great historical events that were significantly affected by the weather: I. the Mongol invasions of Japan

Abstract
Khubilai Khan, the great Mongol ruler of the 13th century, launched two invasions against Japan: in 1274 and in 1281. In both cases, Mongol, Korean, and Chinese forces, Korean as well as South Chinese seamen and vessels were involved. Particularly large was the armada of the second invasion. In both cases the landings took place along the NW coast of Kyūshū, the major Japanese island closest to Korea. Both invasions were abruptly terminated by severe storms at sea, west of Kyūshū. Historians seem to agree that the storm of 1281 was a typhoon. The storms caused heavy losses in manpower and vessels to the invaders. We quote some contemporary records describing the catastrophic effects of the tempests.

1. Introduction
In an earlier paper we have drawn attention to a passage in the classical Greek literature describing the effect of a sea breeze on the outcome of a battle of great historical importance. The event of concern was the battle of Salamis which took place in 480 B.C. between the invading Persian navy of King Xerxes and the defending Greek fleet. According to Plutarch, Themistocles, the Commander-in-Chief of the Allied Greek forces, so directed the hour of beginning of the sea combat and so steered the course of fighting that the heavy and clumsy Persian warships would find themselves in the narrow Straits of Salamis, off Athens, at a time of the day when a diurnal wind (Athens’s sea breeze) springs up in the morning. The large number of somewhat unwieldy Persian vessels found it difficult to maneuver in the narrow straits whose waters were made choppy by the wind. It was then that Themistocles ordered the nimble Greek ships to attack. In these conditions the Greek navy succeeded in annihilating the Persian armada, thus rescuing Greece from certain suffering and from possible destruction. One is probably justified in saying that the victory saved the heritage of Greece for posterity and enabled the Greek culture subsequently to reach even higher peaks. Thus a meteorological factor contributed significantly to the outcome of a great historical event.

The noteworthy role of a meteorological factor in the above mentioned historical battle has aroused our in- terest in other major historical events where weather played an important and, perhaps, decisive part in shaping the course of happenings. The present note is the first of these studies. It relates to the effects of severe storms at sea (probably typhoons) on two attempts by Khubilai Khan, the great Mongol ruler of the 13th century, to invade Japan.

2. Developments leading up to the first invasion
The Mongols conquered northern China around 1230. In 1231 and 1238 they crossed the Yalu river (the name will be remembered from the Korean war of 1950–53) and extended their domain to the Korean peninsula, though the King of Korea (Koryŏ) was permitted to go on ruling as a vassal. Ever since the defeat of the Japanese by China in the 7th century in Korea and in the waters off the peninsula, the Japanese feared that Korea could serve as an assault base for a powerful enemy set at conquering Japan. With Korea “pointing at the heart of Japan” (as the historian Kennedy puts it) and with the peninsula separated from the Japanese isles by a strait of about 150 km in width, the threat of a Mongol invasion loomed large in Japan’s eyes. One is reminded of a more recent period of history when the British were concerned with which power had control of the Low Countries.

In 1259 Khubilai Khan, the grandson of Genghis Khan, ascended the Mongol throne and became the Emperor of China (though southern China was not subjugated by him until 1279). Khubilai Khan ruled until 1294. Following in the tradition of Chinese emperors, he attempted (with considerable success) to force neighboring states into a position of subservience. In line with this tradition, which was rationalized by the irrational argument of a “heavenly mission,” Khubilai sent envoys to Japan, accompanied by Korean officers as guides. They carried a dispatch calling on the “King of Japan” to submit or have his country invaded. The ambassadors set off from a Korean port in 1267, but weather conditions at sea forced the mission to return to the peninsula.

It appears that in subsequent years, up to 1274, Khubilai directed five more embassies to Japan which were never permitted by the Japanese to reach either Kyoto, the imperial capital, or Kamakura, the seat of the Bakufu (military, or “tent,” government; “Kamakura Shogunate”). In 1268 the emissaries were held up at

J. Neumann
Dept. of Atmospheric Sciences
The Hebrew University
Jerusalem, Israel

* See References and Footnotes at end of article.
3. The first invasion: 1274

To launch the invasion, Khubilai Khan needed ships and seamen (as well as soldiers). The Mongols, however, were a people of the steppe and of the saddle. They were no shipwrights, nor did they possess a knowledge and experience of seafaring. The Khan, therefore, ordered the King of Korea to build warships, and to raise a force of fighters and crews to operate the ships. In addition, extensive areas of the peninsula were planted with rice to feed the forces.

