, the seeds of nationalism borne as it were on the currents of the world's major wind systems. These literary allusions, however, tend to obscure consideration of the real influence that wind and its extreme manifestation, storm, may have played in determining the course of history and influencing the shape of societies. This was especially so in the pre-industrial age when wind constituted the primary source of energy available for long-distance transportation and was to remain sovereign well into the nineteenth century. The slow rise of Western European states to global dominance and world empire from the sixteenth century that

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is usually characterised as maritime in nature could equally or perhaps more fittingly be described as Aeolian or wind-driven to denote dependence on the prevailing patterns of atmospheric circulation. While Chinese, Arab, Malay and Polynesian peoples among others also achieved degrees of mastery over this element, none perhaps did so with the pertinacity or with the same ends in mind as the mariners of Western Europe.

In particular, the Spanish empire in the Pacific largely owed its existence to a meteorological phenomenon that few but sailors were aware of and no one really understood. Variations in atmospheric pressure over the Indian Ocean are mirrored by opposite changes over the south-eastern Pacific, so that if one is falling the other is invariably rising. These variants are responsible for determining the nature and strength of the trade winds. Under normal conditions, these winds blow from east to west, pushing surface water with them away from the Americas. It was this pathway that Ferdinand Magellan discovered during his epic voyage of 1521 and along which others followed, so ensuring landfalls in Guam and the Philippines. Ultimately, even Spain's claims to the *Islas Carolinas* were successfully defended against Germany in 1885 through arguments based on prior discovery and prevailing wind/trade patterns despite actual occupation. Atmospheric circulation was responsible not only for the routes that linked these far-flung outposts together but also for ensuring the axis of imperial governance (Mexico, Manila, Guam/Agaña), the means of commerce (the galleon trade) and, of course, the progressive evangelisation of its peoples.[2]

The Western Pacific, moreover, is also the 'breeding ground' of typhoons, strong tropical storms with high winds, 20 or more of which pass over or near to the Philippines each year. The loss of life and property caused by tropical cyclones and the heavy rainfall that falls as a consequence of their passage are greater than any other natural hazard. There are a surprising number of historical sources on typhoons testifying to their importance irrespective of whether or not their effect has been generally recognised in conventional histories. Tropical storms not only sank ships and disrupted commerce but, by their very frequency and magnitude, influenced societies and even helped shape peoples' cultures. This paper examines the relationship between prevailing weather systems and colonialism in the context of Spanish possessions in the Pacific from Magellan till the end of the nineteenth century. It argues that any historical appreciation of Hispanic colonialism and culture would be incomplete without due consideration of the role meteorological phenomena played both at the macro level in terms of the form and extent of empire and at the more micro level manifest in the daily experience of communities.

DEPENDS WHICH WAY THE WINDS BLOW

The Spanish Empire in the Pacific may have been motivated by 'god, gold and glory' but its realisation, in particular its extent and its pulse was largely determined by the Pacific wind system. The global wind pattern or 'general circulation' splits the surface winds of each hemisphere into three belts: the easterly-blowing polar winds, the prevailing westerlies between 30–60 degrees of latitude, and the tropical easterlies between 0–30 degrees.[3] These later are known as the trade winds whose name actually has nothing to do with commerce but was named instead after the now obsolete word *tred*, to take a steady course. As a result of the earth's rotational motion, winds do not blow directly northward or southward but are deflected at right angles away from the straight path of high to low pressure. They are always deflected to the west in the Northern Hemisphere and to the east in the Southern. This spinning force is known as the *Coriolis effect*. Air diverging from a high-pressure region spirals outward, clockwise north of the equator and counter-clockwise in the south. The horizontal effect of this force varies in proportion to the latitude – it is strongest at the poles and vanishes altogether at the equator. Moreover, near the equator, the easterly trades of both

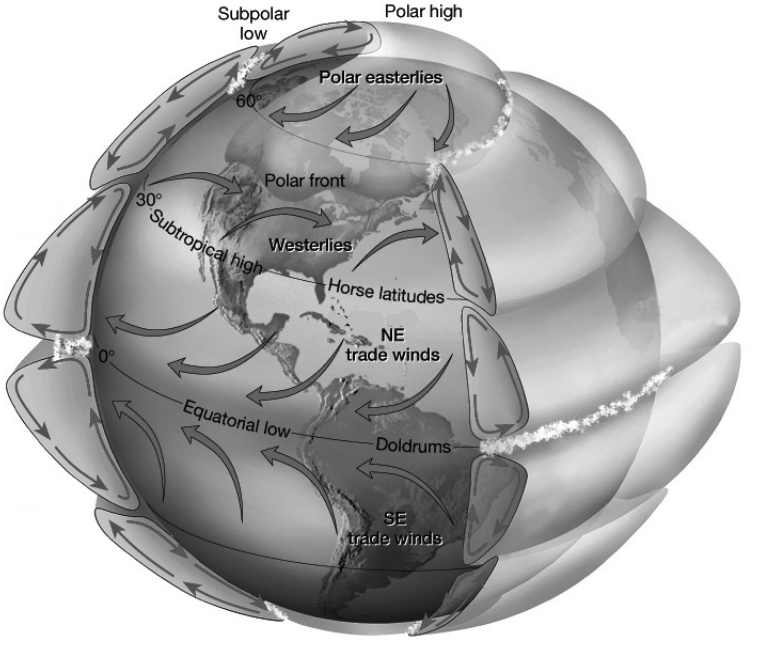

FIGURE 1. Global wind patterns (general circulation)

hemispheres move towards each other to form a narrow zone of low pressure, cloud and humid conditions known as the Inter-tropical Convergence (ITC) where winds are alternating fitful or strong. While the circulation is similar in both hemispheres, the colder mean climate of the troposphere over Antarctica due to the deflecting (*albedo*) effect of its perpetual ice cover has the effect of displacing all southerly climatic zones slightly to the north. Thus the ITC mainly lies several degrees north of the geographical equator in all oceans, a circumstance that greatly reduces the frequency of typhoons in many places but increases the intensity of the prevailing westerlies in the Southern Hemisphere.

This zonal pattern of winds provides only a rough approximation of the actual atmospheric circulation. In reality the latter is considerably modified by the unequal distribution across the globe of continents that constitute significant thermal and topographical barriers, becoming hotter in summer and colder in winter. The seasonal variation of solar heating depending on the tilt of the earth's rotation means that areas of high pressure tend to build up over cold continental land masses in winter, while low-pressure development takes place over the adjacent, relatively warm oceans. Exactly the opposite conditions occur during summer, although to a lesser degree. These contrasting pressures over land and water are the cause of the monsoon winds. Superimposed upon the general circulation are many lesser disturbances, such as the common storms of temperate latitudes and the typhoons or hurricanes of the tropics. These generally move along the path of the prevailing winds but maintain within them their own circulatory pattern. While the wind system over the Pacific conforms to the general model of circulation thus described, the region is characterised by a distinctive phenomenon known as the Southern Oscillation in which variations in atmospheric pressure over the Indian Ocean (in the West) are mirrored by the opposite changes over the south-eastern Pacific (in the East), so that if one is falling the other is rising. An *El Niño* (Southern Oscillation or ENSO) event – named after the Christ Child by Peruvian fishermen – is a combination of interrelated oceanic and atmospheric processes that occurs every two to seven years when atmospheric pressures shift and the normally easterly trade winds slacken and even temporarily reverse. Wind intensities are affected too, especially close to the equator. One may encounter unexpected variations in the strength of the usually predictable north-east and south-west monsoons as well as more localised fluctuations in direction and speed influenced by the local island topography.[4]

The ocean's currents, too, are largely dependent on the way the winds blow. Oceans are certainly not inert bodies; they have their own complex circulatory systems. Surface currents tend to conform closely to the prevailing wind system, especially along the equatorial belt that girdles the globe. Two surface currents, the North and South Equatorial Currents, flow westward blown by the trade winds separated by an eastward flowing surface Equatorial Counter-current.[5] Near the western margins of all oceans, however, the cumulative flow of the

equatorial currents pile up warm water against the continental boundaries. A portion of this surplus water returns eastward via the surface and subsurface counter-currents but most of the water forms deep narrow fast-moving western boundary currents that are guided pole-ward by the margins of the continental shelves at speeds of between three to five knots. In the western North Pacific, the Kuro-shio Current (also known as the Japan Current, *la corriente negra* or black current) off the north-east coast of Japan flows eastward at around 36°N, near the latitude of Tokyo, in the direction of the prevailing westerlies as far as about 160–170°E beyond which it becomes too diffuse to be any longer identifiable. Similarly, the prevailing westerlies are also responsible for creating continental currents off the coast of North America around latitude 40°: one that flows north towards the pole and another, the California Current that heads south at least as far as Acapulco.[6] Any change to the way the winds blow, such as occurs during an *El Niño* event, will affect the surface ocean currents, causing sea levels in the western Pacific to fall and warm water to slip back towards America with corresponding effects on local climatic conditions – and on ships at sea.

