

A GEOGRAPHY OF CHINA

T. R. TREGEAR

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Preface

This book is intended primarily for serious students of geography but it is hoped that it will appeal to the general reader. For this reason technical terms have been used as sparingly as is consistent with correct meaning.

It has been the aim of the author to present, wherever the subject matter permits, a picture of geographical growth and to show the interaction of geographical environment and the human activity and institutions. An understanding by the rest of the world of what is happening in China and why it is happening is a matter of great urgency. Although present changes are taking place with breath-taking rapidity, they must be seen against the geographical and historical background if they are to be properly understood. A knowledge of the environmental facts is essential to an appreciation of the political, economic and social problems facing the Chinese people today. It is hoped that what is presented in the following pages will help towards this understanding.

The book has been arranged in four sections: Physical, Historical, Economic and Regional. Such a treatment necessarily involves some repetition but this, in some ways, is an advantage as it serves to emphasize the fact that the sections are themselves very closely interlocked. No apology is needed for including a considerable historical geographical section. The subjects treated under this heading are a few choice plums selected from a basketful of excellent fruit. No attempt has been made at a connected historical survey or treatment.

One aspect of Chinese geography which is fraught with difficulty is place-names. Cities, large and small, throughout history have changed their names many times. This habit continues today. For example, Anlu, a city on the Han River where the author lived in 1923, is now known as Chungsiang, whilst its nearest neighbouring city, which was then called Teinan, has now assumed the name of Anlu. This is all very confusing. In order to meet this difficulty, place-names used in the text have been plotted, as far as possible, on accompanying sketch-maps and have followed those used in the new edition of *The Times Atlas*. The names in brackets are alternatives and are often in more general use. Another confusion, which bedevils place-names and many other things besides, arises from the many systems of romanization of the Chinese script which have been attempted, e.g. Lantow, Lantao, Lantau. Incidentally this problem of finding a satisfactory romanization of Chinese writing which would have the same universal acceptance and understanding throughout the land as their present 'characters' have, has yet to be solved.

PREFACE

Another difficulty is that of securing adequate and reliable statistics. Records of many aspects of Chinese life and economy have been kept over a longer period than in any other civilization. For example, there are records of floods and droughts reaching back to the early Han dynasty. These, like most of the statistics of the country right up to the present day, need to be read with great care and caution. What constituted a flood or a drought was largely a subjective measurement by a district or provincial governor, whose judgement was coloured too often by the effect of prosperity but more usually of poverty (and consequently lower taxes) he wished to produce. Statistics compiled by the Chinese Maritime Customs (1854-1931), for so long under the control of Sir Robert Hart, are among the most reliable. The present Chinese People's Government began to develop a reliable statistical bureau between 1949 and 1958. Its work then suffered a disastrous set-back at the hands of fanatics during the 'Great Leap Forward' when it gradually emerged that figures for that year were unreliable to a degree. It is now most difficult to assess the amount of reliance that can be placed on figures for subsequent years. Statistics quoted for the post 1949 period are taken directly or indirectly mainly from the journals *Peking Review* and *China Reconstructs* and, to a lesser degree, from *Far East Trade* and translations of mainland papers and magazines.

It will be noticed that Taiwan, Hong Kong and Macau have been included in the text as though they were legally integral parts of China. It would be ludicrous to exclude them from description on the ground that at the moment they are politically administered by governments other than that of the People's Republic. They are geographically parts of one whole and it would seem virtually certain that, sooner or later, they will come under the jurisdiction of a Chinese government. This is essentially a geographical work, but anyone who has had experience of communism will know that its emphasis is primarily political. Consequently political aspects will now and again protrude themselves.

A glossary has been compiled (see pp. 333-4), which will be helpful, since it will often give significant meaning to a place name, e.g. Peking (*Pei* - north; *king* - capital); Nanking (*Nan* - south; *king* - capital); Shantung *Shan* - mountain; *tung* - east); Shansi (*Shan* - mountain; *si* - west).

It is hoped that full acknowledgment has been made of all published material used. Reliable and tested information regarding recent development and growth is difficult to obtain. The author was fortunate in being able to re-visit China in 1956 and to observe many of the changes which were already well under way in 1951 when he left the country.

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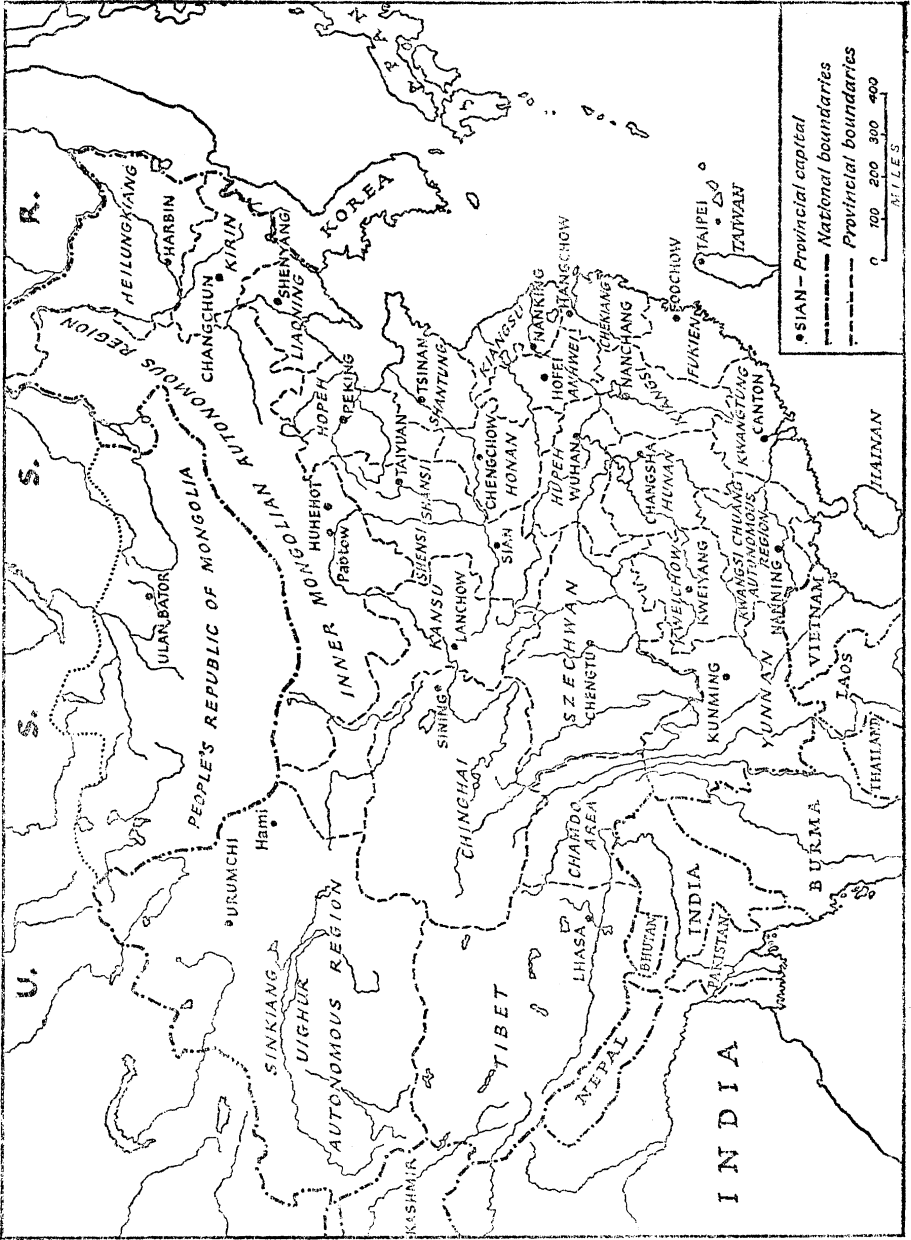