In November 1274 an armada of approximately 40,000 men, including about 20,000 Mongol and Chinese, 8,000 Korean troops, and some 7,000 Korean and Chinese seamen, put to sea from a port in Korea. The fleet included about 300 "large" ships and 400 to 500 small craft. For a comparison, one may point out that the Norman force of William the Conqueror, which invaded Britain in 1066, counted, according to the historian Corbett, a total of about 5,000 men (plus 2,500 horses), including the seamen. As Corbett puts it: "In that age even 5,000 men were an almost fabulously large force to collect and keep." And, we shall see below, the armada of the second Mongol invasion was over three times larger than that of the first invasion. Moreover, judging by the Bayeux tapestry, the largest vessels of William the Conqueror were nothing but open barges (with one square sail), whereas, according to a contemporary Japanese testimony cited by Henthorn, even the ships that carried Khubilai's emissaries to Japan, were "large."

The fact that the great Khan sent a force of about 40,000 must mean either that he grossly overestimated the capabilities of his men or that his intelligence reports of Japan's military power and potential must have been poor. Some historians (Murdoch) estimate that Japan would have been able to mobilize something like 400,000 men, including the determined samurai ("guards") warriors. Thus, even in terms of sheer numbers the Japanese fighting body could have greatly outnumbered the Mongol-Chinese-Korean invasion force, not to mention the combat quality of the Japanese, and, especially, that of the samurai.

Khubilai's armada first overran some small islands off the NW coast of Kyushū (see Fig. 1) annihilating the Japanese garrisons there, and then, on 19 November, landed at Hakata and Imazu on Kyushū proper (Fig. 1). The Mongols were at an advantage insofar as they possessed great slings and crossbows, which completely out-ranged the great samurai crossbows although the latter required strong men to draw. According to some contemporary records, the Mongols brought along, additionally, weapons that were in the nature of rockets that fired combustible materials; this is the first time the Japanese met such weapons. Other historians (e.g., Franke), however, do not accept this idea that the rockets were taken along.

Sir George Sansom, the prominent scholar of Japanese history, describes the events of 19 November as follows:

...
It looked as if the whole Kyūshū force would have to fight until near annihilation, so as to give time for the arrival of reinforcements which then were approaching from the central and eastern provinces. Despite their failure at Hakata, however, the Japanese were by no means defeated, since given time they could overwhelm the Mongols by superior numbers. As it turned out, such desperate measures were not needed, since luckily for the Kyūshū men, that night as they lay exhausted and drenched in their dyke a great storm threatened and the weather-wise Korean pilots pressed the Mongol generals to re-embark their army, lest they should find themselves isolated on shore, their ships on the rocks and all possibility of retreat cut off.

The storm and the fear of a night attack by the Japanese led the Mongol commanders to order a general re-embarkation and sail-off. Sansom continues:

Fortunately for them [the Japanese], when daylight came they saw the last stragglers of the enemy fleet making out of the bay. One vessel at least ran aground on the Shiga spit [Fig. 1], and many more sank in the open sea during the tempest—according to some accounts two hundred were lost. Korean records say that 13,000 men of the invading force lost their lives during this expedition, many, perhaps most of them, by drowning. The invasion had failed and the remnants of the Mongol force made their way back to Korea in disorder and distress.

The historian Murdoch also mentions that as a result of the storm “One ship with about a hundred men aboard ran aground on Shiga spit . . . and these unfortunate were promptly captured, carried to Mizuki, and there put to sword. Many of the Koryu [Korea] vessels foundered on the open sea.”

