GeoJournal 17.4 447–455

The Sino-German Joint Expedition to S Tibet, Shisha Pangma and the N Flank of Chomolungma (Mt. Everest) 1984 – Expedition Report

Kuhle, Matthias, Prof., Dr., University of Göttingen, Institute of Geography, Goldschmidtstr. 5, D-3400 Göttingen, FR Germany;
Wang Wenjing, Prof., Dr., Academia Sinica, Institute of Glaciology and Cryopedology, Lanzhou, PR China

(Presented at the International Symposium on Tibet and High Asia, October 8–11, 1985, Göttingen, FR Germany)

ABSTRACT: The Sino-German Joint Expedition consisted of a group of 8 scientists from the Lanzhou Institute for Glaciology and Cryopedology and the Institute for Plateau Biology in Xining (China) as well as 3 participants from the Geographical Institute of the University of Göttingen (FR Germany). The research expedition to S Tibet and the N slope of the Himalayas was undertaken from August to November 1984, supported by technical personel and yak herders.

During the 87–day field campaign studies were done in the Transhimalayas, Tibetan Himalayas, and High Himalayas on Shisha Pangma (8046 m) and under specific aspects on Chomolungma (Mt. Everest, 8848 m). The participants of the expedition worked 63 days at altitudes above 6000 m and 6500 m. The highest altitude reached during the collection of data was 7100 m, i.e. the E face of Chang La leading to the N summit of Mt. Everest. Results were attained in the areas of Pleistocene research, recent glaciology (glacier movements, ablation, albedo and firn-ice temperature measurements), neoglacial and recent glacier history, cryopedology (debris drift measurements), botany and vegetation geography. Additionally, geoecological data on all significant climatic parameters at high altitudes were collected. This work was documented on 16-mm sound movie film in cooperation with the Institute for Scientific Films (IWF, FR Germany). The expedition results were presented and discussed at the International Symposium on Tibet and High Asia, October 8–11, 1985, in Göttingen.

On the Tradition of New Research on High Asia in the Peoples Republic of China and the Federal Republic of Germany

The Lanzhou Institute for Glaciology and Cryopedology of the Acacemia Sinica founded in 1958 has now been sending expeditions for field research between Tien Shan in the N and the Himalayas in the S for over 20 years. Highlights were the first studies done on Shisha Pangma (1964) and Chomolungma (Mt. Everest, 1966–1968) (Shi Yafeng et al. 1966; Lanzhou Institute 1975, 1977). Since 1981 several of the Tibetan glacier and permafrost areas have been researched in cooperation with foreign scientists (Xie Zichu, Zhou Youwu et al. 1986). While research together with Japanese glaciologists was occupied in that year with the Tien Shan glaciers, work with scientists from the FR of Germany concentrated on NE Tibet (Qinghai-Xizang plateau) and the E portions of Kuen Lun (including Animachin), Datsaidan Shan, Kakitu and Quilian Shan, and the mountain chain inbetween (Hövermann and Wang Wenjing 1982; Kuhle 1982a, b). This 4-months undertaking by the 1st Sino-German Joint Expedition 1981 commenced a multiyear cooperation with the Geographical Institute of the University of Göttingen (Kuhle 1985a).

At the Göttingen Institute this tradition is only half as old and began in 1973 and 1974 with glacial-geomorphological reconstructions and cryopedological research in the mountains of SE Iran (Kuhle 1974, 1976) in order to then extend research further to the E in 1976 to the central Himalayas including the Dhaulagiri and Anna-

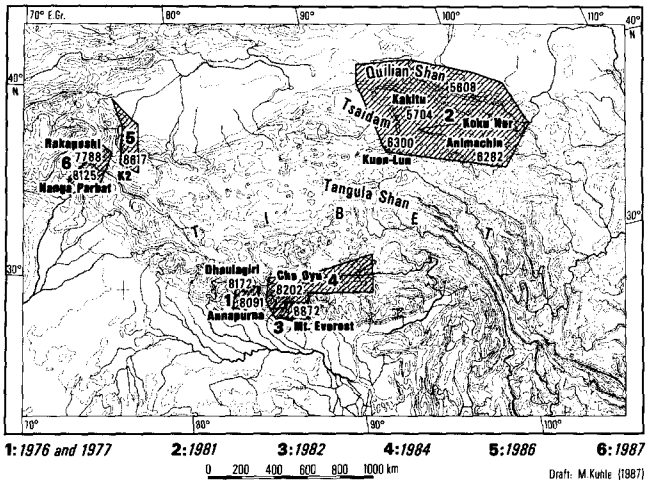
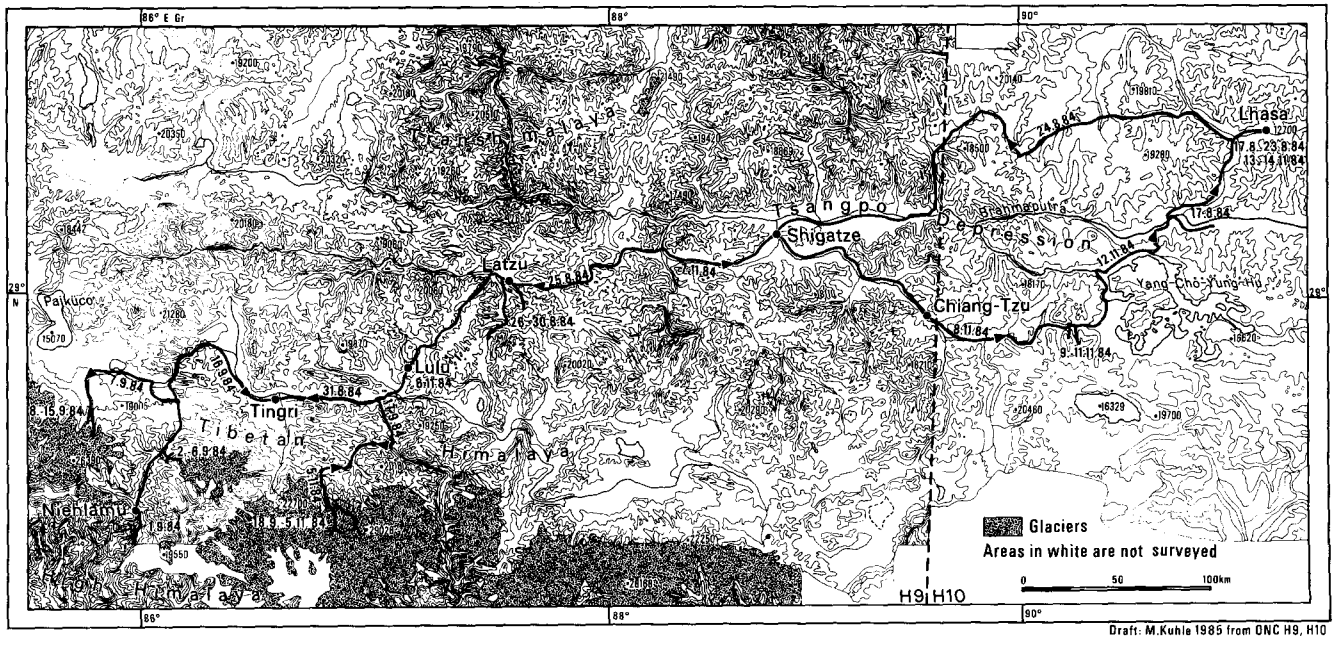