FIG. 1. Political divisions of China

Introduction

From the beginning an attempt must be made to convey to the reader some impression of the immense size of the country which we shall describe. It stretches from latitude 54° N. (Dzhalinda) to 18° N. (Hainan), and from longitude 74° E. (W. Sinkiang) to 135° E. (Khabarosk), but a mere recital of latitude and longitude, striking as it is, is rather sterile. It is perhaps more helpful to imagine the superimposition of China on other parts of the world better known to many readers. For example, if the China of the present People's Republic were superimposed on North America, its northernmost point, Dzhalinda in Manchuria, would lie somewhere in the vicinity of James Bay, while its southernmost point, Hainan, would coincide with Jamaica. The western border of Sinkiang would lie off the coast of California, while Khabarosk at the confluence of the Ussuri and the Amur would coincide with Cape Breton Island. For those who are more familiar with Europe a similar superimposition would show China covering the Mediterranean from end to end with Dzhalinda in the vicinity of Moscow and Hainan near Khartoum.

The area of the People's Republic of China is 3,657,765 sq. miles. This is some 620,587 sq. miles less than under the Manchu regime, owing to the secession of Outer Mongolia, when the estimated areas were:

	sq. miles
China Proper	1,532,800
Manchuria	363,700
Mongolia	1,367,953
Chinese Turkestan (Sinkiang)	550,579
Tibet	463,320
	<hr/>
	4,278,352

This was a large secession. Economically it is of comparatively small importance since it is comprised largely of desert, semi-desert and poor steppeland, but politically and strategically it may have far-reaching implications.

For at least the last 2,000 years there has been a distinction in Chinese eyes between what is termed China Proper and the dependencies or colonies

INTRODUCTION

of Imperial China. China Proper embraces the eighteen provinces¹ which lie between the Pacific Coast and the Tibetan highlands in the west, and the series of ranges forming the edge of Inner Mongolia in the north. In these was developed the civilization which has had a continuous existence from ancient times until today. Outside have lain the 'barbarians' from whom, in times of Chinese ascendancy, tribute was received. Due to its encirclement by great mountain wastes on the west, and mountain and desert on the north and north-west, China Proper has been singularly cut off by land from the influence of other civilizations. The dependencies of Tibet and Mongolia have acted as effective buffers. The only invasions experienced were from the nomadic peoples occupying the steppelands who were, in due course, either absorbed or expelled.

Similarly, the vast expanse of the Pacific Ocean for long militated against intercourse with the Americas to the east, regions which, in any case, were undeveloped. It is true that there was appreciable trading intercourse with the Arabs, Persians and Indians in early medieval times, but this had little real impact on so vast a land as China. There was no danger of invasion from this direction. Any such attack would have entailed far greater accumulation of capital and military 'know how' than then existed. Such penetration had to wait until the industrial revolution in the West had come to full fruition.

Thus it was that China remained in virtual isolation. Even in times of its greatest imperial expansion its contacts with Europe and even India were seldom, if ever, direct. It cultivated a rich civilization of its own, conservative and complaisant in its self-sufficiency. The stirring intellectual and spiritual revolution of the Renaissance, which so rocked Western thought, left China unmoved. The industrial and technical revolution of the eighteenth and nineteenth centuries made no appreciable impact on China until the twentieth century. China remained essentially rural and medieval in essence until very recently. The explosiveness of the sudden intrusion of Western ideas and techniques has therefore been all the greater. The rapid changes that have taken place have been attended by constant war, unrest and disorder, which were resolved only by the Communist revolution of 1949.

Although there has been this dramatic break-through in China's long period of isolation, the old parochialism has spilled over even into these revolutionary times. Anyone who has visited China in very recent years

¹ Hopei, Honan, Shantung, Shansi, Shensi, Kansu, Szechwan, Hupeh, Hunan, Anhwei, Kiangsu, Chekiang, Kiangsi, Fukien, Kweichow, Yunnan, Kwangtung, Kwangsi.

INTRODUCTION

will have noted both the preoccupation with, and the self-satisfaction in, their own affairs, which characterizes so much of what they are now doing. Little interest is shown in what is happening abroad. Perhaps this is not unnatural in view of the colossal task which confronts the Chinese. Nevertheless it would seem to point to the fact that the influences of their long isolation are still present and that the Chinese still regard their country as

中國, *Chung Kuo*, the Central Kingdom.



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CHAPTER ONE

Physical Geography

'The physical features of a country represent the sum total of the constructive, deformative and erosive processes that have operated in that country throughout geological time.'

J. S. Lee

STRUCTURE AND RELIEF

The physical physiognomy of a country, its mineral resources, its vegetational cover and even, to some extent, the character of its people, are determined, in greater or less measure, by its geology and its structural history. It behoves us, therefore, to turn our attention at this early stage to the evolution which the topography of present-day China has undergone, to pass in rapid review the main geological successions and to observe the effect of the chief periods of revolution.

Much of the vast country is still unexplored or quite inadequately surveyed. A great deal of work is now being done in the field in China but, until this has been properly plotted, analysed and published, we must continue to rely on the work of such pioneers as Richthofen, Willis and Grabau, and of their successors, such as Andersson, Pierre Teilhard de Chardin, Young and Lee. It is to be hoped that in a few years time many of the problems and uncertainties that now exist will be cleared up.

The Ancient Floor

Underlying the whole of China, from east to west and north to south, is a floor of ancient rock. Cores of pre-Cambrian rocks lie exposed in many parts, mainly in ranges to the north of the Yangtze, in Inner Mongolia, Shensi, Shansi, Shantung and Liaoning. They are of two systems: the *Wutai*, named after the Wutai Shan in the Peking Grid, which is composed of highly metamorphosed sedimentaries (gneiss and schist), together with acid and igneous rocks; and the *Simian*, first named by Richthofen and included in the Palaeozoic by Grabau, which is also sedimentary but much less metamorphosed.

A GEOGRAPHY OF CHINA

Rising from this ancient floor are three massifs, none of which has been completely submerged by subsequent transgressions. The largest and most stable of these is Tibetia, whose pre-Cambrian ranges rise through thin layers of gravel, loess and sand. Gobia, although covered in parts during Tertiary times by seas which laid down clays and sands, has also been generally above sea-level. The third, named by Grabau as Cathaysia, is the south-eastern area of China and is the western remnant of a massif, which was raised by folding in the Sinian and existed throughout Palaeozoic times. The eastern part of Cathaysia, through violent folding and down-faulting in recent geological time, has been submerged, leaving Japan, the Philippines and festoons of islands marking its eastern rim.

Palaeozoic

A geosyncline, known as the Cathaysian geosyncline, running from the north-east in present Manchuria to the present mouth of the Ganges and thence westward in the Sea of Tethys, existed almost continuously throughout the Palaeozoic. During the Cambrian this geosyncline underwent considerable subsidence, while the surrounding land was peneplained. Even Shantung was partially submerged.