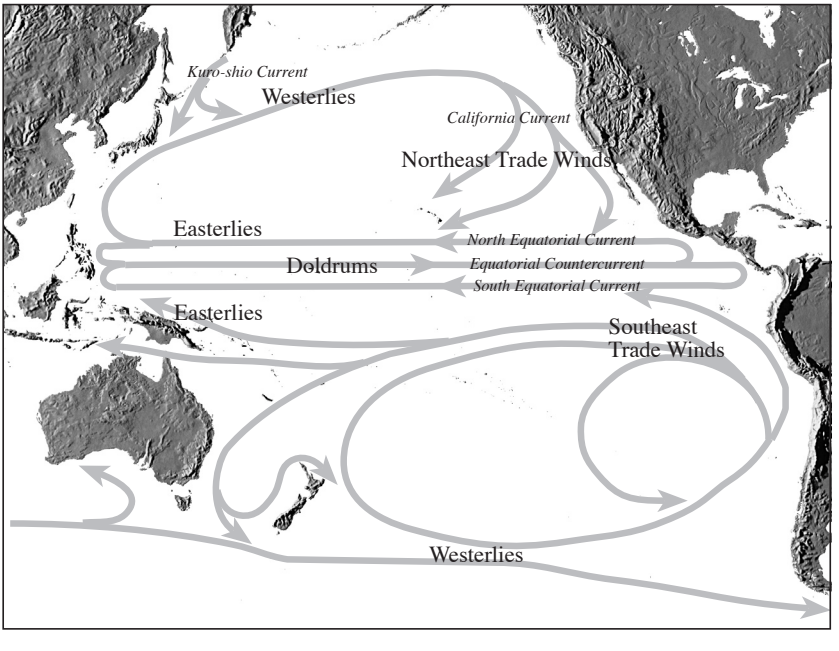

FIGURE 2. Ocean currents and prevailing winds of the Pacific Ocean

WINDS OF COLONISATION: THE SHAPE OF SPAIN'S IMPERIUM IN THE PACIFIC[7]

Superimpose a map of the Spanish imperium in the Pacific on a chart of the atmospheric circulation over that ocean and there is a remarkable 'fit' between the prevailing winds and the form and extent of Spanish colonisation. The routes that the initial explorers took and therefore the landfalls they made were largely dictated by the trade winds. The shape of the Manila-Acapulco galleon trade, the economic lifeblood of the whole Spanish endeavour in this part of the world, was likewise dependent on the westerlies for the passage out to Mexico and on the northeast trades for the westward return route to the Philippines. Islands that served this purpose fell within the Hispanic mantle, those that did not were left for others despite their initial 'discovery' and their preliminary attempts at colonisation by Spaniards. Even the settlements on the west coast of North America owe their rationale partly to the dictates of this economic system. Likewise, islands like Hawaii that one might expect to have come within the orbit of Spanish influence remained unknown or were ignored because of their location in relation to such winds. On the other hand, those places that lay on the appropriate latitudes were eventually to experience the full force of Hispanic cultural influence with all its attendant 'advantages' and 'disadvantages'. Nor was this experience confined to just the sixteenth and seventeenth centuries but was to remain an important factor influencing cultural development right up until the late nineteenth century. It is in this way that one can talk about there being 'winds of colonisation' blowing backward and forward across the Pacific during the days of sail.

The correlation between prevailing winds and colonisation begins with the initial epic European crossing of the Pacific in 1520–1521. Though there is considerable dispute over the exact route followed by Ferdinand Magellan, it is generally considered that he first headed north along the South American coast to reach warmer weather as soon as possible at about 32–34°S before striking out away from land. Here, of course, he may have been influenced in his decision to leave the mainland behind by encountering the prevailing south-east trade winds that blow in a generally west-northwest direction. At all events, running before such winds he was carried across the Pacific. Apart from sighting two small islands, probably outliers of the Tuamotus and the Line Islands, his first landfall was not till he reached the Marianas on 6 March 1521. Needing to obtain fresh supplies, he headed towards the largest of these, Guam. Naming it *Isla Ladrones* – Island of Thieves – after the inhabitants' proclivity to make off with everything they could, he sailed on now driven by the northeast trades till he reached the Philippines a week later.[8] Thus from the first, the pivotal reference points of Spain's imperium in the Pacific were largely set by the general circulation over the ocean: the Philippines as a base in the East (and not Japan

to the north or the Indonesian islands to the south), and Guam not Hawaii as a primary way-station.

Early Spanish enterprise in the region was dominated by the need to find a practical passage back to the Americas, the elusive 'turnback' – *la tornavuelta* or *vuelta*. The Treaties of Tordesillas (1494) and Zaragoza (1529) that divided the world between Portugal and Spain ensured that Spanish mariners returning from Asia would do so by back-tracking across the Pacific, and not by way of the Cape of Good Hope through Portuguese dominions. Four unsuccessful attempts were made to find a return crossing before the Spaniards even colonised the Philippines: the *Trinidad* of Magellan's squadron in 1522, the rescue mission commanded by Alvaro de Saavedra to pick-up survivors from an ill-fated earlier expedition that made two such attempts in 1527, and a ship of Ruy Lopez de Villalobos's expedition under royal instruction in 1542. Although all these efforts ended in failure and the loss of many lives, much useful information was learnt and the importance of sailing north to encounter the westerly winds around the 30th parallel realised. The successful accomplishment of this task was left to Miguel Lopez de Legaspi. As soon as he had gained a foothold in the Philippines in 1565, he lost no time in dispatching his nephew Felipe de

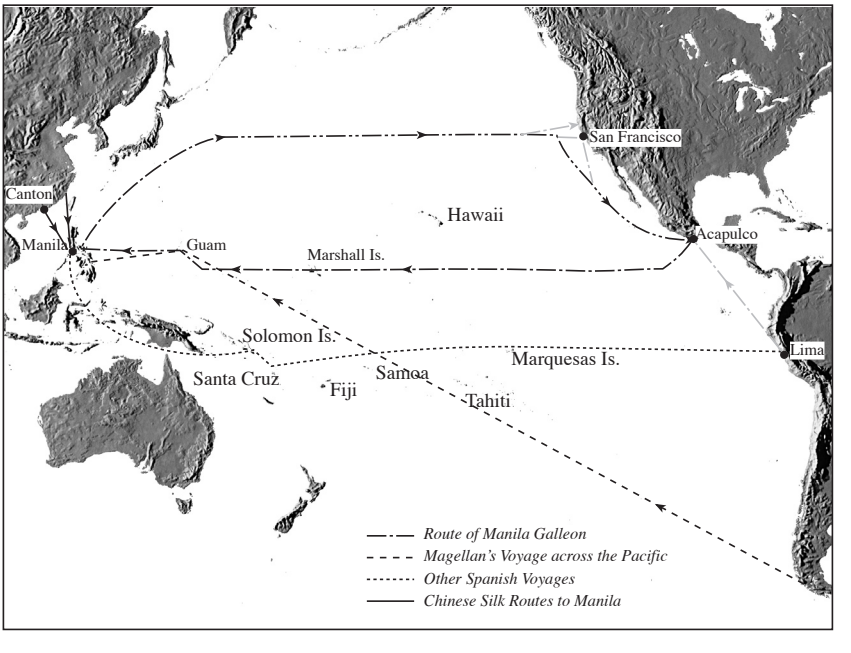

FIGURE 3. Spanish shipping routes of the Pacific

Salcedo and the veteran pilot Friar Andrés de Urdaneta to re-establish connections with New Spain. Their ship, clearing the archipelago through the Straits of San Bernardino, rode the monsoon north and continued to climb in a general north-easterly direction before encountering the prevailing westerlies that carried them across the ocean to the American coast. There the California Current helped them south till they dropped anchor in Acapulco on 8 September after being at sea 129 days. This passage came to be known as 'Urdaneta's route' and was approximately the one followed during the ensuing 250 years of the Manila-Acapulco galleon's history.[9]

