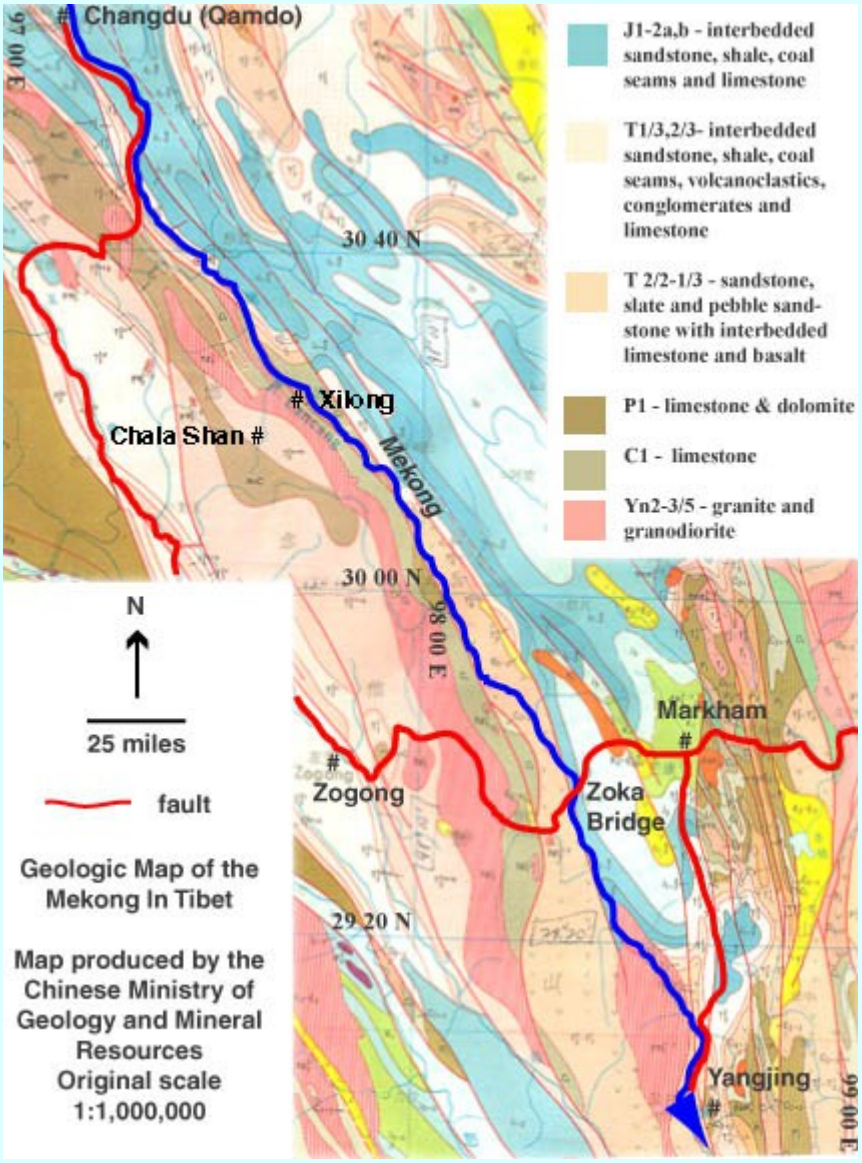
Geography and Geology of the Mekong in Tibet



The Mekong in Tibet flows through a land of dramatic topography and geology. The region is characterized by dozens of glaciated peaks over 20,000' high with major rivers such as the Salween, Mekong and Yangtze flowing through two mile deep gorges within fifty miles of each other. Rocks range in age from Precambrian schists to Quaternary river terraces produced at the end of the last ice age. It is evident that regional uplift is still occuring because seismicity is high and landslides from slopes oversteepened by rapid erosion are common.

Gongga Shan (also called Minya Konga). Photo by Ben Foster

On the drive west from Chengdu, a city of ten million at the west edge of the Sichuan Basin, the road climbs about 14,000' to a pass just north of Gongga Shan. At nearly 24,800', it is the highest mountain outside the Himalayas, and on a clear day there is a spectacular view of it just south of the highway at Xinduqiao. The regional increase in elevation from the Sichuan Basin to the Tibetan Plateau is one of the steepest on our planet. This dramatic scarp is the result of rapid eastward thrusting of Proterozoic, Paleozoic and Mesozoic rocks that underly eastern Tibet over Mesozoic sediments that underly the Sichuan Basin.