In Middle and Late Ordovician times, this geosyncline was interrupted

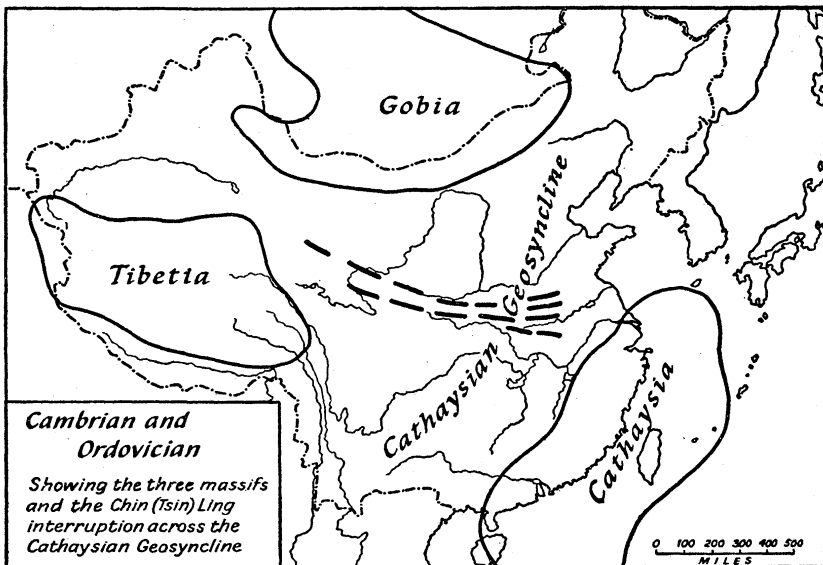


FIG. 2a. Geological succession

PHYSICAL GEOGRAPHY

by the raising of a land barrier running east to west along the line of the present Chinling (Tsinling) in a movement known as the Hsiayuan. This east-west axis has been maintained to the present day and is one of the great geographical divides of China. In these same Ordovician times there was a general subsidence to the south, accompanied by intense folding in Indo-China. The area to the north of the east-west Chinling (Tsinling) axis, which had previously been subjected to repeated submergence, was now uplifted and so remained until late Carboniferous and Permian times, subject to a long period of erosion. In fact, this northern area has never again been deeply submerged.

Owing to this uplift and consequent absence of sedimentary rocks of the period, there is a lack of evidence of the Caledonian movement north of the Chinling (Tsinling). In the far north, the fold mountains of Sayan and Irkutsk on the east and west of Lake Baikal were raised. There was also considerable folding in the south-west, and in the south-east the Nanling and south-east highlands were raised.

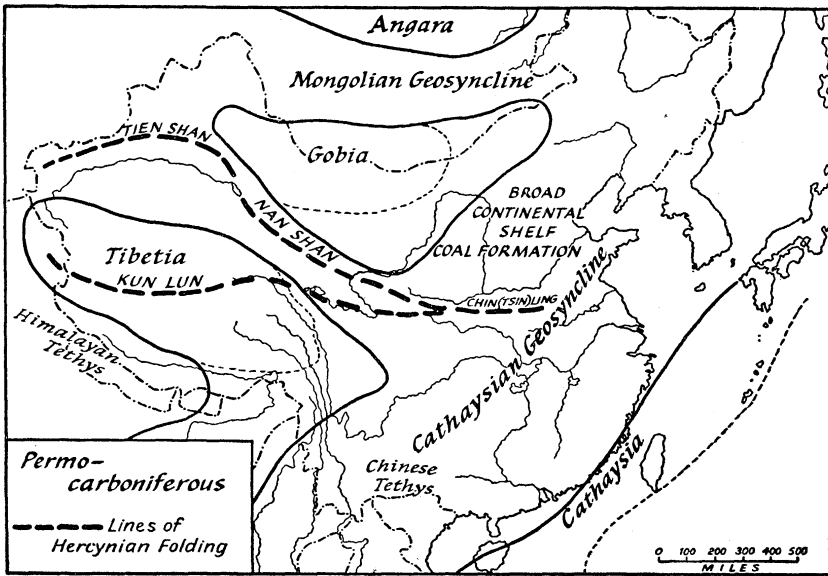


FIG. 2b. Geological succession.

During Permo-Carboniferous times the sea (Chinese Tethys) spread northward, and great stretches of the north oscillated between land and sea, forming at times a broad, shallow continental shelf. It was in this period that the main coalfields of the north and centre were formed.

A GEOGRAPHY OF CHINA

Towards the end of the Permian, the Tungwu orogeny occurred. It was a period of intense folding, corresponding to the Hercynian in the West. The great systems, comprising the Tien Shan, Kunlun, Altyn Tagh, Nan Shan and Chinling (Tsinling) were formed at this time, and their line continued through Shantung and the East Manchurian Mountains. The coal measures, previously laid down in the Carboniferous and Lower Permian, were greatly disturbed. During this revolution Tibetia remained firm and most of north China remained above sea-level, but considerable areas of Gobia were temporarily submerged. Most of southern China and Kweichow were also below sea-level.

Mesozoic

During the Early and Middle Triassic, south-west China, the Red Basin of Szechwan and the lower Yangtze valley lay below the sea. Thin bedded limestones, which are oil-bearing, were laid down at this time. During later Triassic times the greater part of Burma, Thailand and Indonesia were submerged as the Chinese Tethys rejoined the Himalayan Tethys from which it had been cut off during the Permian.

Subsequently, in the Jurassic, coal-bearing shales and sandstones, in

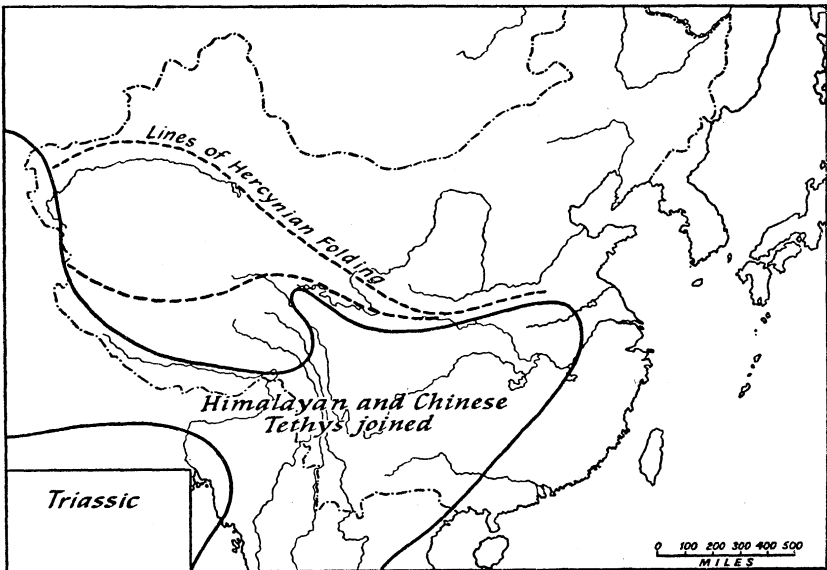


FIG. 2c. Geological succession

PHYSICAL GEOGRAPHY

widely distributed basins of greatly varying size, were deposited.¹ One of these was the present Red Basin of Szechwan. North China for the most part remained above sea-level and was eroded to a peneplain, while the geosyncline to the south of the Chinling (Tsinling) continued to develop and deepen. In late Jurassic or early Cretaceous, the Yenshan or Ning-chinian movement occurred. This again was a period of extensive and