The contours of the Spanish empire were established with the discovery of the eastward passage across the Pacific. The galleon trade that thus began and was to endure until the last ship, the *Magallanes*, cleared from Acapulco in 1815, served as the feeder line servicing Manila as the entrepôt of the Pacific where the silver of New Spain was exchanged for the luxuries of the Orient, above all Chinese silks and porcelains.[10] The route taken by the galleons had the ships heading south from Manila to clear the archipelago through the *Embocadero* or the straits that lie between the southern coast of Luzon and the island of Samar in the Visayas. It was important that the galleons cleared port before the end of July to catch the monsoon that blows northeast at that season. A later sailing that the exigencies of shipyards made all too common meant that the voyage northward was extended beyond the two months it usually took, or became completely impractical when the winds blew in the contrary direction. Debouching from the Straits of San Bernadino, the galleons were driven north-east before the monsoon that could be counted upon to take them to about 15° latitude before encountering more variable winds or storms that might prolong the passage or even drive the crafts back in distress to the Philippines. This calamitous event was known as an *arribada* and happened repeatedly, especially in the early seventeenth century, when six galleons were forced to return to Manila between 1602 and 1617. Beating to the north of the Marianas, the galleons then fell in with the eastward-flowing Kuro-shio Current and the prevailing westerlies in the vicinity of 37–39°N that propelled them across the Pacific within a few degrees of latitude. Making landfall around the headland of Cape Mendocino, California, ships steered south, keeping no nearer to the inhospitable shore than was necessary to discern landmarks, until they anchored at Acapulco. The westward route from Mexico to the Philippines was more direct and much quicker. Galleons dropped from Acapulco to between the 10th and 14th parallels where they picked up the northeast trade winds that carried them across the ocean to the Marianas where it became customary for ships to stop from the latter half of the seventeenth century before riding the continuingly favourable winds on to the Philippines. Often the westward route was almost a straight line with the galleons dropping southwest from Acapulco (16°51'N 99°55'W) to the vicinity of 12°N where they then headed due west to the Straits of San Bernardino at 12°32'N 124°E.[11]

Spanish contact with the Marianas remained fleeting for the first century except for the occasional visit of the Manila-bound galleons, an abortive evangelisation mission in 1595 and the wreck of two ships on Saipan in 1600 and 1638. Though delayed, the physical occupation of the islands could not be ignored indefinitely and it fell to the Jesuit, Diego Luis de Sanvítores to effect its realisation in 1668. This he accomplished with much consequent loss of life due partly to intermittent warfare and mainly to the introduction of virulent diseases like smallpox that decimated the native Chamorro population to the point of virtual extinction. A royal decree of the same year ordered the galleons to call in at the island on their passage from Acapulco and watch-fires were kept lit on the highest points of Guam and Rota during the month of June to guide the ships thither. The significance of wind in relation to the Spanish perception of the islands is suggested by the alternate name often given to them before colonisation; they were known as the *Islas de las Velas Latinas* or the Islands of Lateen Sails.[12]

On the eastern side of the Pacific, the same 'galleon' rationale was a significant factor influencing the settlement of Alta California. The long duration of the eastward passage meant scurvy was a persistent menace and crews were in dire need of fresh water and provisions by the time they neared the coast. This manifested itself as early as 1602. One of the tasks assigned Sebastian Vizcaíno in his voyage of coastal exploration was to seek Californian ports in which galleons could re-supply, and, in 1606, Philip III ordered a way-station established there for ships originating from the Philippines. Though nothing was to materialise for the succeeding one hundred and sixty years, and the eventual establishment of San Diego (1769), Monterey (1770) and San Francisco (1774) had as much to do with the seventeenth century missionary endeavours of Eusebio Francisco Kino and fear of British and Russian encroachment along the northern coasts, the Council of the Indies eventually decreed that galleons should put into port at Monterey in 1773 and imposed a fine of 4,000 pesos on captains who ignored such directives. Francisco Santiago Cruz concludes that 'the passage of the galleons contributed without doubt to the knowledge and occupation of California'. Much of the impulse for the occupation of California came from governors-general of the Philippines who in 1732 and 1734 gave direct orders to the captains of the galleons to put in to existing missions and reconnoitre the coast for other suitable ports and in 1748 advocated the settlement of Monterey.[13] Even the final act of Spain's imperium in the Pacific – the very last *entrada* so to speak, her claims to the Carolinas and Palau islands, on the grounds that she had exercised sovereignty 'since ancient times' despite the absence of any settlement – were adjudicated in her favour by papal arbitration in 1885. The fact that these islands lay along traditional trading routes, themselves largely determined by prevailing winds and currents, was assessed to be more telling than the arrival of a German warship on Yap and led to their eventual occupation by Spain in 1886.[14]

Just as those islands and peoples that were eventually incorporated within Spain's Pacific dominion depended to some extent on the way the winds blew, so those that were not were equally determined by the pattern of the general atmospheric circulation. Spanish mariners' apparent inability to locate the Hawaiian Islands, when their situation mid-way between the Philippines and America made them a potentially ideal place to replenish stocks of food and water, fails to take into consideration their actual position in relation to the prevailing wind patterns. While the islands are reputedly one of the most isolated population centres on earth, their geographic coordinates – about 21° North Latitude and 158° West Longitude – mean that they lie outside the prevailing westerlies in the North Pacific. Likewise they are situated near the furthest extreme of the north-east trade winds, which are weaker anyway than their southern hemisphere counterparts and blow freshest at about 15°N, well south of the islands' location. This is why the galleons dropped to between 10–14° latitude after leaving Acapulco on their westward passage, thus effectively leaving the islands in the middle of the two sailing paths and well out of the anticipated compass of passing ships. There is, in fact, speculation that Spanish seamen may have actually sighted the archipelago, as indeterminably situated islands bearing names such as *La Mesa*, *Los Monjes*, and *La Desgraciada* (The Table, The Hermits, and The Unfortunate One) occasionally appear on maps of the period. Cruz certainly holds that they had been there as early as 1542 based on Baron de Humboldt's study of the galleons' route.[15] Similarly even the fate of Spanish endeavours to the South-west Pacific, the remarkable voyages in Melanesia of Alvaro de Mendaña y Neyra in 1567–1568, of Mendaña again and Fernandez de Quiros in 1595, and of Quiros alone in 1605–1606, who sailed among the Solomons and the New Hebrides (Vanuatu) and even established a temporary settlement on Santa Cruz, were dependent on the prevailing winds. In this case, of course, their location south of the path of the north-east trades and the North Pacific westerlies meant that the supply, maintenance or even very existence of a Spanish presence there proved non-essential and far too costly for the stretched resources of an empire whose primary focus the winds had already determined was to be elsewhere.[16]

Not only did the prevailing winds set the routes and therefore the form and extent of the imperium, but they also established the beat or pulse at which it operated. The date of departure from Manila was dependent on favourable winds for timing. The capriciousness of the atmospheric circulation around the archipelago and its seasonal variations made it advantageous that the galleon commence its outward passage before late June. This month was certainly the best one to navigate the Straits of San Bernardino and to better avoid the storms and typhoons that become more frequent as the year advanced. Evidence points to captains and pilots trying to be underway at least before the end of July. Failure to do so could lengthen the crossing considerably from the four months taken by the *San Jerónimo* and *Santa Margarita* in 1598 to the more than eight

months needed by the *San José* in 1662. Such a delay, moreover, could have serious medical consequences leading to disease, famine and death on board. This presumably accounts for the appearance of a 'ghost' galleon off the coast of Guerrero in 1657 with not a single member of its crew or passengers left alive after a year at sea. Mortality rates were always high even at the best of times and could range to as much as fifty percent. Greater variation than is customary in the wind system of the Western Pacific, such as occurred during the seventeenth century, exacerbated matters, and considerably lengthened the voyages undertaken between 1640 and 1670. Even the great trade fair that was held annually at Acapulco in February was determined by the rhythm of the winds.[17]