Fig 1

purna Himalayas (Kuhle 1977/78, 1979, 1979/80). The 4-months Himalayan expeditions of 1976 and 1977 also led to the N slope of the main ridge and to S Tibet. The regions studied were practically unknown in terms of their geomorphology, glaciology and vegetation, and the fact that several of the valley sections visited were set foot on for the first time substantiates the lack of knowledge here compared with other mountains and highlands of the world (Kuhle 1982c, 1983a; Miehe 1982). All the more reason why it was important to maintain contact with the classic high-mountain geography in the Alps and to employ all possible observations for comparison with other periglacial regions of the world, e.g. arctic, subarctic and the Andes. Thereby, new data and findings can be better explained and classified. In 1981 the aforementioned 1st Sino-German Joint Expedition followed. The Chinese side was directed by Prof. Wang Wenjing and the German by Prof. Dr. Jürgen Hövermann. This expedition enabled the scientists to make the 1800 km jump to the N slope of this great highland. In 1982 the Germans were again working on the S margin in the Mt. Everest region (Kuhle 1983b, 1986a, b; Miehe 1986). All of these multimonth field campaigns were financed by the German Research Society (DFG), the Max Planck Society (MPG) and the Academia Sinica. Fig 1 reveals that for working areas 1, 2 and 3, area 4 is an important void to be filled on a NS profile for the problem of the Pleistocene glacier cover in Tibet, which is the key paleoclimatic problem for the the studies of Prof. Kuhle.

An essential condition for studying the lowest subrecent ice margin positions is sufficiently deep valleys in addition to the height of the glacier catchment area. This is found on the marginal slopes of high Tibet in the S in the high Himalayas (Fig 1, nos. 1, 3) and in the N in Kuen Lun and Quilian Shan (Fig 1, no. 2). Area 4 fulfils this topographic requirement through the deepening of the Tsangpo valley. Within area 4 it cuts into the highland down to 3700–3900 m asl. Thus, the Tsangpo depression between the Transhimalayas and the Tibetan Himalayas in S Tibet (Fig 2) is for Pleistocene research the same as what the Tsaidam depression between Kuen Lun and Quilian Shan, which cuts down to an altitude of 2850 m, in area 2 is. Between areas 4 and 2 the depressions are lacking. The plateau rises over 5200 m asl, and on its surface there are the recent, even more glaciated mountain groups, such as the 6500 m high Tangula Shan.

Fig 2



Preparation for the 1984 Expedition

The expedition plan, based on previous research and the aforementioned considerations, was conceived in 1981 and 1982. The final agreement on the work program, number of participants, stages, dates and expedition route was made in Beijing in March 1984. The areas of Pleistocene research, recent glaciology, neoglacial and recent glacier history, cryopedology, geomorphology of rapid mass movements, botany, plant ecology at high altitudes and ecological data collection at the highest altitudes were decided upon. A 16-mm sound movie film was planned to document the work, in cooperation with the Institute for Scientific Films (IWF). Dipl. Geographer J.-P. Jacobsen, one of the expedition participants, received a training program in camera techniques at the IWF during the preparation for filming. The evaluation, analyses and dating of the samples taken is to be done at the Lanzhou Institute, the Institutes of Geography, Mineralogy, Geobotany at the University of Göttingen, and at the State Survey for Soil Science of Lower Saxony in Hannover, FR Germany. The scientific and expedition equipment was made available by the Lanzhou Institute, the University of Göttingen and German manufactures of measuring and climatic instruments. The financial basis was provided by the Academia Sinica, the German Research Society and the Max Planck Society. The German group departed on August 12, 1984, and joined the Chinese colleagues on August 17 in Lhasa, who had been underway for several weeks with the expedition vehicles from Lanzhou through N and central Tibet.

