

Statistics and comparison of ancient and modern glaciers in Gongga Mountain area, Hengduan Mountains, Sichuan, China

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This study is a part of a project aimed to reconstruct late Pleistocene glaciation in mountain systems of Central Asia. We investigate local centers of glaciation in test regions in order to justify our elaborated GIS technology.

The Gongga Mountain represents a center of glaciation in the Hengduan Mountains – a structure separating the eastern side of the Tibet and Himalaya high-mountain region and the Sichuan Basin. The Hengduan Mountains consist of many mountain ranges stretching from north to south. Their formation was the result of a collision between India-Australia and Eurasia tectonic plates during the Cenozoic Era. The continuous tectonic stress has led to significant topographical differentiation of the mountains. Their deep valleys are the pathways of the largest rivers in South-East Asia: Yangtze, Mekong, and Salween, and their summits are covered by glaciers that have been important river feeders since the Ice Age. Modern glaciers occupy tops of the ranges at 5000 m a.s.l. and higher. Several centers of modern glaciation exist in the Hengduan Mountains, and Gongga is the largest among them.

Mount Gongga, 7,556 m a.s.l., is the highest peak in the Hengduan Mountains and this center of glaciation extends for 60 km from north to south. The Gongga Massif is asymmetric: its western slope are steeper than eastern. The Randolph Glacier Inventory database counts 76 modern glaciers in it. They form on the walls of ancient glacier cirques and some glaciers fill these cirques and flow down the valley; the glaciers are mostly single and some of them are dendritic. The largest glacier is 12 km long. Lowest altitude at which the glaciers end is 3007 m a.s.l. (according to COPDEM30). The largest glacier is 27.6 km² and there are 43 glaciers smaller than 1 km². The total area of the modern glaciers is 189.54 km².

In our study of the maximum extent of the late Pleistocene glaciation, we found traces of 75 ancient glaciers in the Gongga Massif. There were 10 large dendritic glaciers, stretching from 7 to 17.5 kilometers (see Figure). They occupied the main valleys and most of them ended in the middle

of the valleys at altitudes between 2700 and 3300 m a.s.l.; only a few glaciers descended to the valleys bounding the massif in the west. In addition, there were 65 lesser dendritic and single glaciers. The areas of the 10 largest glaciers are between 78 and 12 km² and the area of all 75 glaciers is 503 km².

Conclusively, during the late Pleistocene, the glaciers covered 2.7 times more land than modern glaciers. This value is not high. We explain this phenomenon by the high altitude of the Gongga Massif, which allows for relatively large modern glaciers, on the one hand. The position of the massif in the relatively warm low-latitude area of the Earth limited, on the other hand, the formation of the late Pleistocene glaciers.

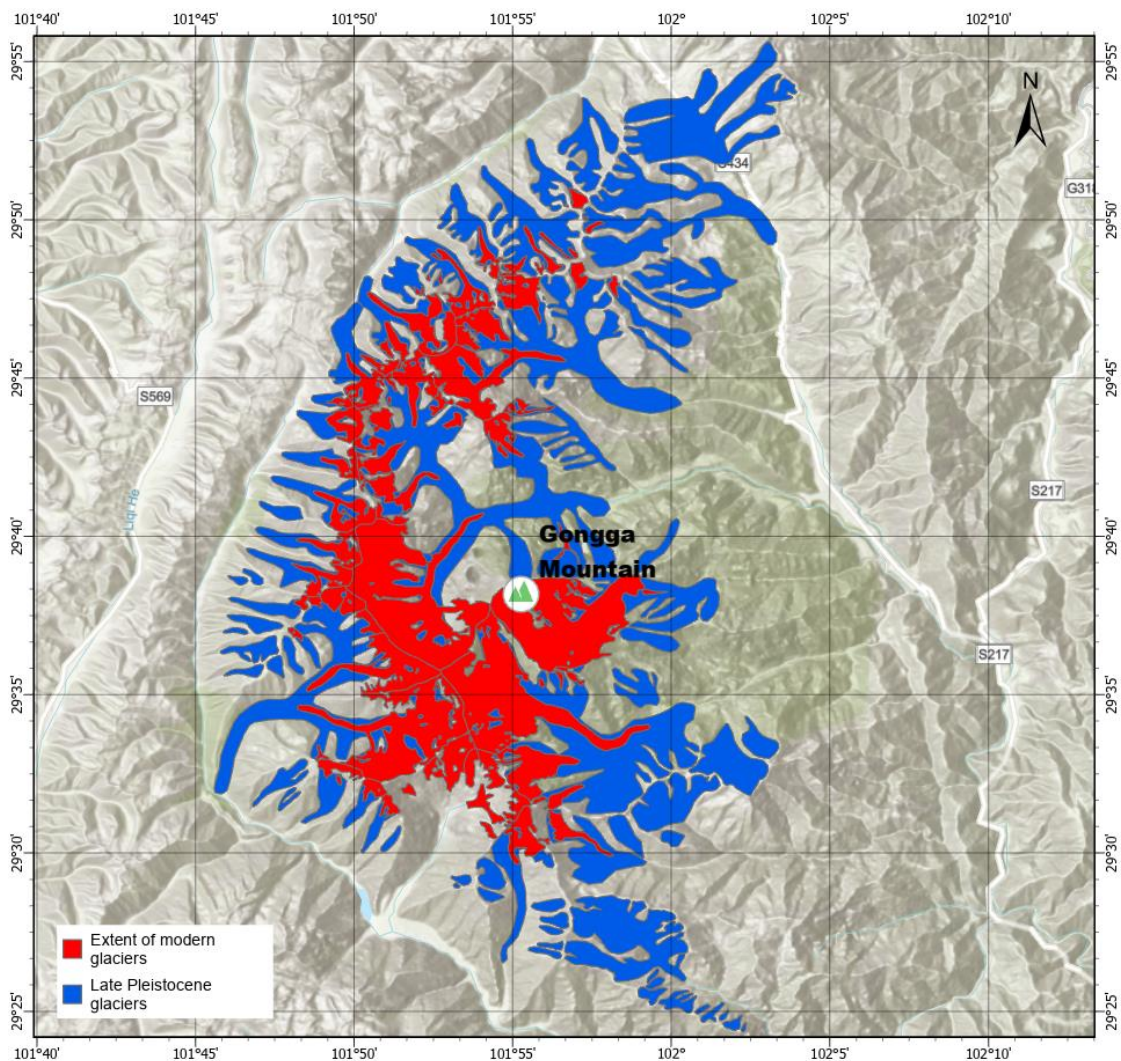


Figure. Extent of modern (red) and late Pleistocene (blue) glaciers in the Gongga Massif. Background is ESRI shadow relief map.