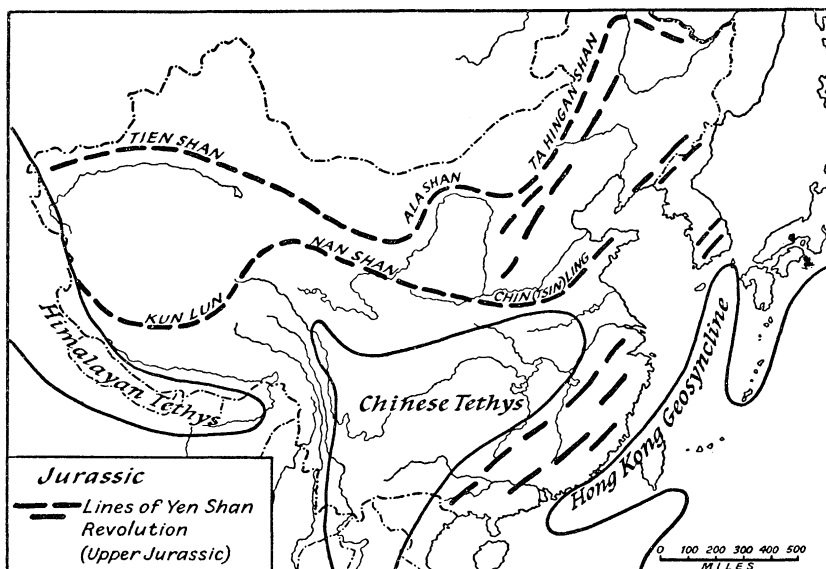


FIG. 2d. Geological succession

powerful folding. Its main lines were along the former Hercynian lines of compression, i.e. Tien Shan, Kunlun, Nan Shan and Chinling (Tsinling) and were continued north and north-east through the Ala Shan and In Shan on the one hand and the T'ai Hang Shan and Luliang Shan on the other to the Great Ch'ingan and Little Ch'ingan. Farther east and south it effected the shattering of the Shantung-Liaoning platform and heavily folded the land of south-east China (Cathaysia), Indo-China and North Borneo. A new geosyncline, known as the Hong Kong and Nippon Bays, was formed to the south-east extending from south Japan to Hainan.

Following this powerful revolution came a period of quiet sedimentation in continental basins, probably undergoing continual subsidence. The most notable and extensive of these basins were in Mongolia, where dinosaur

¹J. S. Lee, *Geology of China* (London 1939), pp. 155-61.

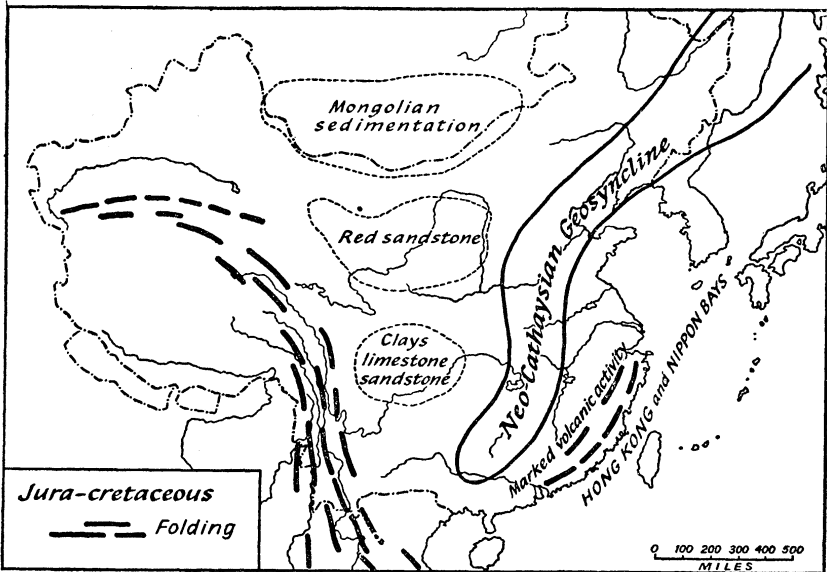


FIG. 2e. Geological succession

eggs of Middle and Upper Cretaceous were found by P. Chapman Andrews, and in the Red Basin, where clays, sandstones and limestones to a thickness of over 3,000 metres were laid down on the Jurassic coal measures. In north-west Shansi, north Shensi and Kansu beds of red sandstone were deposited. Lee comments on the oil-bearing potentialities of these Szechwan and northern deposits, potentialities which have been amply fulfilled by recent discoveries.¹

This period of quiescence was followed by one of great volcanic activity everywhere outside the Cretaceous basins. The igneous intrusions of granite, granodiorite and porphyry at this time are largely responsible for the rich deposits of wolfram, tin, antimony, lead, zinc and copper, which occur especially in the southern half of the country.

The final phase of this Yenshan movement consisted of further folding and volcanic intrusion in Upper Cretaceous times, known as the Chingian movement corresponding to the Laramide of North America, when the Rocky Mountains were formed.

Cainozoic

In mid-Tertiary times there was some marked folding in Sikang (Chamdo

¹ J. S. Lee, op. cit., pp. 183-4.

PHYSICAL GEOGRAPHY

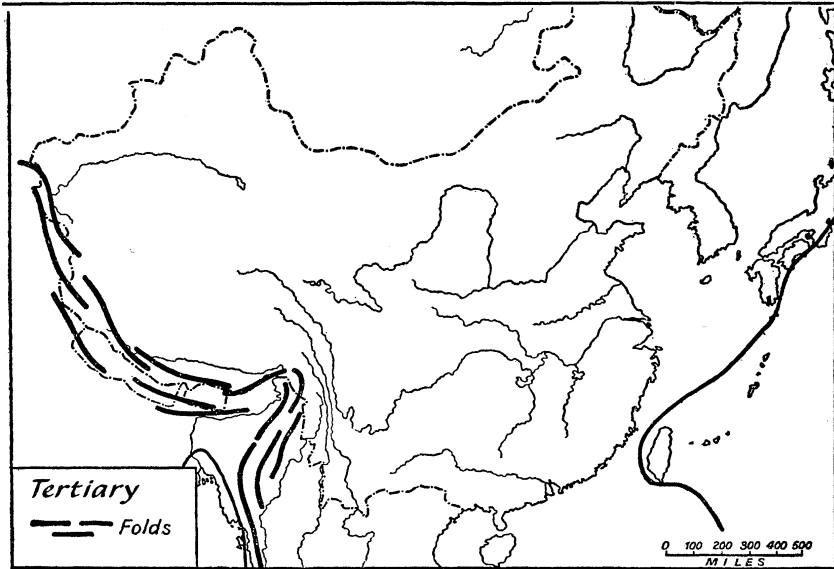


FIG. 2f. Geological succession

Area) but China, as a whole, bears few marks of the Alpine revolution which is so outstanding in Europe, western Asia and northern India. Apparently it affected only the extreme western margins of Yunnan and Szechwan.

In Pleistocene times at a period equivalent to the Würm glaciations the main deposits of loess from the north-west were laid down in Shensi and Shansi. The extent and nature of this fine, wind-borne soil are dealt with fully in a later chapter. Suffice it here to say that deposition is still going on, although apparently at a slower rate than formerly.