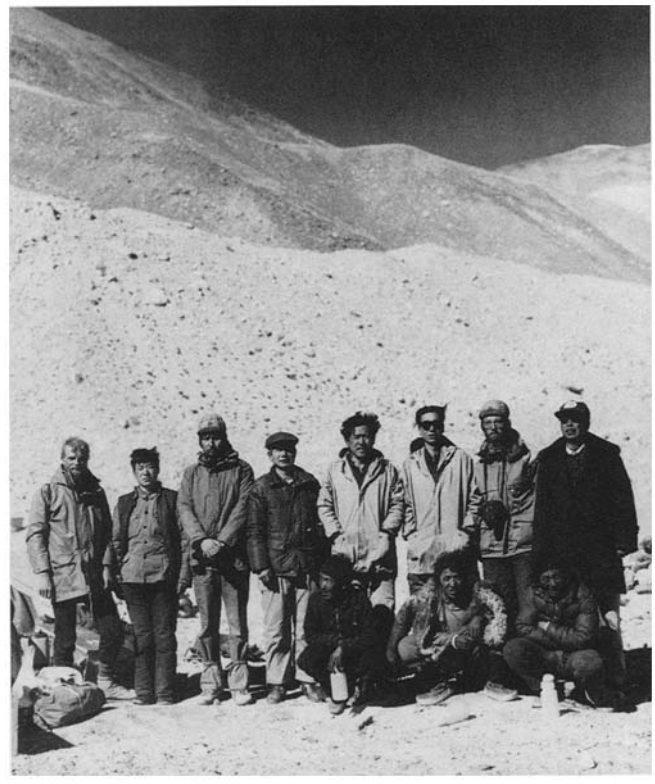


Fig 3 Members of the Sino-German Joint Expedition to S Tibet, Shisha Pangma and the N flank of Chomolungma (Mt. Everest) 1984, left to right, standing: Dipl.-Geogr. Jens-Peter Jacobsen, Cook, Prof. Dr. Matthias Kuhle, Engineer Li, Driver Wang, Driver Li, Dr. Georg Miehe, Prof. Wang Wenjing; in front: Yak-drivers Pemba, Dorji, and Kanza.

The Expedition

The Chinese team was comprised of eight scientists, technicians and a base camp manager, including Prof. Wang Wenjing, Prof. Xu Daoming and Prof. Zheng Benxing from Lanzhou and Prof. Huang Rongfu from the Institute for Plateau Biology in Xining. The German participants were: Prof. Dr. Matthias Kuhle, Dr. Georg Miehe and Dipl. Geogr. Jens-Peter Jacobsen from the Geographical Institute in Göttingen. A cook, three drivers and two helpers completed the expedition team. From the base camp our work at high altitudes was supported by Tibetan yak herders and their pack animals. We drove 2500 km with three cross-country vehicles with all-wheel drive, including a 3-axle truck which made several supply trips. Five base camps were built as starting points.

During the 87 days field campaign studies were done in the following regions: Transhimalayas, Tibetan Himalayas (particularly in the mountains E and W of Chalamba La and E of Utsang Wei at a max. altitude of 6138 m; in the Latzu massif or Quilagugahai Shan and Ladake Shan or Hlako Kangri, ca. 6800 m and 6482 m, respectively; in the massif of Lankazi or Nagartse and Nangkartse, 7188 m or 7191 m, respectively) in the high Himalayas in the Sun Kosi traverse valley (Bote Chu with portions of the group W of the Rolwaling Himal reaching 7038 m asl), on Shisha Pangma (8046 m) and above all on Mt. Everest (Chomolungma, 8848 m) and N of the adjacent massifs. The scientists working at high altitudes stayed 63 days at altitudes over 5000 m and 16 days at altitudes over 6000 m for collecting data. Kuhle attained the highest altitude of the expedition (7100 m) by climbing the E wall of Chang La leading to the N summit of Mt. Everest and the lower portion of the SE ridge of Changtse. The expedition ended on November 20, 1984. Research was facilitated by the extremely good weather. The results presented here were discussed at the International Symposium on Tibet and High Asia from October 8–11, 1985, in Göttingen (Höllermann 1986; Kuhle 1986c).

Detailed Account on the Expedition

For initially adjusting to the high altitudes a stay in Lhasa at 3700 m was planned for August 17–23. This first jump in altitude is considerable, as was confirmed

by the very dangerous case of pneumonia which a Chinese colleague caught. After two days he was brought to the hospital where he was put on an oxygen apparatus. He joined the expedition four weeks later but was not allowed over 5500 m altitude. Precaution was also taken particularly against infections of the respiratory tract. In combination with the unusual altitude they can also lead to edema. A German member of the expedition caught a cold and had a temperature of over 39° C (102° F) within a very short period of time. For this reason he was immediately treated with penicillin and was back on his feet again in just a few days.

