

How Steep is Mount Everest? And Why?

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Steep slopes are usually both a driver and an effect of rapid erosion rates. In the high Himalayas and Karakoram, bedrock erosion is often by landslides or other mass wasting processes. These processes depend on the local slope and the strength of the rocks. Glacial erosion, the primary water transport form at the high elevations, is strongly controlled by local slope but in non-linear fashion. The local slope can be derived from digital topographic data. The extreme topography of the Mount Everest region in the Himalayas has been covered by a number of mapping missions over the last century and a half. Digital topography for Mount Everest has been produced from both spaceborne and airborne imagery and by digitizing topographic map contours. We used several high-resolution Digital Elevation Models (DEMs) to calculate slopes, with similar results where the data overlap. Most of Mount Everest itself, especially the north face, has slope angles close to 45 degrees, steep but not as steep as some of the adjacent mountains. The largest area of extremely steep slopes is on the south side of the Lhotse-Nuptse ridge (from Lhotse west), with many slopes steeper than 80 degrees. The area of steepest slopes on Everest is on the SE (Kangshung) face. Slopes to the north of the Everest are generally much less steep.

We compare the slope maps to the new geological map of the Everest region (Searle, 2003) to what factors control the slopes, the rock units or other variables such as local climate. The extreme slopes on the south face of Nuptse are supported by leucogranites, while the less steep slopes of the north slope of Everest are the geologic units above the Lhotse and Qomolangma Detachments. The steeper slopes on the SE face of Everest are in the granites below the Lhotse detachment. The peak of Lhotse, however, is Everest Series Schists above the detachment and its south face has slopes that are roughly the same as in the granites of Nuptse. Lithology appears to be one important factor, but local climate also seems to affect the development of the steepest slopes. The western part Lhotse-Nuptse ridge is exposed to the monsoon winds bringing precipitation from the south, while the eastern part (Peak 38) which is less steep is more protected. The Lhotse-Nuptse ridge also partially protects Everest from the monsoons.

Reference:

Searle, M.P. 2003. Geological Map of the Mount Everest region, Nepal - South Tibet Himalaya. Scale 1:100,000. Dept. Earth sciences, Oxford University, UK.

Part of this work was performed by the Jet Propulsion Lab, Caltech under contract with the National Aeronautics and Space Administration.