Since the north-east trades that returning galleons made use of on the westward passage vary seasonally, blowing more strongly during the months of March through May, the date of departure from Acapulco was also a matter of critical importance. The galleon had to be underway by March, and most endeavoured to do so by the end of that month. In the Western Pacific, the South-east Asian monsoon begins to dominate the circulation in May, reaching its maximum intensity in July and August. A ship approaching the Philippines before the end of June would generally enjoy an easier westward sailing with the trade winds extending all the way across the ocean than one arriving during the following months. The monsoon trough that is located midway between Guam and the Philippines shifts eastward in July so that ships making a later passage had to contend with south-west winds for the latter part of the crossing. In addition to unfavourable winds, galleons had also to face the heavier weather associated with tropical convective systems. Weather conditions in the Western Pacific seem to have been the main factor in determining the length of the passage from Acapulco. Moreover, ships arriving at the *Embocadero* after the monsoon was well established might be unable to proceed any further and have to unload their cargo and passengers, who would then be forced to make their own way overland to Manila.[18]

IT'S AN ILL WIND THAT BLOWS NO ONE SOME GOOD

Thus it was on the macro level that the winds of the North Pacific largely dictated the form and extent of the Hispanic imperium and were a significant factor in determining which lands and peoples were colonised by Spain and which were not. But weather was also a significant factor in shaping the everyday life of Spain's colonial subjects. In particular, the Pacific is one of the main 'spawning' grounds of tropical cyclones, typhoons or hurricanes, rotary wind systems with speeds in excess of 64 knots. Such phenomena occur most frequently in the warm, western sections of all oceans during summer and autumn, often adjacent to the Inter Tropical Convergence zone. As typhoons require stored-up rotational energy in the air to 'feed on', they are unknown in the South Atlantic or in the

South Pacific east of longitude 130°W where the more northerly position of the ITC leaves insufficient accumulated momentum to generate and sustain strong cyclones. A typhoon consists of a slightly asymmetrical array of intense line squalls spiralling inward to a central 'eye' of between 24 to 48 kilometres in diameter. Surface winds blow inward along these squall lines with ever-increasing velocity reaching speeds of up to 200 knots with accompanying gales extending as far as 500 kilometres from the eye. Each year about 20 typhoons, equivalent to over 25 per cent of the total number of such events in the world, occur in what is delimited as the Philippine Area of Responsibility (PAR). About 95 per cent of these originate in the Pacific Ocean and so particularly affect the Marianas, Carolinas and the eastern half of the Philippine archipelago.[19]

Known respectively by Filipino and Spaniard alike in the Philippines as *baguios*, by the Portuguese in India and China as *tifones*, and as *huracanes* in Spain, there are a surprising number of historical sources on typhoons testifying to their importance, whether or not their effect has been generally recognised in conventional histories. The etymology of the words is also indicative given the local significance of typhoons in the region. *Tifón* is considered to derive from the Chinese *tai* meaning strong and *fung* meaning wind. The origin of *baguio* is more problematic having general usage throughout the languages of the Philippines from the oldest of accounts. These typhoons were not so much 'winds of colonisation' as winds that shaped the nature of colonial societies, threatening the tentative lines of communication at sea and disrupting agriculture and settled communities on land. Much of the colonial history of the Spanish Pacific is a narrative of gradual adaptation to their impact on society. Nowhere was this more so than in the Philippines, the westward 'anchor' of Spain's imperium and the purported 'Pearl of the Orient'. The prime historical source on this phenomenon is Fr. Miguel Selga's *Primer Catálogo de Baguios Filipinos*. The main matter of this compilation provides an historical account of typhoons between 1565 and 1863.[20] The more systematic recording of meteorological data only dates from the establishment of the Manila Observatory and the installation of purpose-built measuring devices in 1865 but a comprehensive list of typhoons from which reliable observation can be made really only exists from 1948 onwards.[21]

Only a proportion of such storms actually make landfall somewhere in the archipelago. A study of all tropical cyclones between 1948 and 1990 reveals that 384 or 45 per cent of the 850 documented events entered the PAR. Reference to typhoons in the more historical sources frequently records the passage of tropical cyclones that never cross land, usually in the context of vessels damaged or lost at sea. In fact, Selga's catalogue of historical typhoons is often nothing more than a chronicle of maritime disaster, with 80 per cent of all entries describing such events prior to the eighteenth century. Among the notable recorded catastrophes was the loss of a whole squadron of six vessels, 'the best that the King had placed at sea', together with over 1,000 men to a typhoon between 10 and 15 October 1617.[22] William Schurz's narrative of the galleon trade also makes

frequent mention of typhoons, noting that a ship that left Manila after the middle of July 'was practically certain of running into rough weather within the next three months of her voyage'. He provides numerous accounts of such tempests experienced on a passage that was described as 'the longest and most dreadful of any in the World'. Many of the more than 30 galleons lost in the history of the trade owed their demise to this end or were only saved from sharing such a fate by miraculous intervention. Thus the crew of the galleon *Santo Cristo de Burgos*, struck by a violent typhoon off the shores of Ticao on its way to clear the archipelago *en route* to Mexico in 1726, attributed their lives to Don Julián de Velasco's pledge to endow the local church in gratitude for their salvation.[23]

Even into the nineteenth century, tropical cyclones continued to pose a serious danger to shipping. The account of the captain of the brigantine *Manuelita* caught at sea on a voyage between China and Peru on 1 September 1850 expresses some of the immediacy of a storm:

> Enormous waves dashed increasingly against the sides of the vessel and, breaking over the bridge, carried away everything that was there. The darkness was so thick that I could not see two yards in front of me – all was confounded – sky, sea, ship were all one – only from time to time, a streak of white foam at a certain height, reflecting the pale gleam of the lightening flashes, threw a ghastly and sinister light on this so sober scene.' And he added the morning after: 'Oh how I longed for daylight! It came at last – sad day – day of mourning, what a horrible sight you offered me, when you showed me this poor *Manuelita* which only the evening before was so clean, so coquettish, now so horribly mutilated! …Oh how small man feels in such moments as these and how his thoughts draw near to God![24]

The ship's sails were shredded, her main, fore and mizzen masts lost and she limped along on a small triangular sail extended on the fore-stay and another fixed to the mizzen-yard till towed into Manila harbour 'after fifty days of misery and suffering'. In fact, many particularly severe typhoons were popularly named after the ships that had been caught at sea and lost such as *Gravina*, *Cantabria*, *Tarloc*, *Quantico* and *Euzkadi*.[25]

On land, too, the experience of typhoons was just as immediate and equally destructive. While tropical cyclones can occur in any month of the year, they are much more frequent between July and November, a period synonymous with the *tag-ulan* or wet season in the vernacular, and very rare between January and March. At least five main tracks of typhoons have been identified: one that crosses to the north of Manila, one that traverses south of the capital, one that passes east or north-east of the archipelago either disappearing or re-curving in the Pacific, one that forms in the China Sea to the west of the Philippines, and another that re-curves in the China Sea between parallels 10º and 20º. As a result, some provinces are more frequently exposed to typhoons than others with Northern Luzon receiving by far the highest frequency and strongest winds. Far from being an abnormal event, as such occasions usually appear in western

histories, they can be termed *frequent life experiences*. An impression of what the actual experience meant to people in the past is given in the local histories. Thus the *Chronicle of Nabua* provides insight into how often communities in eighteen and nineteenth century Camarines and Albay (Southern Luzon) were subjected to 'remarkable' typhoons known locally as *oguis*. The chronicle shows a high degree of consistency in the number of such events: there were nine recorded between 1701 and 1750, nine between 1751 and 1800, 12 between 1801 and 1850, and 11 between 1851 and 1900. Consequently a person was likely to experience a severe typhoon twice every 11 years in the eighteenth century and twice every nine years in the nineteenth century, or between six and eight times during an average life expectancy.[26]

With the typhoons, of course, came rain and with the rain came flood. For many people in the Philippines, the primary peril posed by typhoons was not so much the strong winds that might blow their nipa palm and bamboo house down – rarely a fatal occurrence – but rather the danger that came from a sudden deluge of water. 'Almost always during typhoons', a commentator in Pangasinan noted in 1854, 'the floods are more terrible and destructive than the winds of the storm'. Floods, in particular, have historically been the source of much privation and suffering in the Philippines: 'Hardly a province of the archipelago, but at one time or another has heard the roar of rushing waters and seen the flight of terror-stricken men'. These floods were largely of two types: the sudden raging torrent that peaks sharply and dies away in a few minutes as a result of localised rainfall, and those of a much more widespread nature and longer duration usually associated with persistent rainfall and typhoons. Such events were not generally considered worth documenting unless they had relevance or consequences to Europeans. Local histories, on the other hand, give frequent accounts of such hazards. A list drawn up from these sources found in the Archives of the Manila Observatory constitutes a record of major floods that occurred between 1691 and 1911. While almost certainly incomplete, it does provide an indication of the primary causes, geographical predisposition and even the frequency of such events in specific areas. In particular, the chronicles regularly refer to flooding in connection to the passage of tropical cyclones: over 56 per cent of all recorded incidences are directly attributed to typhoons (Figure 4). One of the very earliest accounts of flooding in Manila, a letter to Philip II, attributes the inundation of Fort Santiago to the passing of a typhoon on 29 June 1589. On other occasions, floods were mainly attributed to heavy rainfall, often associated with the monsoons. Moreover, the close association between flooding and typhoons suggests a degree of seasonality in their occurrence that corresponds to the peak in the latter's annual cycle between July and November.[27]