We used the stay in Lhasa for three 1-day field trips into the granite areas of the Tsangpo tributary valleys. On August 24 and 25 the expedition then crossed several passes in the Transhimalayas W of Lhasa, including the 5300 m high Chalamba La. On the way, detailed surveys were made, and several samples of important erratics were collected. Moving slowly up the roads and the Tsangpo valley and passing Shigatse, the convoy reached the Latzu military station at 4030 m asl. From this point on, work was done until August 30 on the N slope of Ladake Shan with an intermediate camp at 4800 m up into the congelifluction zone (Fig 2). The climb continued from the highest settlement named Phu Shar (4300 m) into a largely unmapped region. The botanist Prof. Huang Rongfu and the three Germans were supported by four porters. The other Chinese participants were already preparing for the Shisha Pangma campaign. In addition to surface temperature measurements, radiation measurements and plant ecology studies the features of recent, extremely glaciated mountain topography – reminiscent of the Scandinavian Alps – were surveyed. On August 31 the group crossed over into the W parallel valley, the Mangaphu Chu and Lho Chu, into Maphu La with light new snow (5220 m; 5439 m according to Howard-Bury 1922) and collected glacial till and erratic samples up to Lulu military station (4350 m). Following the Bhong Chu from 4300 m to 4500 m asl to the W and passing the Tingri settlement, the road from this S parallel valley of the Tsangpo gains the altitude of the 5100 m high Thong or Tung La (5480 m according to Howard-Bury 1922) curving more and more to the S. From here on, the route follows the Bo or Bote Chu (Sun Kosi) from its origin over the main ridge of the Himalayas to Damu on the border between China and Nepal at 2100 m asl. All Chinese and Germans then joined in Nylamu and ventured into the region of the great 1981 avalanche which took over 100 human lives and destroyed the "Friendship Bridge" on the road to Kathmandu. Prof. Huang Rongfu had to be taken to the hospital in Damu due to a gastro-instestinal disorder.

Work on Shisha Pangma

The three German participants, the cook and later the Chinese colleagues lived at first from September 2–6 in a camp at 4300 m asl at the mouth of an E tributary valley of the Bote Chu, N of the main Himalayan chain in the Tibetan Himalayas. From here and an intermediate camp at 4760 m field work continued to 5540 m asl and telemetric measurements were taken up to the upper summit region at 6500 m (Fig 1). These studies were documented on film and the topographical context of the extensive mountain areas concerned were recorded with several panshots.

After the base camp had been moved on September 7 about 70 km WNW to an altitude of 5020 m on the N slope of Shisha Pangma (8046 m), two higher camps at 5300 m and 5550 m were built on the tongue of the Yepokangara glacier during the increasingly better weather of the post monsoon season. Detailed studies were done on the great late-glacial outwash aprons of the N slope of the Himalayas up to an altitude of 6000 m. From the foot of the mountains they run out onto the plateau remains of S Tibet at 5000 m asl. The N side of Shisha Pangma was specially chosen for this work because it is one of the rare regions where the high Himalayas come in direct contact with the plateau without intervention by the Tibetan Himalayas – as is the case for example N of Mt. Everest. Such a mountain foreland situation is the topographical precondition for outwash apron formation. At the same time, the outwash aprons of these glaciogenic foreland deposits were selected because they were not only situated in the permafrost zone at the time of formation, but also still lie in this zone today. As a result, the outwash apron slopes have been smoothed out by solifluction rather than deeply eroded, and thus are better preserved.

Triangulations with the Geodimeter 122 were done for the first time on this field campaign. This was done to redetermine the height of Shisha Pangma. Additionally, automatic climate measuring stations were operated at the three camps, and infrared temperatures, glacier tongue positions and ice pyramid positions were measured. The transport of supplies to camp 2 (5550 m) was eased with the help of yaks and two Tibetan herders, who also helped with the field work by carrying measuring equipment.

The supplies brought were supplemented by milk, butter, cheese and two sheep. We bartered them from the partly nomadic Tibetans who spend the four months of summer on these highest pastures with their herds. Two of the Chinese expedition members went hunting daily and shot hare, ptarmigan *(lerwa lerwa)* and pigeons *(columba rupestris)*. Later, on Mt. Everest, large wild sheep *(ovis hodgsoni)* were also hunted. At the base camp the helpers, cook and the drivers were not only plagued with ailments such as troubled sleep, dizziness, loss of appetite and nausea, but also persistent altitude sickness which was accompanied by intensive headaches and lasted for weeks, even during the time at the Mt. Everest camp. The cook finally had to be taken to the Lulu military station where he recovered at 4300 m asl and did not join us again.

The N Slope of Mt. Everest

On September 16 our work on Shisha Pangma was completed and the equipment was transported to Lulu. Part of the expedition had already departed the day before. On September 17 the three heavily loaded vehicles crossed over the 5200 m high Panga La between the Bhong Chu (basin of Lulu) and the Dzakar valleys and the latter was then followed up into the Rongbuk valley. The monsoon season ended prematurely in 1984, and with only a few short-lived interruptions the good weather continued on into November, till the conclusion of our 50-day studies at Mt. Everest. After we had left behind the deeper sections of the Dzakar Chu (4300–4550 m asl), in which the buckwheat and barley harvest was in full swing, there were three small obstacles to overcome before reaching the tongue of the Rongbuk glacier where the base camp was to be built. The deep Rongbuk river had to be crossed, which was no problem for the first cross-country vehicle and the equipment truck. However, water began to flow into the third vehicle. Only after the passengers had waded to the other shore did the driver succeed in getting the vehicle to the dry bank in low gear and with full throttle. The strenuous uphill drive in rock of the valley floor overheated the motors again and again so that they died and were very difficult to start again. Finally, a large moraine block had rolled down from above the Rongbuk monastery and blocked the way for the wide truck. It took many hours to build a detour around this large block. In the remaining sunlight we were able to set up several tents for sleeping at 5170 m asl in the forefield of the glacier. On September 18 we finished construction of the base camp and installed the measuring equipment (Fig 4). Part of this work involved constructing the stand with the Geodimeter, which was to be in operation for more than 40 days, and the accompanying reflections on various solifluction slopes. The remaining reflectors on the Rongbuk glacier, which were used to make the finest measurements of the decreasing movements at the boundary zone toward the static ice and extended up to 2.6 km into the ice flow, were installed over the next few days.