Quaternary

It is generally agreed that there has been a considerable uplift in the west during quaternary times, a movement which is continuing in the present day. In support of this contention Lee says: 'A striking case . . . In the neighbourhood of Tatsinlu and on the eastern side of the Minyu Gongkai (Minya Konka), Heim has actually observed the fluvio-glacial water cutting its own deposit formed in the glacial age to a depth of 100 metres. There is clear evidence that the glaciers in the high mountains have retreated in recent geological time. The argument that such stream erosion might be due to increased precipitation in post-glacial time can, therefore,

be safely ruled out.¹ Further evidence of this recent uplift is seen in the physiological history of the Yangtze (see p. 230 ff.).

Glacial Action

Until recently the view that China was left untouched by the glacial epoch was firmly held. Andersson, in referring to the loess deposits, says that in north China and Mongolia everything indicates that the climate in those parts was too dry to permit the existence of an ice cover.² However, in the Tatung Basin and the T'ai Hang Shan of Shansi, there are indications of glacial action such as erratics on the tops of high hills, striated boulders and U-shaped valleys. Lee suggests that local glaciers may have been formed towards the end of the Sanmen period when there was a fall in temperature and a rise in humidity.

Similar evidence of grooved rocks, parallel striation of rocks in both mountain and plain, cirque formations, boulder clay and U-shaped valleys in the Yangtze valley, notably in the Lushan Hills, Kiangsi, have, for many years, suggested that there was considerable glacial action in this area.³ Doubt was cast on the validity of evidence in the form of parallel scratches since it was contended that, in view of the heavy weathering to which the rocks have been subjected, the scratches could not have survived. However, in 1936, the occurrence of unusually low water around Lake Poyang provided a unique opportunity for observations of formations, and it is now considered as conclusively established that there was widespread glacial action in this area.⁴

Topography

With this geological background in mind, it is now possible to take a general view of the relief and drainage of China. No attempt will be made to describe this in any detail, which would be a long and tedious undertaking. A more intimate treatment will be made in the regional section.

I. PLATEAUS AND BASINS

Western and north-western China consists largely of great upland regions, separated from each other by massive mountain systems. While

¹ J. S. Lee, *op. cit.*, p. 207.

² J. G. Andersson, *Children of the Yellow Earth* (London 1934), p. 130.

³ J. S. Lee, *op. cit.*, p. 395.

⁴ *ibid.*, pp. 398-9.

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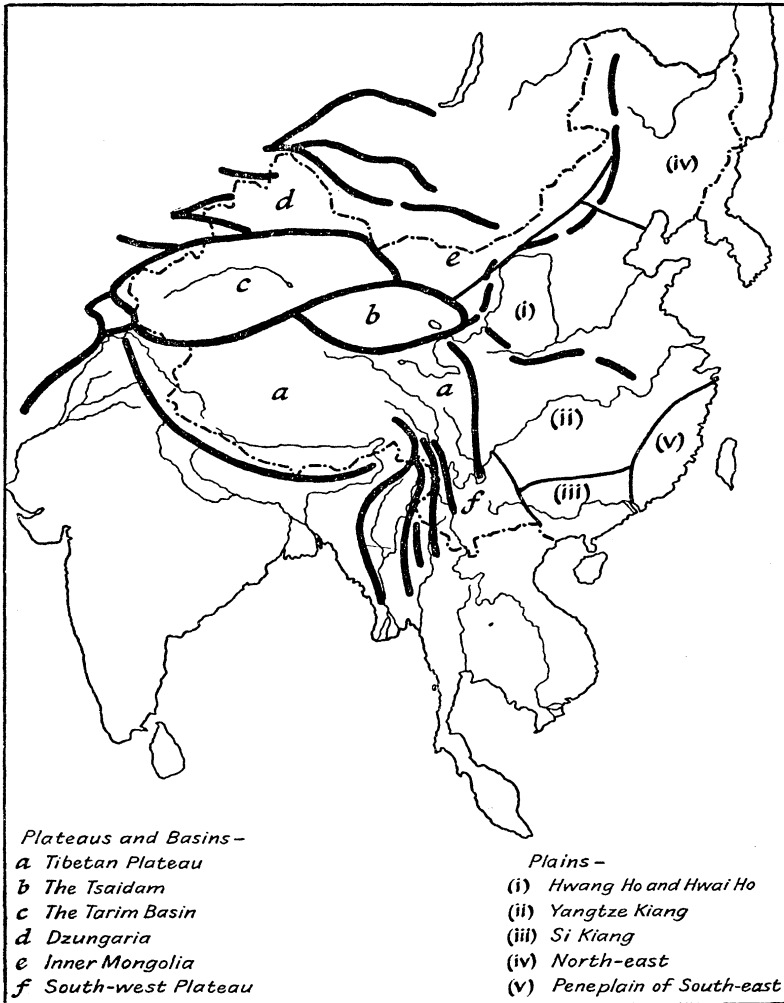


FIG. 3. Topographical divisions of China

these basins vary greatly in height from below sea-level to over 12,000 ft., they have one common characteristic. They are all inland drainage basins.

(a) *The Tibetan Plateau.* This great massif stands today at a general level of over 12,000 ft. Its boundaries are everywhere considerably higher than the interior: on the south the Himalayan ranges; on the west the Hindu Kush, which extend into the plateau itself in the Karakorams; on the north the Kunlun and Astin Tagh (Altyn Tagh); and on the east the north-south

A GEOGRAPHY OF CHINA

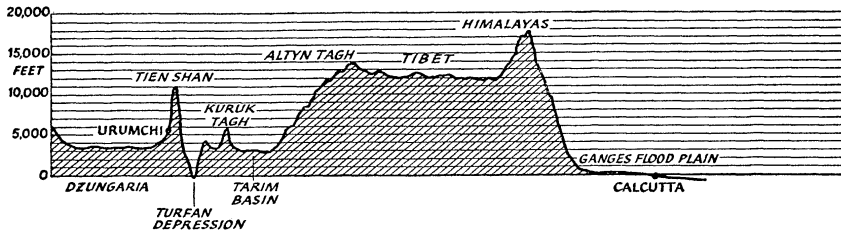


FIG. 4a. Section from Dzungaria to Bay of Bengal

folds of the mountains of Sikang. In its southern and eastern periphery great rivers find their sources and their way to the sea: the Indus and Brahmaputra; the Mekong, Yangtze and Hwang-ho. Most of the precipitation on the interior side of the boundary ranges flows inward and terminates in the many brackish lakes which stud the plateau. Innumerable east-west ranges, rising through thin layers of sand, gravel and clay, push their ancient cores to heights of over 18,000 ft.

(b) *The Tsaidam.* North-east of the Tibetan plateau is a smaller basin, the Tsaidam, which stands at a general height of about 9,000 ft. This is bounded on the north-west by the Astin Tagh (Altyr Tagh); on the north-east by the Nan Shan and on the south by the Kunlun. This, again, is an inland drainage area.¹

(c) *The Tarim Basin.* North of the Tibetan plateau and at the much lower general level of 3,000 ft. lies the Tarim Basin. It is hemmed in by great mountain ranges; the T'ien Shan on the north, the Pamir Knot on the west and the Astin Tagh (Altyr Tagh) on the south. From these heights, glacier-fed streams descend, only to lose themselves in the sands and gravels of the Taklamakan desert, which occupies the centre of the basin and which is one of the most barren of the world's deserts. This area figures prominently in Chinese history, for it was along the line of oases which fringe the north and south edges of the desert, that the earliest contacts with the West were made.

To the north-east of the Tarim Basin and included within the same bounds is the smaller Turfan Basin, which is 940 ft. below sea-level.