Typhoon-induced downpours and the steady unremitting rains of the northeast monsoon transformed the tiny streams and puny creeks of the Sierra Madre Mountains into swelling rivers that could soon become avalanches of water rushing northward into Cagayan: 'The tobacco plantations are washed away;

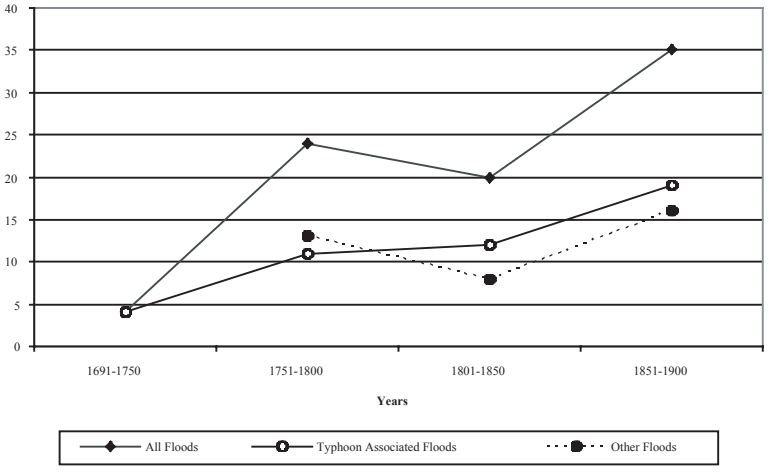

FIGURE 4. Total recorded floods, 1691–1900. Source: 'Floods in the Philippines'[28]

houses are shattered to bits or float crazily on the water like derelict ships; bridges are swept away; hundreds of people are trapped in the low lying barrios unable to escape or are carried away by angry waters into a seething sea'. The flooding of the Rio Grande de Cagayan was severe enough to be recorded as a national calamity on a number of occasions throughout the nineteenth century: in October 1845, November 1870, October 1871, September 1874 and August 1881. Some idea of what the incidence of flood on local communities might mean can be gauged by a closer scrutiny at the more complete local chronicles that suggest how often people were faced with such situations. The records for Nabua in Camarines between 1691 and 1856 and those for Pangasinan between 1768 and 1872 depict just how frequent a life-event were floods. In Nabua, a person experienced one such event every 9.7 years on average but once every 5.6 years between 1733 and 1800. This latter figure is more in line with that for Pangasinan where the average was once every 5.7 years. While the later province is located within the region where the highest incidence of floods occur, there is no reason to suppose that this degree of frequency was particularly exceptional.[29]

Other local histories present a glimpse of the reality of this hazard for communities in different regions of the archipelago. In northern Luzon, the *Chronicle of San Nicolas* in Ilocos Norte describes a violent storm and flood that destroyed half the town in 1798, while that of Balaoan, La Union, reports heavy rains in 1830 that demolished many houses and led to the relocation of the military

barracks to safer ground. The same was true of central Luzon. The *Chronicle of Pagsanjan* in Laguna gives details of the overflowing of the Balanoc and Bumbungan rivers on a number of occasions: flooding the town with enormous loss to both life and property on 22 October 1831, rising to over half a metre along the Calle Real in October 1840, and again inundating the town in 1882. The Chronicle of Nasugbu in Batangas recounts a great flood in 1839 which carried away many animals and submerged the town so that people had to use *bancas* (indigenous canoes) to move around even in the centre. Further south, the *Chronicle of Daet* in Camarines relates how rains carried away the newly constructed bridge in 1847 and how those of 1857 were 'exceedingly heavy'. A similar picture emerges for the Visayas with various chronicles mentioning the great destruction wrought in Dumangas on 3 April 1841, the floods in Barnate in 1848 and again in 1890, or the big flood in Caibiran, Leyte, that washed away 'most of the houses, and even the church and bell tower' in 1876.[30]

Any impression that these were simply small scale disasters and localised tragedies are refuted by chronicles, such as that of Tayum with its account of the rising of the Abra River to a height of more than 25 metres above its normal course causing over 1,800 deaths between 25 and 27 September 1867. The flooded area around Bangued was reported as almost circular with a diameter approximating 10 kilometres and a height of more than 20 metres. The entire town of Caoayan disappeared beneath the waters. Or the flood that inundated large portions of Central and Northern Luzon in October 1871, drowning 1,342 cattle, 842 horses, 761 carabaos and numberless hogs and domestic animals in Ilocos Norte alone. Or again, the flood in Santa Maria, Ilocos Sur, that destroyed the barrio of Sumagui, carrying away over 22 houses and causing more than 100,000 pesos worth of damages in 1911. The most obvious flood-prone areas in the islands were the ancient channels of river systems filled with Quaternary alluvial deposits. As these are also among the flattest, most fertile and easiest to irrigate landscapes, they have also been the richest centres of agriculture and intensive human settlement. Currently, half of the country's provincial capitals and major cities are situated on these floodplains.[31]

As might be expected from their geographical location, this pattern of typhoon-borne destruction was repeated on a smaller scale in Spain's main oceanic possessions, the Marianas and the Carolinas, though for here the historical sources are much scarcer. Still a somewhat similar picture emerges for Guam where it is an uncommon year without at least one typhoon passing, where tropical cyclones of medium intensity occur every six to ten years, and where really destructive ones happen about every 18 to 20 years. Records of severe typhoons exist for 1568, 1604 and 1638 based on maritime accounts. The typhoon of 1670, the first after Spain's physical occupation of the Marianas, was so severe that it was said to have destroyed the greater part of Guam and to have been regarded by the Chamorro population as a sign of the displeasure of the Christian god for their continuing resistance. An expedition despatched to reconnoitre Palau recounts

experiencing no less than four strong tropical cyclones in 1709 while another account mentions a similar storm hitting those islands in 1750. The typhoon of December 1792 flattened the church and parsonage of Agaña, the capital of Guam. So destructive were the winds that hit the Carolinas in 1815 that boat-loads of people made their way to Saipan where they sought permission to establish a community. The storm was so severe that it had deprived them of all means of sustenance – an early recorded instance of environmental refugees.[32]

Everything, however, pales in comparison to the typhoon that struck Guam on 23 September 1855. The winds between eight o'clock in the evening and two o'clock the following morning were of such intensity 'that they picked up rocks and flung them about' and 'threatened to leave nothing left afoot over the surface of the entire island'. All the native houses were destroyed without exception; the church of Agar was de-roofed and those of Merizo, Inarajan and Pago were demolished to their foundations. Nor did stone and tile buildings escape damage: doors, windows and balconies were smashed or ripped off their hinges and even many walls were damaged. But the subject of real consternation to the inhabitants was not the structural damage, severe as it was, but the loss to agriculture and the consequent threat of famine. Plants and crops stripped of their foliage 'looked as though they had been burnt'; trees were uprooted and even the coconut, the most wind-resistant of all trees, were badly affected and their fruit rendered useless. 'According to public opinion', reports the governor to his superiors in Manila, 'the typhoon experienced now has caused more damage than all the others this century'. Nor was this the end of it and further destructive typhoons were experienced in 1871, 1872, 1876, 1884, 1885, 1891 and 1895.[33]