The Central Rongbuk Glacier

After short exploratory climbs camp 1 was set up on the central Rongbuk glacier (Fig 4). It stood in the orographically right marginal depression at 5500 m asl and was built with the help of yaks, as important means of transport. The 100 m high steep innerslope of the moraine caused problems for the pack animals and here they lost four loads. The fallen aluminium cases were badly damaged and the valve on our oxygen equipment was broken. Until the beginning of October work was conducted from camp 1 onto the central Rongbuk glacier up to the N face of Mt. Everest at 6450 m and over to

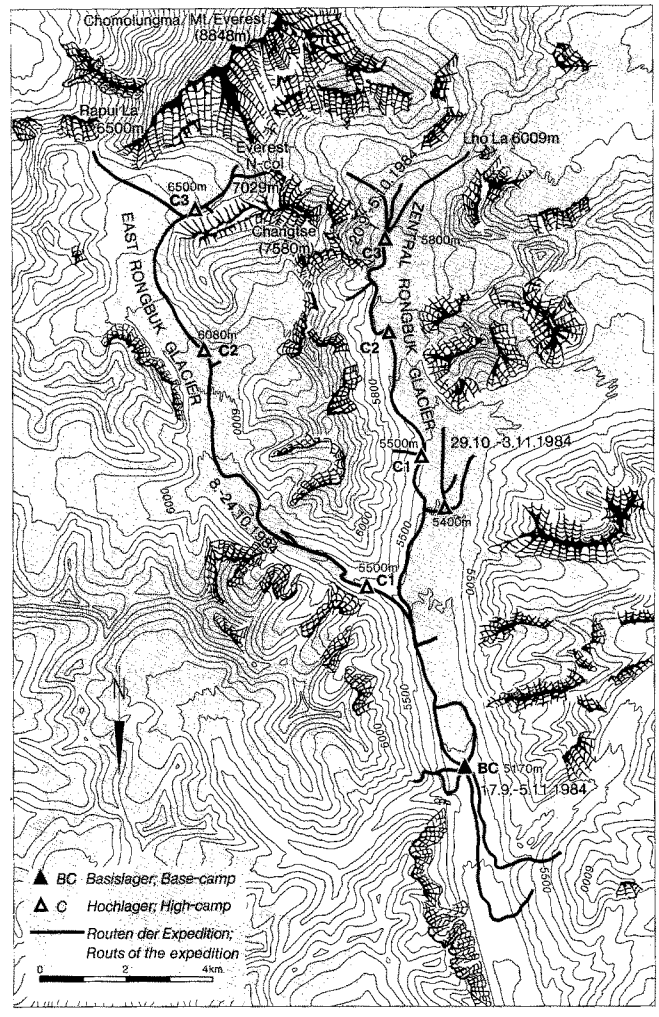


Fig 4

Lho La (Fig 4). Prof. Huang, who was now back on his feet, and a helper joined the German group in camp 1. Two of the Tibetan yak herders set up camp 2, which was built between two ice pyramid chains on the upper moraine, and brought supplies up. Further up on the glacier, the scientists continued with field work as well as supply trips, cooking and building camp 3 at 5850 m asl (Fig 4). This double burden of collecting scientific data on one hand and the logistics on the other, including the transport of 25 to 30 kg loads to the other side through difficult glacier terrain partly covered with broken rock and avalanche, was overcome due to the good weather. During the 15 days of work on the central Rongbuk glacier rock samples, lichen samples and the highest plants were collected and radiation, radiation balance, humidity, soil temperature, firn temperature and ablation measurements were taken. Ice-, firn- and rock-surface temperatures were measured up to 8700 m asl.

During this time, a Chinese group under the direction of Prof. Wang worked on measuring the movements of the central Rongbuk glacier on a profile

at 5400 m. The placement of the measuring rods was impeded by the ice-flow surface caused by cryokarst phenomena.

The E Rongbuk Glacier up to the SSE Ridge of Changtse

On October 6 and 7 back at the base camp, the climb over the E Rongbuk glacier was prepared. While several Chinese colleagues were to oversee the measuring equipment at the base camp, a Sino-German working group planned a stay of at least 14 days for research at 6000–7100 m asl. The scientists started on October 8 and were back in the base camp on October 24 after 17 days of work. Camp 1 (5500 m) was solely used for one night during the climb up and later by the three Tibetan yak herders. Camp 2 (6080 m) was used for six days and camp 3 (6500 m) for nine days (Fig 4).

The group was supported by pack animals up to camp 3. The route over the E Rongbuk glacier enabled eight yaks, each carriyng 40 kg, to transport equipment twice up to camp 2 at 6500 m. The equipment consisted of instruments, provisions, fuel, two wind-resistant thermal dome-tents, rope and climbing gear and medical supplies including several oxygen tanks. The oldest yak herder, named Pemba, demonstrated his talent in an unusual way by cutting steps into the impassable lower portion of the glacier ice for the yaks. In this manner the smooth, steep slopes of ice were able to be ascended. The hoof injuries of the pack animals had to be disregarded, just as the danger of rockfall. Finally, the group was happy to reach the top without losing any animals and seriously damaging any equipment.

None of the yak herders remained very long or even stayed overnight in camp 3. Porters, helper or a cook did not assist the scientists as they were accustomed to on the other side of the Himalayas, in Nepal. In this context, it was medically interesting to note that the Tibetans who were used to higher altitudes and had their permanent settlements downvalley at 4600 m asl, complained more about problems with headaches, nausea and stomachaches than the scientists. These complaints were apparently to allow them to descend from camp 3 again as soon as possible.