4. The second invasion: 1281

Khubilai Khan believed that the failure of the invasion was due to the storm. As Sansom puts it: his generals were careful not to contradict the idea. In 1275 he sent another mission to Japan demanding submission. These envoys were executed by the Bakufu. Greatly angered by the execution of his emissaries, the Khan now intensified his preparations for a second invasion. He even set up an “Office for the Chastisement of Japan” for the supervision and coordination of the efforts by his court and by some of the vassals. (One is somewhat reminded of the “Continental System,” that is, the continental blockade organized by Napoleon against Britain).

In 1279 Khubilai conquered southern China; this considerably increased his maritime resources and manpower for the new invasion. In some of his messages he even attempted to use the fact of South China’s submission in order to intimidate the Japanese, but to no avail.

In the meantime, the Bakufu worked, on its part, to build up Japan’s military strength. As an additional measure, a defense wall as constructed along the Hako-zaki Bay (Fig. 1, crenelated line in inlay map) of Kyūshū, including the area where the main Mongol invasion force landed in 1274.

The Khan’s invasion forces moved off in 1281. Some 40,000 Mongols, Koreans and North Chinese sailed in about 900 vessels from Korea. A second force, believed to comprise some 100,000 men, embarked from ports of the recently subjugated South China. The latter force was to rendezvous with the northern armada. Actually, the northern force was ready in spring and one speculates whether this time was chosen so as to reach Japan before the onset of the typhoon season. The southern force, however, was late: the actual invasion did not begin until late in June. The samurai and the other Japanese warriors must have put up a most determined and effective fight as the invasion force was hardly able to make territorial gains for some six weeks (when a typhoon terminated the invasion). The combat was restricted to the coastal area of the NW Kyūshū. The Japanese even dared attack the vessels of Khubilai’s armada by their “mosquito” fleet, their small vessels. This is all the more astounding as it is almost certain that the invading armada must have had ships of considerable size for the times. Marco Polo, who arrived to Khubilai’s court in 1275, describes in his travel account that Chinese boats were large, being served by 200 to 300 seamen. And, perhaps, we can believe Polo when he tells of things seen by himself.

The invading army, especially the Chinese, were loath to fight. (One is again reminded of Napoleon’s times. To conquer Russia, the French Emperor assembled the “Grand Army,” drawn from several nations whose loyalty was not assured). After prolonged fighting along the NW coast of Kyūshū, another severe storm (said to have been a typhoon) set an end to the invading force. We return to quote Sansom:

The month of August usually brings typhoon weather to the waters surrounding Japan, especially to the southwest. In 1281, as the invaders might have foreseen, a great hurricane arose and beat with violence upon the shores of Kyūshū for two days. It came to be known in Japanese annals as the Kamikaze or Divine Wind, for it blew the enemy fleet to perdition. This was on the fifteenth and sixteenth days of August.

How great the enemy losses were is not clear. Most accounts agree that the Korean shipmasters, scenting danger, managed to get most of their vessels away from the shore before the tempest reached its height; but even so they are said to have lost on their flight more than one-third of the Korean and Mongol troops that they were carrying. As for the southern fleet from China, the greater part of which was operating in the Gulf of Imari in Hizen, it was there exposed to the full power of an on-shore hurricane. When the escaping vessels in desperation made for open water, many of them were caught by tide and wind and helplessly jammed together in the narrows. Of those that got out to sea many if not most foundered in the storm. The total loss of life must have been enormous. The Chinese ships had carried perhaps as many as 100,000 men, and certainly far more than half of these were drowned or slaughtered before they could embark. The main body of this Chinese armada had entered the Gulf of Imari soon after making its landfall. It had put ashore strong forces at several points along the coast of Hizen, and a numerous contingent occupied the island of Takashima, which lies at the entrance to the Gulf. Most of these men were...
unable to reach their ships, and thousands were killed or taken prisoner by Kyushū warriors who attacked here and elsewhere before the storm abated.