It's an ill wind, however, that blows no one some good and a distinction should be made between these destructive typhoons and the more ordinary variety of tropical cyclones. The former have been described as 'one of the greatest natural calamities that may occur in any place', while the latter are responsible for much of the rain that makes the climate so conducive to agriculture. In the Philippines, for instance, tropical cyclones constitute an important contribution to total rainfall, especially during the latter half of the year. A study undertaken by the Philippine Atmospheric, Geophysical and Astronomical Administration (PAGASA) attributes 38 per cent of all annual average rainfall between 1951 and 1997 to the passage of typhoons over the country. Similarly, floods were so frequent that they actually shaped the morphology of local landscapes, filling-in depressions and obliterating *esteros* (canals or streams) and covering everything in a rich layer of silt that might explain why such areas continue to be the site of repeated human occupation. Only when the floods were 'exceptional and lasted too long' did they cover 'the fields and destroy the harvests, causing losses that were impossible to assess with any certainty'. In fact, typhoons have had such an impact on Pacific societies that they have been instrumental in shaping many features of Hispanic culture there.[34]

The evidence of this over time can be found in local architectural styles and land usage: the low-to-the-ground residential dwellings with stout walls and the emphasis on root crop agriculture (yams, sweet-potatoes, taro, garlic and onions) to resist strong winds that are characteristic of both the Batanes and Marianas islanders' life. In other environments variants of the traditional nipa palm and bamboo house constructed on stilts is also an innovative adaptation to flooding. All across the Philippines, evidence of co-operative arrangements exist that share certain basic characteristics to do with the mobilisation of community labour, especially in times of misfortune or loss arising from natural hazards. In his 1914 report, Harvey E. Hostetter, Director of Education (employing municipal schoolteachers to conduct local enquiries) recorded such associations building special houses 'which might be occupied by anyone whose residence would be destroyed by a typhoon' and noted that such practice 'was a custom here'. An account written in Ilocos Norte recounted how after 'a furious typhoon' the previous May in which nearly all the dwellings were levelled 'the destroyed houses…were rebuilt quickly as soon as the storm was over because the owners could help each other by turn in spite of their lack of funds'. The communal construction of dams to protect *barrios* (neighbourhoods) from floods was apparently common practice in Antique as well. Hispanic colonial societies exhibited an intricate and complex web of social, economic and cultural relationships to the weather that oscillated between disasters on the one hand and the timely need for rainfall on the other.[35]

CONCLUSION

Winds, then, are not just so much hot (or cold) air but were a significant factor in determining the form and shaping the experience of Spain's imperium in the Pacific. Of course, they do not explain why Spaniards went there in the first place: origins and motives may still have to be accounted for in terms of god, gold and glory. It was the general circulation in the Northern Pacific, the direction and flow of the north-east trades and westerlies that primarily decided which islands and peoples were to be included within the empire and those which were not. If this is only logical, and *it is only logical*, it nonetheless should not diminish consideration of the influence that weather patterns had in an age before steam when locomotion depended primarily on sail. To a large extent, the Philippines, the Marianas, the Carolinas and Palau were affected by Hispanic culture and not by some other European one because that was the way the winds blew. If the imperium's shape was attributable to the winds, then its continuing maintenance that way was due to the innate conservatism of an empire extended beyond its resources and one where unnecessary risk-taking had come to be looked upon with disfavour and even aversion. Once set, Spain's empire in the Pacific did not expand if one discounts the *de facto* as opposed to the *de jure* occupation

of the Carolinas and Palau in the late nineteenth century. Hawaiian islanders, therefore, were able to enjoy another two centuries of undisturbed development before being 'discovered' in their turn by Captain Cook in 1778.

If the wind was an important factor in determining the larger picture, it was also a significant one in shaping societies at the more micro level. Typhoons are simply a part of life in the Western Pacific, one that with their strong winds and heavy rains frequently destroys ships at sea and buildings on land, putting lives at risk in both realms, and that can even, as in the case of the Carolinas in 1815 and as suggested on Guam in 1855, threaten whole societies with famine and social collapse. That such events were common is indisputable; that people so affected became accustomed to them and adapted their lives accordingly raises some intriguing avenues of inquiry. Perhaps a society's past accommodation and constant exposure to threat is important to the generation of its historical development and present culture especially in the case of communities that are geographically located in hazard-prone landmasses. In fact, the history of such societies may be largely shaped by the inter-relationship of the natural to the human, of the physical to the social. To what extent were Hispanic colonial societies influenced by such phenomena in terms of agriculture (crops sown and land usage), architecture (design and construction materials), settlement sites (location and migration) and even the writ of imperial government (damage to infrastructure and problems of communication)? Giving due consideration to the influence of weather – the direction of winds and the impact of typhoons – on the formation and operation of Spain's empire in the Pacific is not an argument in favour of environmental determinism but one that properly recognises the historical importance of natural processes in the formation of human cultures.[36]

NOTES

[1] This article was begun in the hospital delivery room while my daughter, Jenna Annemarijn was being born in Hoorn, the Netherlands on 20 August 2004. The following text is dedicated to her.

[2] On the nature of imperial governance, see Charles Cunningham, *The Audiencia in the Spanish Colonies as Illustrated by the Audiencia of Manila, 1583–1800* (Berkeley: University of California Press, 1919); Eliodoro Robles, *The Philippines in the Nineteenth Century* (Quezon City: Malaya Books, 1969); Nicholas Cushner, *Spain in the Philippines: From Conquest to Revolution* (Quezon City: Ateneo de Manila University Press, 1971); and Greg Bankoff *Crime, Society and the State in the Nineteenth Century Philippines* (Quezon City: Ateneo de Manila University Press, 1996). On evangelisation, see John Leddy Phelan, *The Hispanicization of the Philippines: Spanish Aims and Filipino Responses 1565–1700* (Madison: University of Wisconsin Press, 1959); Horacio de la Costa, *The Jesuits in the Philippines, 1581–1768* (Cambridge, Massachusetts: Harvard University Press, 1961); Gerald Anderson, *Studies in Philippine Church History* (Ithaca: Cornell University Press, 1969); and Vicente Rafael, *Contracting Colonialism Transla-*

tion and Christian Conversion in Tagalog Society under Early Spanish Rule (Ithaca: Cornell University Press, 1988).

[3] Winds are named according to the point of the compass from which they blow, that is winds blowing from the West are west winds or westerlies, conversely those blowing from the East are east winds or easterlies.

[4] The above discussion of atmospheric circulation is based mainly upon William van Dorn, *Oceanography and Seamanship* (Centreville, Maryland: Cornell Maritime Press, 1993), 59–67. *Primer on El Niño/Southern Oscillation (ENSO)* (Quezon City: Climatology and Agrometeorology Branch, PAGASA, Department of Science and Technology, 1997), 2; Maxx Dilley and B. N. Heyman, 'ENSO and Disaster: Droughts, Floods and El Niño/Southern Oscillation Warm Events', *Disasters* 19, 30 (1995): 181–2; and *The El Niño Phenomenon* (Nairobi: UNEP/GEM Environment Library No. 8, 1992), 14–15. While the dynamics of ENSO are now reasonably well understood, meteorologists are still unable to explain what upsets the normally balanced cycle of wind and water. It is considered possible that the amount of snowfall in the Himalayas may provide the trigger that initiates a warm or cold event or that they are linked to the number of sunspots. *The El Niño Phenomenon*, 9; G. Diokno, 'Coping With the El Niño of the Century', *Canopy International* 23, 5 (1997), 6; David Enfield, 'Historical and Prehistorical Overview of El Niño/Southern Oscillation', in *El Niño: Historical and Paleoclimatic Aspects of the Southern Oscillation*, ed. H. Diaz and V. Markgraf (Cambridge: Cambridge University Press, 1992), 95–118.

[5] There are also subsurface Equatorial Counter-currents that flow eastward beneath the surface currents.

[6] Dorn, *Oceanography and Seamanship*, 101–4, 107–9; Francisco Santiago Cruz, *La Nao de China* (Mexico: Editorial Jus, 1962), 98.

[7] Parts of this section have previously appeared in Greg Bankoff, 'Depends Which Way the Winds Blow', *Mains'l Haul: A Journal of Pacific Maritime History, 41, 2/3 (2005).*

[8] Oskar Spate, *The Spanish Lake: The Pacific since Magellan, Volume 1* (London: Croom Helm, 1979), 47–9.

[9] Spate, *The Spanish Lake*, 104–6; and William Schurz, *The Manila Galleon* (Manila: Historical Conservation Society, 1985 originally published E. P. Dutton & Co., 1939), 178–82. On the early history of Spain in the Philippines, see Phelan, *The Hispanicization of the Philippines*.