One of the weaknesses in the equipment became very evident during the operations on the upper E Rongbuk glacier, i.e., the lack of walkie-talkies. With the distance of several tens of kilometres and an altitude difference of 2000 m they would have eased the work and above all increased the safety factor at an altitude to which proper adaption is physiologically no longer possible. However, for financial reasons and more importantly due to problems with space and weight at this altitude we dispensed with them. Yet, after this experience, they were used for the Sino-German Karakorum expedition in 1986 to the 25 km long N K2 glacier.

On October 8 camp 1 was built in the forefield of the E Rongbuk glacier (Fig 4) and on the next day camp 2 on the medial moraine of the N Changtse and E Rongbuk glaciers, below the eastern N Changtse spur (Fig 4). The instruments for measuring radiation were installed and research on the N Changtse and E Rongbuk ice flows was done until October 14 up to an altitude of 6480 m. During this time work was hindered by overcast skies with light snowfall and gusty wind (jet stream) with temperatures down to −12° C. On October 15 camp 3 was then constructed at 6500 m under the cover of a shallow glacier crevasse, but not out of danger from avalanche and rockfalls of the 550 to 900 m high SSE wall of Changtse. From this point, glaciological, climatological, geomorphological and even plant ecology studies were conducted with wind temperatures of −18° C (at 6500 m) but under clear skies. In a roped party all areas of both upper firn basins of the E Rongbuk glacier up over the Rapiu La bordering to the E, which connects the Kangchung valley with the E flank of Mt. Everest, were traversed (Fig 4). Thereby, telemetric temperature measurements were taken on the N flank of Chomolönzo and Makalu (8481 m) which were a continuation of the studies on these mountains which began in 1982 from the W.

On October 21 three of the scientists traveled to the foot of the NE wall of Chang La. One of them climbed this flank to the N anticline of Mt. Everest on the SSE ridge of Changtse, while the others took measurements in the W firn basin of the E Rongbuk at 6650 m asl. The climb was eased by a fixed rope left behind by an American expedition to Mt. Everest. From the SSE ridge of Changtse at 7100 m asl the reduction in snow and firn cover with altitude was able to be recorded and mapped in detail due to the suitable distance of 3.5 km from the summit of Mt. Everest and thus the sufficiently shallow angle of the perspective. For observations of this type there is not a more suitable point at this altitude on Mt. Everest.

Jacobsen carried the heavy 16 mm camera with a great expenditure of energy so that good quality pan and still shots were able to be recorded up to altitudes of 6700 m for a scientific film (Kuhle 1985b, 1986d). Miehe also took care of the very hard, nonscientific work at the base camp. A part of this, for example, was the many hours of cooking and melting ice to cover the high daily water requirements of ca. 5 liters per person. These enormous amounts of water fight firstly against dehydration caused by hyperventilation during climbing and work in thin air and relative humidities of no more than 0.13 and 2.52 g/m^3 and secondly against thickening of the blood dependent on the increasing hematocrit values with decreasing amounts of oxygen. Altitude-dependent risks of blood thickening are frostbite of the hands and feet in spite of good clothing, overexertion of the heart, leading to edema of the brain or lungs and internal broken blood vessels, which can lead to cerebral apoplexy and nearly irreversible bleeding in the inner eye (Zink 1978). Apparently as a result of insufficient water intake Jacobsen suffered from very light frostbite of the

feet in spite of his special aluminium-lined double shoes made for high altitudes. On October 23 he complained about slightly troubled vision which originated from damaged blood vessels in the eye as an altitude-dependent sickness, i.e., blood intrusion into the vitreous humor. For this reason he had to take good care of himself from now on, remained at the base camp altitude after the descent and did not participate on the climb to the N slope of Mt. Everest. This eye problem troubled him long after the expedition.

In the late evening of October 24 the scientists reached the base camp with all the equipment from the upper camp and spent the next two days taking repeated measurements with the Geodimeter 122. Some of the Chinese had used the meantime for taking more ice movement measurements at the tongue of the central Rongbuk glacier. With a party of four under the direction of Wang Wenjing they had also set up an upper camp for several days at 5400 m asl for this purpose.

The Concluding Work on the N Slope of Mt. Everest

On October 27 and 28 the detailed work on the right and left flanks of the Rongbuk valley outside of the base camp was completed up to an altitude of 5550 m. This work involved collecting samples for radiometric age dating of late- to neoglacial marginal moraine terraces, measuring sprout deformation of dwarf shrubs on creeping waste slopes and completing the collection of plant material.

On October 29 Kuhle and Miehe began the last longer excursion at Mt. Everest to the confluence of the W Rongbuk glacier and the central ice flow. This time they were supported by two Tibetan herders with five yaks and set up camp on the upper moraine of the main glacier (Fig 4). During the six days on the glacier they busily collected data on ice pyramid formation, on upper moraine thickness and thermokarst phenomena with melt water pools and rock-specific cryoconite formations under dark crystalline schist and light tourmaline granite debris along several glacier cross sections. On November3 the pack animals came again to pick them up. During this time Jacobsen recorded the amount of runoff from the 140 m^2 Rongbuk glacier system at the Rongbuk river.

On November 4 a portion of the expedition personnel dismounted and packed the instruments at the base camp. Some of the scientists used this time to make a previously postponed trip up to the mouth of the tributary valley with the tongue of the NE Gyachung Kang glacier (7975 m) at 5650 m asl. Following the 50 days of field work at Mt. Everest the descent from the base camp to 5170 m was planned for the afternoon of November 5. Although the weather was still good, there was a growing danger of snowfall beginning in the middle of October and the temperatures decreased to $-12°$ to $-15°$ C even at the base camp, so the date for descent seemed to be chosen well. The extreme onset of winter in Tibet with temperatures of $-40°$ C and heavy snowfall at the end of October and beginning of November in 1985 confirms just that it was not too early.