(d) *Dzungaria.* North of the Tarim Basin is yet another inland drainage area, Dzungaria. The heart of this basin descends to heights of less than 1,000 ft. above sea-level. Thus we find three clear downward steps as we pass northward from Tibet to the border of the USSR. Dzungaria is enclosed

¹ P. Fleming, *News from Tartary* (London 1938).

PHYSICAL GEOGRAPHY

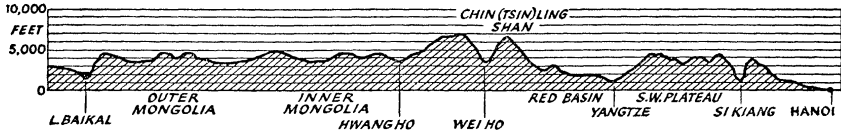


FIG. 4b. Section from Lake Baikal to Gulf of Tongking

by the T'ien Shan on the south; the Altai Mountains on the north-east, cutting it off from Outer Mongolia; and the Tarbagatai Mountains on the north-west, forming the frontier between China and the USSR.

Like the Tarim Basin, this area figures prominently in early East-West contacts, for one branch of the Silk Route passed along the northern edge of the T'ien Shan.

It should be noted that, while formerly Sinkiang and the Tarim were often used as synonymous terms, today Sinkiang is officially the political district embracing both the Tarim Basin and Dzungaria.

(e) *Inner Mongolia.* Inner Mongolia is the southern half of the Gobi, which geographically embraces both Inner and Outer Mongolia and is the great shallow, inland drainage basin enclosed by the Khangai, Altai and Nan Shan in the west; the Ala Shan and In Shan in the south; the Ta Ch'ingan in the east; and the Sayan and Irkutsk Mountains in the north. It descends to about 1,500 ft. in the centre. A number of streams, the greatest of which is the Estin Gol, descend from the Nan Shan, across the 'pan handle' of Kansu, to be lost in the heart of the desert.

(f) *South-west Plateau.* This plateau, which comprises the whole of Yunnan and the western part of Kweichow, is highly dissected. It is the only one of our classified plateaus whose drainage is entirely seaward.

2. THE GREAT PLAINS

The three east-west axes, along the In Shan, Tsinling and Nanling, noted by Lee,¹ have had marked influence on the three great rivers of China, determining their direction of flow.

(a) *The Hwang Ho* is confined between the northern axis of the In Shan and the central axis of the Tsinling. After it descends from the Tibetan massif, it meanders between these two until it finds an outlet of its own making across the North China Plain to the Gulf of Pohai. After cutting through the Nan Shan at the Liuchia Gorge, it turns north in a great loop and flows

¹ J. S. Lee, *op. cit.*

in a wide, shallow stream through the Ordos Desert. Turning south just north of Hokow, it cuts deeply through the loess, and passes through the region which cradled Chinese civilization, where it turns abruptly eastward at the confluence of the Wei River by way of the Tung Kwan gorge. Thence it emerges on to the wide alluvial flood-plain, which, although so subject to disaster, is yet so heavily populated.

(b) *The Yangtze Basin* lies between the Tsinling and the Nanling axes. Nearly one-third of the great river's upper course lies in the highlands of Sikang. After cutting its way through the Taliang Shan, it flows eastward through a series of former lake basins: first the Red Basin of Szechwan, with its four left bank tributaries; then the lake-studded Central Basin of Hunan, Hupeh and Kiangsi, drained by the Han, Yuan, Siang and Kan Rivers; and finally the 'delta' region of Anhwei and Kiangsu. These three basins form the most productive and most densely populated region in China.

(c) *The Si Kiang Basin*. Rising in the Yunnan plateau, the Si Kiang pursues an eastward course, south of the Nanling through Kwangsi and Kwangtung and enters the sea by an extensive delta at Canton. While not as extensive a plain as either the Hwang Ho or the Yangtze, it is important in that it has a sub-tropical climate and consequently is a double-cropping rice area.

(d) *The North-East (Manchurian) Plain*. This great undulating plain lies in the extreme north-east and is comprised of the three provinces of Heilungkiang, Kirin and Liaoning. It is bounded on the west by the Ta Ch'ingan Mountains and on the north by the Hsiao Ch'ingan Mountains. The Eastern Manchurian Mountains form a considerable part of its eastern boundary, separating it from Korea. On the south the Jehol Mountains and the sea form the boundary. The plain is split into northern and southern halves by a low divide, the northern half being drained by the Sungari River and its tributaries, which empty into the Amur or Heilung Kiang, and the southern half by the Liao River.

3. THE SOUTH-EAST

Lying between the lower Yangtze and the lower Si Kiang basins is a region of much-folded mountains, having a north-east, south-west trend, the main ranges of which are the Wuyi Shan. Rivers are comparatively short and fast-flowing in steep-sided valleys down to the rugged south-east coast. It is a land which long resisted incorporation into the Chinese

Empire and, even today, it remains distinct, particularly in its dialects. Its people look largely to the sea for their livelihood.

CLIMATE

It is not surprising to find, in a country so vast as China, covering as it does so great a range in both latitude and longitude and including peaks of nearly 5 miles in height and basins below sea-level, that one encounters not one climate but a variety of climates. Here, in this vast sub-continent, are found hot desert climate in the Tarim Basin; cold desert in the Tibetan plateau; temperate continental climate in the north-east; the unique temperate Szechwanese climate of the Red Basin; and the tropical and sub-tropical in Kwangtung, to mention only a few. Yet, in spite of all these differences, close analysis will show that they are all variations on one basic theme of causation.

The theme is provided by the monsoon rhythm arising from the continentality of the huge land-mass of Asia. The variations on the theme, played on the instruments of varying altitude, contrasting ranges of seasonal and diurnal temperature, contrasting types of seasonal rainfall and precipitation and of quietude and storminess—all reveal in greater or less degree their causal relationship to this basic continentality, to a rhythmic seasonal change from a dense high pressure centre over the land in winter to a low pressure area in summer.

The Monsoon

The term *monsoon* is used in everyday conversation to connote a particular type of weather experienced in South-east Asia. Usually what is in mind is the onset of a summer season of heavy rain. It is true that this is a marked phenomenon of the monsoon, but it is the result of the monsoon rather than the monsoon itself, which technically is a wind system with a clear seasonal change in direction. In India this change is from south-west in summer to north-east in winter. In China the change is from south-east in summer to north and north-east in winter. To a less marked degree there is a similar seasonal change in eastern North America with an inflowing south-east wind in summer and an outflowing north and north-west wind in winter. However, owing to the fact that the land mass of North America is not nearly so great as that of Asia, the seasonal reversal of the winds is less marked. Moreover the general trend of highland is N-S in North

America, admitting an easier flow of warm and cold air than in East Asia, where the mountain trend is rather E-W.¹

The Winter Monsoon

Asia is the greatest of the world's land masses and, in consequence of this, its heart experiences greater variations in temperature between summer and winter than any other part of the world. As autumn progresses, the land mass quickly cools in marked contrast to the slower cooling ocean along its southern and eastern borders. A great pool or mass of cold air settles in the large, shallow basins of Siberia and Mongolia, forming an anticyclone or centre of high pressure, which rises to 30·6 in. By November this cold air-mass is fully established: its centre covers the whole of Inner and Outer Mongolia, and spreads steadily southward until it meets the warm air-mass of the North Pacific Trades along a front rather to the south of the China coast and Taiwan in what is now known as the *West Pacific Polar Front*. This air-mass is a fairly shallow layer of less than 10,000 ft. It remains stationary over East Siberia and Mongolia from November to March and is generally in undisputed control.