[10] Oskar Spate, *Monopolists and Freebooters: The Pacific since Magellan, Volume 2* (Canberra: Australian National University Press, 1983), 279–89. In 1813 the Cortes de Cadiz issued a decree ending the trade. The last galleon 'raised its rusty anchors, set its yellowed sails and slowly sailed out of Acapulco bay toward the setting sun, never to return' in March 1815. M. Almazán, 'El Galeon de Manila', *Artes de Mexico* 18 (1971): 19. On the galleon trade, see also Jose Maria Frances *Mexico y Manila (Historia de Dos Ciudades)* (México D. F.: Secretaria de Educación Publica Departamento de Bibiotecas, 1964), 31–6; Rafael Bernal, *México en Filipinas Estudio de una Transculturación* (México, D. F.: Universidad Nacional Autónoma de México, 1965), 75–86; John Hoyt Williams, 'Tapping the Orient: Voyages of the Manila Galleons', *Oceans* 15 (1982): 44–9; and Ostwald Sales Colín, *El Moviemiento Portuario de Acapulco El Protagonismo de Nueva España en la Relación con Filipinas, 1587–1648* (Mexico D.F.: Plaza y Valdes Editas, 2000), 81–110. For a complete list of all Pacific sailings through Micronesia, see

Rodrigue Lévesque, 'Ships through Micronesia', in *History of Micronesia* (Gatineau, Quebec: Lévesque Publications, 2002), 20: 377–646.

[11] William Schurz, 'The Manila Galleon and California', *Southwest Historical Quarterly* 21, 2 (1917): 107–126; Cruz, *La Nao de China*, 101; and Rolando Garcia, Henry Díaz, Ricatrdo García Herrera, Jon Eischeid, Maria del Rosario Prieto, Emiliano Hernández, Luis Gimeno, Francisco Rubio Durán and Ana María Bascary, 'Atmospheric Circulation Changes in the Tropical Pacific Inferred from the Voyages of the Manila Galleons in the Sixteenth–Eighteenth Centuries', *Bulletin of the American Meteorological Society* 82, 11 (2001): 2346. There was much discussion and even gubernatorial directions on occasion to have the galleons take the much more direct route up the west coast of Luzon and around Cape Bojeador with claims that ships could reach the 20°N parallel in two to three days and so reduce the voyage to Mexico from five or six to three months. Schurz, *The Manila Galleon*, 183–184. Galleons are known to have returned to Manila in 1593, 1602, 1616–1617, 1663, 1672, 1682, 1687, 1795 and 1806. Cruz, *La Nao de China*, 136.

[12] Spate, *Monopolists and Freebooters*, 114–8; Cruz, *La Nao de China*, 101; Schurz, *The Manila Galleon*, 201. The Chamorro population of Guam, Saipan and Tinian (the inhabited islands) declined from an estimated 80–100,000 in 1668 to 3,197 by the Census of 1710 and had utterly disappeared by 1887. See also Andrés de Ledesma, *Mission in the Marianas: An Account of Father Diego Luis de Sanvítores and his Companions, 1669–1670*. Trans. with commentary by W. Barrett (Minneapolis: University of Minnesota Press, 1975); Francisco García, *Sanvítores in the Marianas* (Guam: Micronesian Area Research Center, University of Guam, 1980); and Emilie Johnston, *Father Sanvítores: His Life, Times and Martyrdom* (Guam: Micronesian Area Research Center, University of Guam, 1993).

[13] Cruz, *La Nao de China*, 110–115, 139; W. Michael Mathes, *Vizcaíno and Spanish Expansion in the Pacific Ocean, 1580–1630* (San Francisco: California Historical Society, 1968); Schurz, *The Manila Galleon*, 190, 198–200; and Spate, *Monopolists and Freebooters*, 296–307. On Spanish settlement of Alta California and the Northwest, see Irving Richman, *California Under Spain and Mexico 1535–1847* (New York: Cooper Square Publisher, 1965); John Kendrick, *The Men With Wooden Feet: The Spanish Exploration of the Pacific Northwest* (Toronto: NC Press Limited, 1985); Warren Cook, *Flood Tide of Empire: Spain and the Pacific Northwest, 1543–1819* (New Haven and London: Yale University Press, 1973); David Thomas, (ed.) *Spanish Borderlands Sourcebooks: Native American Perspectives on the Hispanic Colonization of Alta California* (New York: Garland Publishing, 1991); and George Phillips, *Indians and Intruders in Central California 1769–1849* (Norman: University of Oklahoma, 1993), 32–64.

[14] Rafael Gracia y Parejo, *Considerations on the Rights of Spain over the Caroline Islands* (Madrid: Establecímiento Típographico de Gregorio Juste, 1885). On Spanish colonialism in the Carolinas, see David Hanlon, *Upon a Stone Altar: A History of the Island of Pohnpei to 1890* (Honolulu: University of Hawaii Press, 1988); and Francis Hezel, *Strangers in Their Own Land: A Century of Colonial Rule in the Caroline and Marshall Islands* (Honolulu: University of Hawaii Press, 1995).

[15] Dorn, *Oceanography and Seamanship*, 74; Schurz, *The Manila Galleon*, 186–187; Cruz, *La Nao de China*, 107. See also Alexander von Humboldt, *Political Essay on the Kingdom of New Spain* (London: Longman, Hurst, Rees, Orme and Brown, 1811), volume 4.

[16] Spate, *The Spanish Lake*, 119–143. On the voyages of Mendaña and Quirós, see William Amherst and Basil Thomson, *The Discovery of the Solomon Islands by Alvaro de Mendaña in 1568* (London: Hakluyt Society, London, 1901); Celsus Kelly, *La Australia del Spiritu Santo: The Journal of Fray Martin de Munilla and Other Documents Relating to the Voyage of Pedro Fernández de Quirós to the South Sea 1605–1606 and the Franciscan Missionary Plan 1617–1627* (Cambridge: Hakluyt Society at the [Cambridge] University Press, 1966); and Clements Markham, *The Voyages of Pedro Fernández de Quirós, 1595 to 1606* (Nendeln, Liechtenstein: Kraus Reprint, 1967). On Spanish influences on other parts of the Pacific, see Robert Langdon's controversial studies *The Lost Caravel* (Sydney: Pacific Publications, 1975) and *The Lost Caravel Re-Explored* (Canberra: Brogla Press, 1988).

[17] Cruz, *La Nao de China*, 103, 125–6, 130, 138, 140; and Garcia et al., 'Atmospheric Circulation Changes in the Tropical Pacific', 2448–50. A royal order decreed that galleons should set sail before 1 July. The prevailing winds in the Philippines blow from the east between mid December and March, north to south from April to May, south-easterly June through August, north-easterly from late September to October, and from the north and north-east from the end of October to the beginning of December. Cruz enumerates the following deaths among crew sizes that ranged between 60 and 100 in the first galleons to upward of 400 on the largest: 80 in 1606, 99 in 1620, 105 in 1629, 114 in 1643 and 82 in 1752.

[18] Garcia et al., 'Atmospheric Circulation Changes in the Tropical Pacific', 2440, 2442, 2447–8.

[19] The remaining tropical cyclones come across the South China Sea. The western and central areas of the archipelago are generally less exposed to the full force of typhoons whose intensity tends to dissipate as they cross the central mountain ranges. Dorn, *Oceanography and Seamanship*, 80–81; and Nicholas Brown, Leoncio Amadore and Emmanuel Torrente, 'Philippine Country Study' in *Disaster Mitigation in Asia and the Pacific* (Manila: Asian Development Bank, 1991), 196. The PAR includes a rectangular area of ocean with the Philippine Islands at the centre, Palau at the eastern edge, Taiwan to the north and Sabah in the south.

[20] Miguel Selga, 'Primer Catálogo de Baguios Filipinos', *Revista de la Sociedad Astronómica de España y América* 19 (1928): 15, 19, 42, 63–4, 94–5, 110–11, 142–3, 20, (1929): 14–15, 27–31, 44–7, 60–4, 73–9, 89–96, 141–4, (1930): 7–13, 25–32, 46–7. This astonishing chronicle of typhoons in the archipelago commences with a Chinese account of the one that struck the ship carrying the Buddhist sage Fa-hien on his return to China off the West coast of Palawan in July 414 and of the similar fate that overtook the Moorish traveller Ibn Batuta on a voyage between Amoy and Sumatra in July 1348. Miguel Selga, 'Notas Etimológicas Sobre el Tifón y el Baguio', *Revista de la Sociedad Astronómica de España y América* 16 (1926): 110. A detailed discussion of the historical sources on the nomenclature of typhoons is given in Footnote 40 of Miguel Selga, 'Relación Inédita del P. Francisco Ignacio Alzina S.J. sobre los Baguios, Mareas y Terremotos de Filipinas', *Revista de la Sociedad Astronómica de España y América* 18 (1928): 43.