The Lankazi Massif in the Tibetan Himalayas

On November 6 samples, e.g., varve clays, were collected in the Lulu basin (middle Bhong Chu). One and a half additional days with a stay in Shigatse were necessary to cross the three passes on the road to the E to the Lankazi massif (Fig 2). From November 8 to November 12 the expedition worked in this 7191 m high mountain group of the Tibetan Himalayas with intermittent light snowfall. On the first day work was done from the 5100 m pass road. Work continued on November 9–11 from two higher camps which were set up near the Kang Chüng glacier at 4870 m and 4720 m asl. The geomorphological, glaciological and plant ecology studies concentrated on the 6679 m high Kang Chüng massif for which recently completed topographic maps from the Lanzhou Institute for Glaciology and Crypedology were available. Thereby the scientists, following a late-glacial marginal moraine terrace into an eastern, N-draining tributary valley for 10 km, reached an altitude of 5300 m. From this point they were able to look out onto and photograph the N flank of an estimated 6500 m high glacier berg which was located outside of the map area and which acted as the catchment area of the aforementioned moraines.

One working group led by Prof. Wang undertook a climb from the Lankazi military station (4500 m) to the very extensive E flank of the Lankazi massif for topographical and glaciological purposes and attained nearly 5000 m altitude. Due to lack of time, however, none of the glacier tongues there, which are still unknown, were able to be reached.

Conclusion of the Expedition

On November 12 soil and peat samples were collected on the SW shore of the Yung-Cho-Yung-Hu lake (Yamdrok lake according to Aufschnaiter 1983, 118–119) at 4480 m asl. Then we drove over the nearly 4900 m high Tschü Sü La (Gampa La according to Aufschnaiter 1983, 118) into the Tsangpo valley. We arrived in Lhasa in the evening (Fig 2). The cleaning, drying and sorting of the equipment, instruments and samples as well as the discussion on the procedure and distribution of the evaluation took place on November 13. In the evening the German participants were invited to a joint farewell dinner since the mutual undertaking was disbanded on November 14. With the exception of Prof. Wang who accompanied the Germans to Chengdu and Beijing, the Chinese personnel drove back to Xining and Lanzhou where they arrived 2½ weeks later.

On November 16 Prof. Kuhle was invited to a lecture at the Geological Institute of the Academia Sinica in Chengdu. In conclusion, we had the preliminary discussions for field research at the Minya Konka massif (7590 m) on the E margin of the Tibetan plateau planned for 1991. These discussions were with Prof. Li Jian and Li Tianchi, who visited the Geographical Institute in Göttingen from 1980 to 1982. The travels by train lasting nearly two days through Chengdu of E China offered informative insights into the old Far East cultural setting which the Germans particularly enjoyed after the months in uninhabited areas. In addition to recreational and sightseeing tours during the last two days in Beijing there was a banquette at the Chinese Academy of Sciences in honor of the joint expedition as an official conclusion at which there were also representatives from the German Embassy.

References

Aufschnaiter, P.: Peter Aufschnaiter, sein Leben in Tibet. Innsbruck 1983.

Bruce, C. G.: Mount Everest. Der Angriff 1922. Basel 1924.

Dyhrenfurth, G. O.: Zum dritten Pol. Die Achtausender der Erde. München 1952.

Finch, G. I.: Der Kampf um den Everest. Leipzig 1925.

Höllermann, P.: Neuere Forschungen über Tibet und Hochasien. Bericht über ein Symposium in Göttingen 1985. Erdkunde 1 (1986)

Hövermann, J.; Wang Wenying: First Sino-German Joint Expedition to Qinghai-Xizang (Tibet) Plateau 1981. In: Wannagat, U. (ed.) Sitzungsber. u. Mittl. der Braunschw. Wissensch. Gesellsch. Sonderheft 6, Die 1. Chinesisch-deutsche Tibet-Expedition 1981. Braunschweig-Symposium 14.–16. 4. 1982, Göttingen 1982.

Howard-Bury, C. K.: Mount Everest. Die Erkundungsfahrt 1921. Basel 1922.

Kuhle, M.: Vorläufige Ausführungen morphologischer Feldarbeitsergebnisse aus dem SE-Iranischen Hochgebirge, am Beispiel des Kuh-i-Jupar. Ztschr. f. Geomorph. N. F. 18, 4, 472–483 (1974)

Kuhle, M.: Beiträge zur Quartärmorphologie SE-Iranischer Hochgebirge. Die quartäre Vergletscherung des Kuh-i-Jupar. Gött. Geogr. Abh. 67, V. I, 1–209, V. II, 1–105 (1976)

Kuhle, M.: Über Periglazialerscheinungen im Kuh-i-Jupar (SE-Iran) und im Dhaulagiri-Himalaya (Nepal) sowie zum Befund einer Solifluktionsobergrenze. In: Coll. sur le Périglaciaire d'Altitude du Domaine Mediterranéen et Abords, Strassbourg 1977, pp. 289–309, Strassbourg 1978.

Kuhle, M.: Settlements on the Southern Slope of the Dhaula-Himal. A Contribution to the Settlement Geography of the Nepal-Himalaya. Nepal Research Centre Miscellaneous Papers 33, 1–36 Kathmandu 1979.

Kuhle, M.: Klimageomorphologische Untersuchungen in der Dhaulagiri- und Annapurna-Gruppe (Zentraler Himalaya) 244–247. Tagungsber. u. wiss. Abh. 42. Dt. Geographentag 1979, Wiesbaden 1980.