Contemporary Korean records\(^{26}\) describe some aspects of the disaster wreaked by the typhoon as follows:

A storm arose from the west, and all the vessels made for the entrance of the harbour together. The tide was running in very strong and the ships were carried along irresistibly in its grip. As they converged to a focus at the mouth of the harbour a terrible catastrophe occurred. The vessels were jammed together in the offing, and the bodies of men and broken timbers of the vessels were heaped together in a solid mass so that a person could walk across from one point of the land to another on the mass of wreckage. The wrecked vessels carried the 100,000 men from Kiang-nam (i.e. South of the Yang-tse Kiang),

Murdock adds that the "harbour" here probably means Imari Gulf in northern Hizen, the entrance to which is protected by Takashima island (see Fig. 1).

We have mentioned earlier that Marco Polo, the famed Venetian traveler, reached Khubilai's court in 1260. The Great Khan, serving him until 1292. Therefore, he must have witnessed the preparations for the second invasion and must have known about the course of events. In the Prologue\(^{27}\) to the book recounting his travel experiences, he refers to himself and to his travel descriptions as those of "Messer Marco Polo, a wise and noble citizen of Venice, as he saw them with his own eyes. Some things indeed there be therein which he beheld not; but these he heard from men of credit and veracity. And we shall set down things seen as seen, and things heard as heard only, so that no jot of falsehood may mar the truth of our book, and that all who shall read it or hear it may put full faith in the truth of all its contents."

Unfortunately, many of his stories or "facts" do not stand up to a critical examination. As far as the fate of the second invasion is concerned, he\(^{28}\) writes the following:

And it came to pass that there arose a north wind which blew with great fury and caused great damage along the coasts of the island, for its harbors were few. It blew so hard that the great Khan's fleet could not stand against it. And when the chiefs saw that, they came to the conclusion that if the ships remained where they were the whole navy would perish. But when they had gone about four miles they came to a small island, on which they were driven ashore in spite all they could do; and a large part of the fleet was wrecked, and a great multitude of the force perished, so that there escaped only some thirty thousand men, who took refuge on this island.

Acknowledgment. The writer is pleased to thank Stanford University Press for permission to reproduce the map of the Kyushū coast (Fig. 1 in this paper) from Sir George Sansom's book *A History of Japan to 1334* (see p. 446). The original of the map was drawn by Dr. Joseph Williams, Stanford University.

References and footnotes

1 In this footnote we list those books that will be quoted more than once in the text of this paper or in the subsequent footnotes:


In the notes that follow, the above books will be referred to under the author's name and page number where the pertinent information is found. In references to Franké's *Vol. 4*, the volume number will be omitted.


3 In the English transliteration of names we follow Sansom's above mentioned text.

4 Sansom, p. 52; see also, Kennedy, p. 60.

5 Kennedy, p. 60.

6 Sansom, p. 439. Some other sources say that Khubilai was made Khan in 1260.

7 Varley, p. 72.

8 Franké, p. 492.

9 Sansom, p. 441; Kennedy, p. 59. The stormy sea that caused the first mission to return is referred to by Franké, p. 433, as 'Sturm und Wellengang'.

10 Sansom, p. 441.

11 Ibid., p. 442.


13 Henthorn, p. 222.

14 Murdoch, p. 507.

15 Franké, p. 438; see also vol. 5, p. 213.

16 Sansom, pp. 443-444.

17 Murdoch, p. 512. This author refers to the storm of 19 November 1274 by the name 'tornado'. As to the storm that terminated the second invasion, Murdoch once applies (p. 519) the name 'tornado' and, subsequently (p. 522), the name 'hurricane'.

18 Sansom, p. 444.

19 Franké, p. 437, cites contemporary Chinese records (Yuan Shi) according to which the Mongol imperial army ran out of arrows. Presumably, this was said in justification of the sudden termination of the invasion. Other historians (e.g., Murdoch, Sansom) do not quote this record. Indeed, it is hard to believe that the Mongols, who carried their con-
quests to Central Europe, many thousand kilometers away from their home bases and who, therefore, must have been aware of the need for adequate supplies, should not have arrows for more than about one day's fighting. One speculative possibility is that because of the severe storm, the supply ships were unable to refurbish the forces on land or that the seamen did not dare to draw close to the coast for fear of getting wrecked on rocks in the storm.

The magnitude and composition of the invasion forces, as cited by us, are those given in Mongol records quoted by Sansom, pp. 418-449.