[21] Vicente Manalo, Vic Leaño and Ernesto Verceles, 'Frequency of Tropical Cyclones, By Intensity, Crossing the Philippines', *Ang Tagamasid* 23, 2 (1995): 8. The catalogue of typhoons is continued for the late nineteenth century in a publication on climate complied by the Manila Observatory in 1899 and published as part of *El Archipiélago Filipino* printed in Washington at the expense of the US government and later repro-

duced in the *First Report of the Philippine Commission to the President* (Washington: Government Printing Office, 1901): 4, 290–344. Additional material on southern Luzon for the mid nineteenth and early twentieth centuries is provided by the local history of Nabua in 'List of Typhoons', Archive of the Manila Observatory, Box 9–35. Material on the number of typhoons experienced during the first two decades of the US colonial period is contained in the *Census of the Philippine Islands, 1918* (Manila: Bureau of Printing, 1920): 1, 445–67.

[22] Bernardo Soriano**,** 'Tropical Cyclone, Statistics in the Bicol Region', *Ang Tagamasid* 20, 4 (1992): 12; Selga, 'Primer Catálogo de Baguios Filipinos'; Miguel Selga**, '**El Baguio del Santo Cristo de Burgos', *Revista de la Sociedad Astronómica de España y América* 20, 134 (1930): 20, 44–5.

[23] The ship's image was placed on the main altar and became an object of local veneration to the islanders. The body of water encompassed by Burias Island, Sorsogon and Ticao Island is known as the Ticao Pass. It is an area of strong currents and relatively shallow seabed. Schurz, *The Manila Galleon*, 204–6, 208; and Selga, **'**El Baguio del Santo Cristo de Burgos', 10. See also Garcia et al., 'Atmospheric Circulation Changes in the Tropical Pacific', 2447–8.

[24] 'El Tifón del Bergantín Francés Manuelita', Archive of the Manila Observatory, Box 10–36/6.

[25] Miguel Selga, 'La Cronología Popular en la Designación de Temporales y Terremotos', *Urania* 28, 206 (1938): 65.

[26] There is little difference in either the total number or the nature of tropical cyclones between Central and Southern Luzon and the Visayas but Mindanao presents a very different profile, having fewer tropical cyclones and a higher percentage of milder events than any other region. *Census of the Philippine Islands, 1903* (Washington: United States Bureau of the Census, 1905), 1, 158–60; *Census of the Philippine Islands, 1918*, 1, 447–52; Greg Bankoff, *Cultures of Disaster Society and Natural Hazard in the Philippines* (London: Routledge Curzon, 2003), 45–6, 158–63, 179–180; and 'List of Typhoons'. The *Chronicle of Nabua* was compiled from the municipal reports sent in reply to a questionnaire of 1911. The chronicle lists typhoons in the following years: 1701, 1703, 1709, 1713, 1721, 1723, 1726, 1733, 1748, 1758, 1762, 1766, 1774, 1776, 1781 x 3, 1790, 1801 x 4, 1803, 1811, 1816, 1824, 1839 x 3, 1857, 1867, 1870, 1875 x 2, 1881, 1885, 1891 x 2, and 1892 x 2.

[27] Miguel Selga, 'El baguio del 4 de Octubre de 1854 en Pangasinan', Archive of the Manila Observatory, Box 10–36/10; and 'Floods in the Philippines 1691–1911'. The later list is anonymous and does not seem to have been composed by Miguel Selga but makes frequent reference to his works and so presumably post-dates him.

[28] 'Floods in the Philippines 1691–1911', Archive of the Manila Observatory, Box 10–37.

[29] 'Floods in the Philippines 1691–1911'. Severe flooding of the Rio Grande de Cagayan also happened in October 1908, October 1909, October 1924 and December 1937. Half of the 18 floods in Pangasinan were recorded in the chronicle of Calasiao. Floods occurred in Nabua in 1691, 1697, 1733, 1748, 1758, 1767, 1775, 1783, 1786, 1787, 1790, 1793, 1798, 1800, 1817, 1840 and 1856; and in Pangasinan in 1768, 1774, 1776, 1777, 1779, 1785, 1790, 1794, 1797, 1806, 1820, 1821, 1825, 1831, 1857, 1865, 1871 and

1872. Part of the following account has previously appeared in Bankoff, *Cultures of Disaster*, 48–51.

[30] 'List of Typhoons'; and 'Floods in the Philippines 1691–1911'.

[31] G. Balce, R. Villones and D. delos Angeles, 'An Overview of Flood Hazards in the Philippines', in *Natural Disaster Mitigation in the Philippines. Proceedings of National Conference on Natural Disaster Mitigation 19–21 October 1994* (Quezon City: DOST-PHIVOLCS, 1994), 19–30; 'List of Typhoons'; and 'Floods in the Philippines 1691–1911'.

[32] 'Sobre La Periodicidad de Los Baguios de Guam', Archive of the Manila Observatory, Box 10–41. For a detailed record of the frequency and magnitude of typhoons during the nineteenth century, see an abridged version of a register known to have been kept by several Agaña parish priests in Fathers Ancieto Ibáñez del Carmen and Francisco Resano del Corazón de Jesús, *Chronicle of the Marian Islands* (*Crónica de las Islas Marianas*) Translated and annotated by M. Driver (Mangilao, Guam: Micronesian Area Research Center, University of Guam, 1998).

[33] 'Sobre La Periodicidad de Los Baguios de Guam' and Ibáñez del Carmen, *Chronicle of the Marian Islands*, 8–10.

[34] José Coronas, 'The Climate and Weather of the Philippines, 1903–1918', in *Census of the Philippine Islands, 1918* (Manila: Bureau of Printing, 1920), 1, 446; *Documentation on the Impacts of and Responses to Extreme Climate Events Food and Agricultural Sector* (Quezon City: Extreme Climate Events Technical Working Group for Agriculture, chaired by Dr Romeo Recide, Bureau of Agricultural Statistics, 2001): 9; 'Alcalde-mayor de Bulacan to Governor-general, Bulacan, 6 March 1872', Philippine National Archive, Calamidades Publicas, Baguios y Huracanes, Bundle 2; and 'Floods in the Philippines 1691–1911', 5.

[35] Raymundus Blolong, 'The Ivatan Cultural Adaptation to Typhoons: A Portrait of a Self-Reliant Community from the Indigenous Development Perspective', *Aghamato* 8 (1996): 18–19, 21; Ibáñez del Carmen and Francisco Resano del Corazón de Jesús, *Chronicle of the Marian Islands*, 9; and Florentino Hornedo, *Taming the Wind: Ethno-cultural history on the Ivatan of the Batanes Isles* (Manila: University of Santo Tomas Publishing House, 2000); and Julian Balmaceda, '"Turnuhan" as Practised in Various Provinces', *Philippine Agricultural Review* 20, 4 (1927): 386, 387, 401. On the different types and construction techniques of indigenous house-building, see Julian Dacanay, *Ethnic Houses and Philippine Artistic Expression* (Pasig, Metro Manila: One-man Show Studio, 1988); Norma Alarcon, *Philippine Architecture during the Pre-Spanish and Spanish Periods* (Manila: Santo Tomas University Press, 1991), 23–77; and Corazon Hila, Rodrigo Perez and Julian Dacanay, *Balai Vernacular Images of the Filipino's Private Space* (Manila: Sentrong Pangkultura ng Pilipinas, Manila, 1992), 13–72.

[36] Bankoff, *Cultures of Disaster*; Greg Bankoff, 'Cultures of Disaster, Cultures of Coping: Hazard as a Frequent Life Experience in the Philippines, 1600–2000', in *Natural Hazards Responses and Strategies in Global Perspective*, ed. C. Mauch and C. Pfister (USA: Rowman & Littlefield, forthcoming 2006). Susanna Hoffman and Anthony Oliver-Smith refer to this human-environmental interaction in terms of 'mutuality'. Susanna Hoffman and Anthony Oliver-Smith, 'Anthropology and the Angry Earth: An Overview', in *The Angry Earth: Disaster in Anthropological Perspectives*, ed. A. Smith and S. Hoffman (New York and London: Routledge, 1999), 6.