From this great anticyclone there is an outflow of dry northerly and north-easterly winds over China bringing prolonged and bitter winters to the northern part of the country and really cold weather as far south as the Central and Lower Yangtze Basins. The barometric gradient between high pressure and low pressure is steep, and the resulting winds are strong.

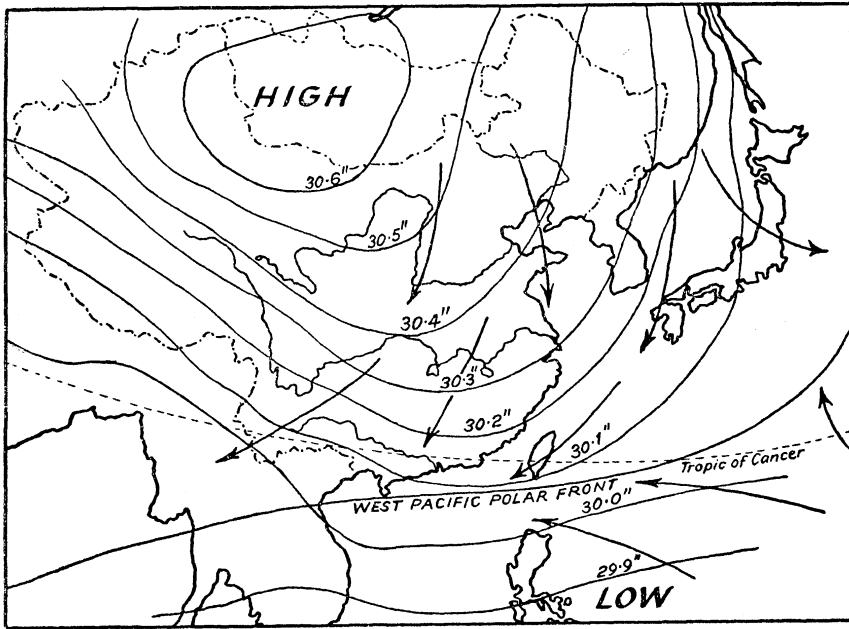
Occasionally this bitter weather is interrupted by a welcome warm spell brought about, apparently, by depressions moving in from the west in the upper layers of the atmosphere. At 10,000 ft. the circumpolar westerlies move freely above the lower colder layer as shown in Fig. 5. F. K. Hare says of these disturbances: 'Though they invariably weaken as they cross the continent, not a few of these European or Atlantic storms actually penetrate to Manchuria or North China every winter. At such times the Siberian high, usually regarded as permanent, is displaced far to the north-east, or may even be absent . . . During the lull it is common for warm moist air (either mT or modified cP) to spread far northward across China and Japan, giving a welcome relief from the cold of the monsoon.'²

These lulls are of short duration and, as the cold air moves southward once more with the re-establishment of the high, further cyclones are

¹ See F. K. Hare, *The Restless Atmosphere* (London 1953), Chapter 12.

² *ibid.*, p. 144.

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Nov - Mar

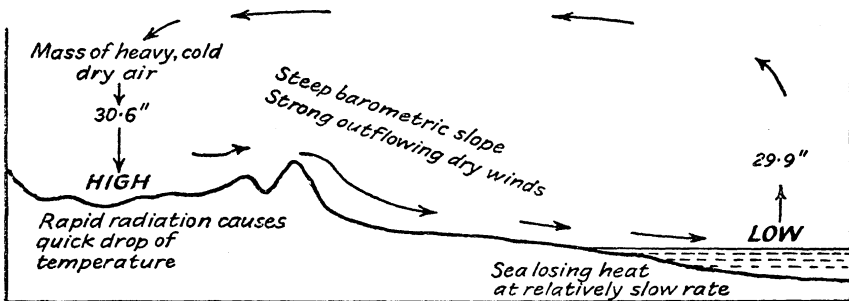


FIG. 5. Pressure and winds: winter

developed along the cold front and travel from west to east across China, continuing over Japan, often with increased intensity. These disturbances may arise on latitudes as far north as Dzungaria and Inner Mongolia, but their main development is along the Yangtze Valley, where the increased humidity may cause heavy snowfalls, hail and glazed frosts.

There is, however, a marked difference between the weather of north and south China at this time. Whereas the north experiences generally

clear, bright days with deep frost and occasional light snowfalls, there is more cloudiness and precipitation south of Tsinling Shan.

TRANSITION FROM WINTER TO SUMMER MONSOON

As spring (April) approaches the passage of cyclones increases both in number and intensity. The cold, heavy air-mass over the heart of the continent begins to warm up, at first very gradually, giving place to a continental low, while a high pressure centre is slowly established over the eastern Pacific. Wind direction is slowly reversed, northerly and north-westerly winds give way to those from the south and south-east, and a great current of warm, humid air moves in from the south. Its onset is felt earliest in the south and south-east. By May much of South China experiences mainly south and south-east winds and an increase in rainfall along the West Pacific Polar Front, which steadily retreats northward.¹ T'u Chang-wang comments on the gradualness of the onset: 'In India the "burst of the monsoon" can be followed pretty easily, but in China we have only a "burst of the cold waves", that is the winter monsoon, whereas the advance of the summer monsoon is very gradual and inconspicuous, hence the task of following its advance or retreat is more complicated.'²

By June the West Pacific Polar Front is over the Yangtze Valley, and by July it lies somewhere across the loess region and the Ordos, bringing occasional heavy rainfall to this dry region. Winds are now south-easterly over the North China Plain and southerly over Central and South China. The summer monsoon has now arrived. As can be seen from the map (Fig. 6) the barometric gradient between high and low is much gentler than in winter and consequently winds are lighter. The characteristic weather of the summer monsoon over much of China is hot, calm days of high relative humidity, which are very oppressive. Exasperatingly, any slight breeze which may have been blowing during the day so often fails in the evening, giving long, breathless nights. Coastal regions, especially in the south and south-east, are periodic victims of disastrous typhoon winds. Further inland very strong winds, known as *feng pao*, occasionally disturb the prevailing calm.

The duration of the summer monsoon varies between north and south, being shorter in the north on account of the lateness of onset. T'u Chang-wang and Hwang Sze-sung make a general estimate:

¹ Tao Shih-yen, 'Surface Air Mean Circulation over China', *Academia Sinica*, Vol. 15, No. 4, 1948.

² T'u Chang-wang and Hwang Sze-sung, 'The advance and retreat of the summer monsoon in China', *Meteorological Magazine*, Vol. 18, 1944.