22 Murdoch, p. 520, uses the term "Mosquito" fleet to indicate the smallness of the boats. See also Varley, p. 82.

23 Polo, p. 250.

24 Murdoch, on p. 519 of his book refers to the storm of 14-15 August as "tornado". Then, on p. 522 he calls it a hurricane. Franke, p. 439, refers to it under the name typhoon but he gives the date as 19 September. He thus differs from both Murdoch and Sansom who agree that the storm occurred mid-August. He also differs from Kennedy, who on p. 60 of his book says that the typhoon occurred on 15-16 August.

25 Sansom, p. 450.


27 Sansom, p. 450.

28 Polo, p. 252-253. The unreliability of Marco Polo's accounts is also shown by the fact that it would follow from his story on p. 255 that the (second) invasion occurred in 1279. It must be pointed out in Marco Polo's defense, however, that his "book" was dictated by him to a fellow prisoner in Genoa prison, where he was shut up in 1298 by the authorities of Genoa, Venice's commercial rival. See Introduction by Th. Yoseloff to Polo's book cited in footnote 1. A few more details will be found on pp. 5-6 of Collis, W., 1960: Marco Polo, New York, New Directions, 190 pp.

(Continued from announcements, page 1166)

OSTIV gliding congress—call for papers

The Fifteenth Congress of the International Scientific and Technical Gliding Organization "OSTIV" (Organisation Scientifique et Technique Internationale du Vol a Voile) will be held at the site of the World Gliding Championship in Räyskäli, Finland, from 18-26 June 1976. The scientific sessions will focus on the atmospheric aspects of soaring and will include, but not be limited to, the following topics: characteristics of thermal convection (including organized convection); soaring in "thermal waves"; atmospheric boundary layer fluxes; mountain flow (including lee waves); cloud physics studies using sailplanes; motor gliders or model airplanes; measuring techniques and instrumentation; forecasting for soaring pilots; extraordinary soaring flights.

The program will allow the Congress participants to observe the international flight activities, to attend the meteorological pilot briefings, and to mingle with experienced glider pilots from many parts of the world.

Papers and a comprehensive abstract should be sent not later than 1 February 1976 to: Dr. Joachim P. Kuetterer, Chairman OSTIV Scientific Section, c/o World Meteorological Organization (OMM), 1211 Geneva 20, Switzerland.

NRC research associate ship for 1976

The National Research Council (NRC) has announced the Research Associateship Programs for 1976. These programs provide scientists and engineers with opportunities for post-doctoral research on problems in many fields of atmospheric and earth sciences, chemistry, engineering, environmental sciences, life sciences, mathematics, physics, and space sciences. The competition is open to recent recipients of the doctorate and in some cases to senior investigators. Some associateships are open to non-U.S. citizens. Postmark deadline for applications is 15 January 1976. For more information and application materials, contact: Associateship Office, JH 606-P, National Research Council, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

New publications

Abstracts from the 26th International Science and Engineering Fair (Science Service, 1975, 207 pp., $2.50 paperbound, from Science Service, 1719 N Street, N.W., Washington, D.C. 20036) contains the abstracts of the finalists at the International Science and Engineering Fair for students held in Oklahoma City, Okla., 12-17 May 1975 (see Bulletin, 56, p. 916).

Advances in environmental science and technology, volume 5 (James N. Pitts, Jr., and Robert L. Metcalf, editors, 1975, 400 pp., $24.00, from Wiley-Interscience, John Wiley & Sons, Inc., 605 Third Ave., New York, N.Y. 10016) discusses the effects of combustion-generated air pollution on the environment and compares pollution-ridden and pollution-free environments in Japan and Australia. Technological advances in controlling water pollution from thermal contamination are also discussed.

Advances in hydroscience, volume 10 (Ven Te Chow, editor, 1975, 432 pp., $39.50/$19.75, from Academic Press, 111 Fifth Ave., New York, N.Y. 10003 or 24-28 Oval Rd., London NW1 7DX, England) contains chapters on modeling techniques for groundwater evaluation; tidal theory and computation; hydrothermal convection in saturated porous media; and theory of weirs.


(Continued from page 1174)