

HOLIDAY GEOLOGY

Huascáran National Park, Peru

At 6768m high, Huascáran is the highest mountain in Peru and is now contained within a vast national park that encompasses the entire Cordillera Blanca, the highest range in the Peruvian Andes. Peru is distinguished by its climatic variation from the extremely arid Pacific coast to the rain forest of the Amazon interior, with the glacier covered mountains in between.

The Andes are formed of uplifted continental rocks and huge granite batholiths that lie along the margin of the South American plate where it over-rides the Pacific Ocean floor and the subducting Nazca plate. Andean orogenesis spans the last 100M years. There are numerous active volcanoes along the Andes, except in Peru where a bend in the plate boundary locally reduces subduction, which therefore lacks volcanic activity except close to its southern border.

In the northern half of Peru the Andes consist of three parallel ranges. The Coastal Range, or Cordillera Negra, has been uplifted by the continental crust riding up over the oceanic crust. It consists mainly of Archean sediments, variously metamorphosed and all strongly folded, along with Tertiary granitic rocks. Within the Amazon catchment, the Eastern Cordillera has been formed largely by over-thrusting of continental rocks. The resultant crustal shortening has left the local continental crust about 75 km thick, where granitic plutons have risen within the mountain ranges there to be exposed by subsequent erosion.

The central and highest range is the Western Cordillera, also known as the Cordillera Blanca because of its caps of snow and ice, and this is now protected within the Huascáran National Park. It lies above the Benioff zone, along most of which the subducted oceanic plate is partially melted and changed to diorite

with resultant andesitic volcanism. The regions with no current volcanism are referred to as “flat slab” and are thought to be where the angle of subduction is too shallow to create a sufficiently active Benioff zone. Huascáran is in such a region and is composed largely of granite. Within the National Park, glaciations have exposed the granite and also revealed splendid cross sections through strongly folded Jurassic limestones and overlying volcanic lavas.

The cities of Huaraz and Caraz stand in the valley of the Rio Santa, which drains roughly northwards between the snow-capped peaks of the Cordillera Blanca and the dark, semi-arid Cordillera Negra. From the valley floor below the 3000-metre level, three roads cross the park eastward over passes that rise to nearly 5000 metres. These give access to some spectacular mountain terrains and botanical and geological delights.

Huascáran is also infamous as the site of one of the world's greatest landslide disasters. In May 1970, an earthquake of Magnitude 7.8 struck Peru, from a focus on the Nazca plate boundary some 30 km offshore from

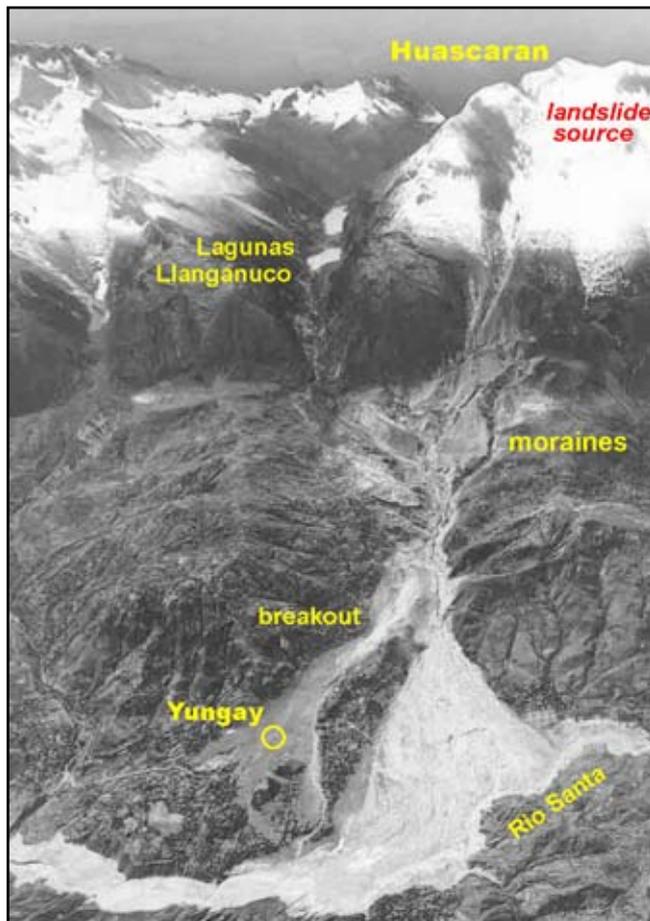


The Llanganuco Valley, with its twin lakes in a beautiful glaciated trough extending westwards towards Yungay, seen from the Abra Portachuelo, a major col at an altitude of 4767 metres on the continental divide, (photo: Harry Jans).



Nearly vertical limestones and overlying lavas on the flanks of Nevado Pastoruri, south of Huascáran (photo: Alan Filmer).

Snow and ice on Huascáran, seen from the south in early morning light, with the source of the 1970 landslide on the steep face that is lost in the deep shadow left of and below the distant north summit (photo: Alan Filmer).



Chimbote. It caused widespread destruction, but also triggered a giant landslide from the steep western face of Huascáran. A slab of rock about 800 metres wide and just as high, slipped from the face along with about 100 metres of snow and ice that had stood in a sheer wall above it. Some 25M m³ of rock and ice fell into the head of a steep ravine, where it probably doubled in volume as its fast-moving mass picked up soil and till.

The resultant debris flow, saturated with water from the frictionally melted ice and enriched with mud from the soils, was extremely fluid. Its descent of some 4000 metres in its 15 km run to the Santa valley took it to a speed of over 300 km/h, as indicated by huge boulders that bounced out of it and flew hundreds of metres across the adjacent land. It was moving so fast down the valley below the Llanganuco lakes that, on the outside of a bend to the left, a lobe of the debris swirled up and over a ridge that stood more than 100 metres above the valley floor. Beyond this breakout over the ridge, it buried the town of Yungay beneath debris more than 5 metres deep. More than 20,000 people died, and only 92 residents survived. In the three or four minutes that the landslide debris took to reach the town from the summit of Huascáran, they had run to the top of Cemetery Hill, which remained above the torrent of mud and rock debris. The undisturbed site is now a national cemetery, and the new town, Yungay Nuevo, stands a few kilometres north of the debris plain.

Alan Filmer and Tony Waltham

Huascáran and its debris flow seen from the air soon after the 1970 event. The main, paler debris floors the Llanganuco valley, and extends into the Santa valley; Yungay lies buried beneath the darker lobe of debris that crossed the ridge where it broke out from the main flow (photo: George Pflafer, USGS).

With Huascáran on the skyline, the broad valley in the foreground is the site of Yungay, now buried beneath the debris flow and subsequent plant growth; the towering pink memorial on the extreme left stands directly over the old town's central plaza (photo: Jim Winterhalder).