West of Gongga Shan, in the high country around the town of Litang (between the Yalong and the Yangtze), the town of Markham (between the Yangzte and the Mekong) and the town of Zogong (between the Mekong and the Salween), Precambrian schists are overlain by relatively flat lying late Paleozoic carbonates (Carboniferous and Permian) and Mesozoic clastic sediments (Triassic and Jurassic), and the topography is more typical of the Tibetan Plateau. High peaks in this area are glaciated, and evidence of Quaternary glaciation at elevations as low as 12,000 feet is common. High valleys have glacial lakes behind terminal moraines in U shaped valleys but at lower elevations they become steep, deep and narrow canyons. Where these steep canyons flatten out in places such as the town of Bangda (just east of the Yangtze), they are filled with gravels and boulders eroded from glacial moraines.

For the first 50 miles or so below Changdu (Qamdo on some maps, in far northeastern Tibet), the Mekong flows through a broad valley that is filled with glacial gravels so most rapids in this stretch are gravel bar riffles with an average gradient of about 12 feet per mile. Rocks here are Mesozoic clastic sediments that become increasingly folded and faulted as one progresses downstream (falling off the Tibetan Plateau), and in places there are spectacular views of folded quartzite beds.

Photo by Lui Li

After the confluence of the Jing He and Chaya Jiang, the Mekong enters a canyon that is initally cut in late Paleozoic carbonates, but near the end of the road intrusive rocks appear at river level and within another ten miles or so the canyon walls are primarily Precambrian schist. The gradient doubles here, giving it the river enough energy to scour smaller gravels, so rapids are formed where the river pours over larger boulders deposited by landslides and by flash floods down steep side canyons. Major faults and fold axes trend north to northwest, generally parallel to the river. There is a zone of forest from about 11,500' to the tree line at 13,000', but the canyon slopes below 11,500 feet are barren. It rains and snows at higher elevations, but the lower canyons are a desert. We were struck by the strong similarity between the Mekong gorge and the inner gorge of the Grand Canyon, which is also cut through Precambrian schist in a desert environment.

Photo by Travis Winn

For reasons explained in the detailed description of the expedition (see below), we were not able to float the entire distance of the Mekong in Tibet. We aborted the expedition a few miles below the village of Xilong, about 80 miles below Changdu, and hiked to the west up a nearby

side canyon to Chala Shan, a village where there was road access to the main highway between Zogong and Changdu. On this hike we passed from Precambrian schist at river level (10,000') into granitic and granodioritic intrusives (11,500 - 13,000') with glaciated Paleozoic carbonate roof pendants exposed on high peaks (up to 21,000').

Between Xilong and Yangjing, our only view of the Mekong was at the Zoca Bridge, about two-thirds of the way between Changdu and Yangjing. The canyon widens here, and the Tibetans farm Quaternary gravel terraces 200' to 300' above the river. These terraces are remanants from the last glacial retreat (about 10,000 years ago) when rivers were choked with sediment. They are common throughout the river canyons of Tibet. Rather than scouring deeper canyons, rivers deposited glacial gravels, raising the elevation of their beds as much as several hundred feet. This also raised the base level for side canyon deposits, causing the development of terraces that could be grazed and farmed when humans migrated into the canyons about two thousand years ago.

Photo by Travis Winn

At Yangjing (located on a large, high terrace in far southeastern Tibet), the river cuts through Cenozoic volcanics not shown on the geological map. In association with these volanics, there are low sulfur content hot springs that are utilized by a local resort and warm springs that are exploited for their high salt content.

Photo by Liu Li

One of the objectives of the expedition was to field check Chinese geologic maps of the area that were produced from aerial photos, but the difficulties encountered on the river resulted in a failure to achieve this object. In other areas, Chinese geologic maps have been fairly accurate given their scale (1:1,000,000), but floating the Mekong in Tibet is so challenging that further geologic work should be done by hiking into and along the canyon where possible.