

Past and Current Geo-morphological Processes on the Nazca Upland Surface, Peru

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The geoglyphs and lines of Nazca pampa, Peru. were drawn by grooving the surface weathered zone of the gravel bed of the terrace. The lines, geo-metric shapes and the abstract figures of animals and plants were made during 1C,B.C.to.8C,A.D. and were recognized as the World Heritage in 1994.

It is necessary for the planning of the conservation the cultural heritage to reveal the geo-morphological processes acting on the Nazca upland surface.

The main subjects of this report are to show the estimation of the degree of erosion of the Lines during the last about 1,500 years and the current flood damage caused by the El Nino.

The Nazca upland is a part of coastal plain of Peru which is characterized by the desert. The height of the Nazca terraces is 100 to 200m near the sea, and about 500m in the foot of the ranges, about 50km from the sea.

The width of Nazca upland is 20km in the east to the west, and is about 15 km in the north to the south. The 100 m thick gravel bed making up the upland is thought to be glacio-fluvial, but the age of it is not certain. The depth of dissecting valley is 200m in the lower end to several tens meters in the fan head.

The surface of the weathered gravel bed shows the dark brown color. The aeolian sands, originated from the Pliocene unconsolidated sand layer lying under the fanglomerate and cropping out in the dissecting valley slope, is covering the upland surface thinly. The Aeolian sands are being blown up to the hill slope and moved down to the upland surface, and are being circulated within the Nazca upland.

The chief geo-morphological process on the upland surface is the erosion by the flood stream during the rare but strong rainfall in the desert. The recent heavy rainfall in the Nazca pampa were occurred in 1998 and 2007.

[The Geo-morphological land-classification of Nazca Upland] As the Nazca Pampa surface has no vegetation, the colors in the satellite image shows the degree of stability of the upland surface directly. In the images of the Quick Bird and ALOS, it is easy to show the three classification of the upland surface from the stable (1) to the unstable (3) as follows; (1) the most dark colored ground, the pattern of which shows the debris cone in the hill foot and gravel bank in the upland surface. (2) inter-mediate colored part between the type 1 and type 3. The plan of which shows the gravel bank grooved by the streams. (3) The most light colored channel courses.

The fresh current channels originated from the east hills are abundant in the east half of the upland, but are rare in the west half of the upland.

As the large stream does not originate in the west part of upland, the erosion of the geo-glyphs by channels are weak. The amount of lateral erosion of stream was also negligible in the case that the geo-glyph pattern was cut by stream,

Many lines and figures are distributed in the west part of Nazca upland selectively, so the land condition might be considered when the lines were grooved.

Effect of the current flood:

Strong channel erosion observed in the 17th, Feb., 2007 flood in the east part of the upland. Large stones were moved over the Pan American Highway. The changes of channels are monitored by comparison of the ALOS images before and after the flood.