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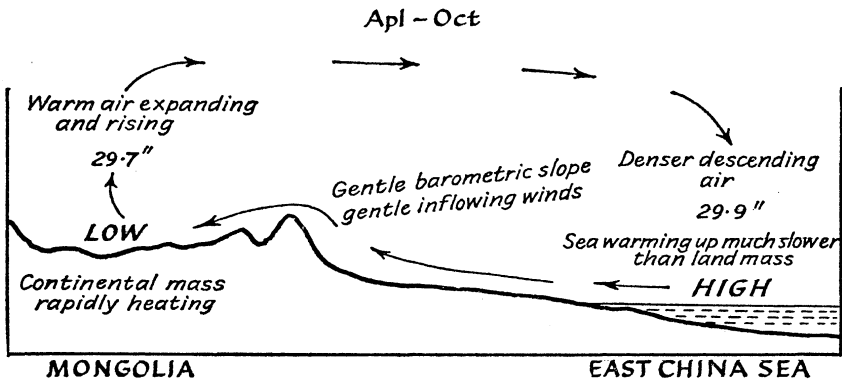
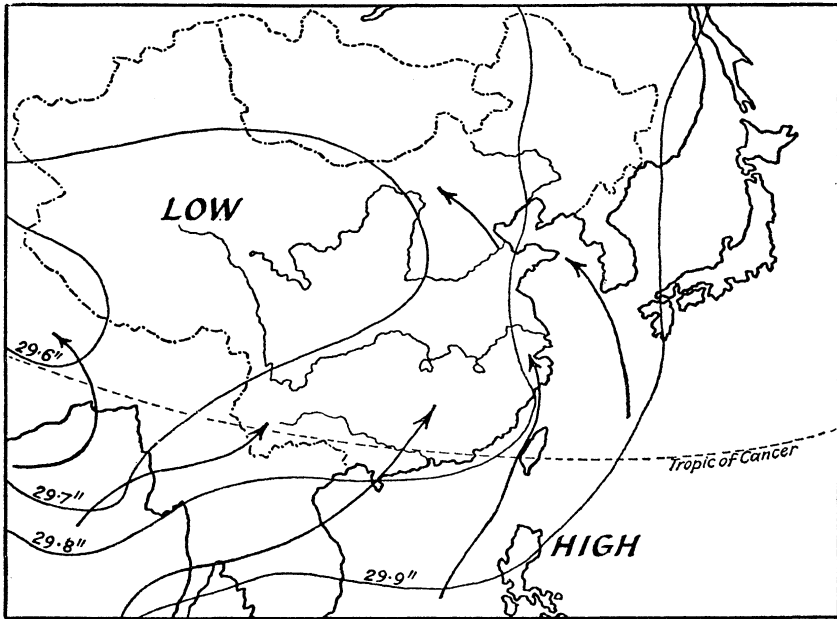


FIG. 6. Pressure and winds: summer

			<i>Rainfall</i>
S. of Nanling Hills	Mid April-end October	6½ months	75-90%
S. of Yangtze	May-mid October	5½	60-80%
N. China and N.E.	June-end August	3	60-75%
Kansu and Inner Mongolia	June-end August	3	less than 60%

Temperature

All three of the major influences on temperature namely altitude, latitude and land-mass play very outstanding parts in China. There is a difference of over 30,000 ft. between Everest and the Turfan basin. There is a difference of nearly 40° in latitude between Hainan (18° N.) and Moho (53° 33' N.) on the Amur in Heilungkiang. China has an area of 3,657,000 sq. miles and lies on the eastern side of the greatest land-mass in the world into which it penetrates some 3,000 miles. Small wonder therefore that we find vast differences both in range and level of temperatures from place to place and from season to season.

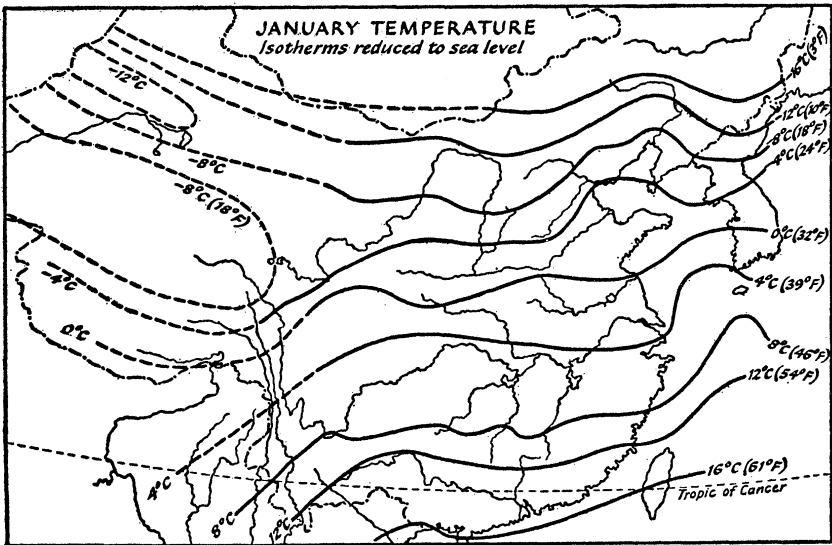


FIG. 7. Temperature chart

In winter there is a large and steady fall in temperature from south to north. Hong Kong has a January temperature of 60°F., Harbin -2°F. It will be noticed that the isotherms are remarkably regular in their alignment E-W. The isotherms bend slightly northward over the China Sea, but the ocean has very little moderating effect on winter temperatures since the winds are outflowing from the central low pressure and the cold Kamchatka current hugs the coast in its southward flow. Chefoo, on the Shantung coast, is as cold as Peking, both having an average January temperature of 23°F. Shanghai, on the coast, is as cold as Hankow, which is 600 miles inland.

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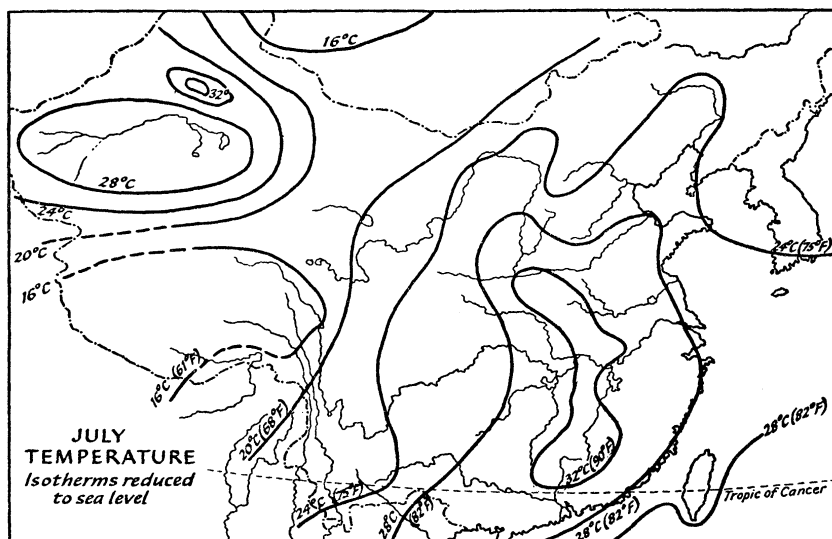


FIG. 8. Temperature chart

In summer the isotherms run N-S and reflect the influence of the in-flowing winds of the summer monsoon. There is a remarkable uniformity of temperature in summer, there being a difference of only 15°F. between places in China proper as compared with some 60°F. in winter. Everywhere it is hot and humid until one passes north-westward into the desert and semi-desert regions of Sinkiang, Mongolia and Dzungaria. Here annual temperature ranges are very great indeed. Luchun, which is in the Turfan basin and is 56 ft. below sea-level, has an annual range of 76°F. Compare this with Hong Kong, on the coast and in the tropics, which has an annual range of only 22°F.

As a result of continentality the cold pole of the northern hemisphere lies in the heart of Siberia, over Irkutsk and results in the 32°F. isotherm extending farther south in China than in any other region in the northern hemisphere. In China it reaches approximately 33° N.; in Europe 43° N. and in North America 38° N. The following are average temperatures for January of places of the same latitude:

Chefoo	23.5°F.	—	Algiers	54.0°F.
Mukden	8.6°	—	Rome	44.6°
Shanghai	37.8°	—	Port Said	56.1°