Kuhle, M.: Erste Deutsch-Chinesische Gemeinschaftsexpedition nach Tibet und in die Massive des Kuen-Lun-Gebirges (1981) – ein Expeditions- und vorläufiger Forschungsbericht. Tagungsber. und wiss. Abh. 43. Dt. Geographentag 1981 in Mannheim, 63–82. Wiesbaden 1982a.

Kuhle, M.: An Expedition to an Unexplored Region of Tibet. German Research, Reports of the DFG 3/82, 26–29 (1982b)

Kuhle, M.: Der Dhaulagiri- und Annapurna-Himalaya. Ein Beitrag zur Geomorphologie extremer Hochgebirge. Z. f. Geomorph., Suppl. 41, 1 1–229, 2 1–184, Geomorph. Karte 1:85 000. Berlin-Stuttgart 1982c.

Kuhle, M.: Der Dhaulagiri- und Annapurna-Himalaya. Empirische Grundlage. Ztschr. f. Geomorph. Suppl. 41, 1–383. Berlin-Stuttgart 1983a.

Kuhle, M.: DFG-Forschungsbericht der Expedition von Aug. bis Nov. 1982 in die Mt. Everest-Südabdachung. 1–23, 1983b.

Kuhle, M.: Glaciation Research in the Himalayas: A New Ice Age Theory. Universitas 27, 4, 281–294 (1985a)

Kuhle, M.: Die Südtibet- und Mt. Everest-Expedition 1984 – Geographische Untersuchungen in Hochasien. 16 mm-Farbtonfilm, Dauer: 42', Kamera: J.-P. Jacobsen, produziert in Zusammenarbeit mit dem Inst. f. d. Wiss. Film (IWF), Göttingen 1985b.

Kuhle, M.: Absolute Datierungen zur jüngeren Gletschergeschichte im Mt. Everest-Gebiet und die mathematische Korrektur von Schneegrenzberechnungen. In: Tagungsber. u. wiss. Abh. 44. Dt. Geographentag 1985 in Berlin, Wiesbaden 1986a.

Kuhle, M.: Former Glacial Stades in the Mountain Areas surrounding Tibet- in the Himalayas (27°–29° N: Dhaulagiri, Annapurna, Cho Qyu and Gyanchung Kang areas) in the south and in the Kuen Lun and Quilian Shan (34°–38° N: Animachin, Kakitu) in the north. In: Joshi, S. C. et al (ed.) Himalayan Research & Development, Himalayan Research Group, Vol. Nepal-Himalaya-Geo-Ecological Perspectives. 1986a.

Kuhle, M.: New Research on High Asia, Tibet and the Himalayas. The International Symposium on Tibet and High Asia on Oct. 8–11, 1985 in Göttingen. GeoJournal 12, 3, 341–343 (1986c)

Kuhle, M.: Die Südtibet- und Mt. Everest-Expedition 1984. Film-Kommentar und Erläuterungen. In: Publ. zu wiss. Filmen, Sektion Geographie, Inst. f. d. Wiss. Film, Göttingen 1986f.

Miehe, G.: Vegetationsgeographische Untersuchungen im Dhaulagiri und Annapurna-Himalaya. Dissertationes Botanicae 66, 1, 1–224, 2 1–152 u. Abb., Karten (1982)

Miehe, G.: Die Höhenstufen der Vegetation am Mt. Everest. In: Tagungsber. u. wiss. Abh. 44. Dt. Geographentag 1985 in Berlin, Wiesbaden 1986.

Norton, E. F.: Bis zur Spitze des Mount Everest. Die Besteigung 1924. Basel 1926.

Shi Yafeng et al.: A Photographic Record of the Mount Shisha Pangma Scientific Expedition. Peking 1966.

Xie Zichu; Zhou Youwu et al.: Selbstdarstellung des Lanzhou-Instituts für Glaziologie und Cryopedologie und seiner Geschichte. Lanzhou 1986.

Lanzhou-Institut: Wissenschaftliche Ergebnisse der Mount Jolmo Lungma- (Mt. Everest-) Expedition 1966–68. Peking 1975.

Lanzhou-Institut (1977): A Photographic Record of the Mount Jolmo Lungma Scientific Expedition. Peking 1977.

Zink, N.: Ärztlicher Rat für Bergsteiger. Stuttgart 1978.

Maps

General map of Hedin's travels in Tibet 1906–1908 (1:3 000 000, designed and drawn by O. Kjellström 1909, Leipzig).

The Transhimalayas (1:1 500 000, drawn from the original map of Sven Hedin by O. Kjellström 1909, Leipzig).

Atlas of the Polish Peoples' Republic (sheets 77 and 78, 1:2 500 000, Warsaw 1971.)

Preliminary map of the route of the 1921 Mt. Everest Expedition (1:750 000, by H. T. Morshead, Basel 1922.)

Mt. Everest and the Tschomo Lungma group (1:63 360, drawn by C. Jacot-Guillarmod using the photogrametric photo by R. E. Wheeler and H. Singh, Mt. Everest Committee of the Royal Geographical Society and the Alpine Club, English Mapping Office, Basel 1925.)

Topographic map section of the northern slope of Shisha Pangma (1:50 000), surveyed on the 1964 Chinese Shisha Pangma Expedition, Lanzhou Institute of Glaciology and Cryopedology, Academia Sinica, Peking.

Chomolungma (Mt. Everest) map (1:50 000) of the 1966–1968 expedition "The comprehensive Expedition to the Qinghai-Xizang Plateau". Academia Sinica, Peking 1979.