

Gully Erosion and Its Relating Rainfall Events in Agricultural Area, Middle Parts of the Inner Mongolia, China

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In this presentation, we reveal the land environmental condition, in particular, the current condition of gully erosion and its cause, as one of physical environmental resources for agriculture. The Wuchuan County is situated in the north of the Huhhot City, the capital of the Inner Mongolia: The mean annual air temperature and the mean annual precipitation are 2.5 degree Celsius and 354.1 mm, respectively, on the basis of the data from the China Meteorological Administration. Our observations were conducted mainly at two gullies (about 1650-1700 m a.s.l), where the regional low-relief landform is distributed, corresponding to the denudation surface overlain by thin sheetwash deposits.

In this area, the maximum gully-extending rate ranged from 0.25 to more than 1 m/yr between 2003 and 2010. We presume that these gullies started to form in the several hundreds of years ago at least, in consideration of the average yearly extending rate for about 50 years, that is, more than 1 m/yr. From the observation and radiocarbon dating of sheetwash deposits, it is concluded that the area has been subjected to gully erosion resulted from the predominant sheetwash since the mid-Holocene.

It is inferred that the gully erosion in this area is also caused by overland runoff and shallow ground water flow arisen from rainfall, because the noteworthy erosion appears especially in the gully heads and the retreat amounts of gully walls at a short distance away from the head become extremely low from our observation.

The appearance of the gully erosion temporally coincides with rainfall events in the warm season, accompanied by a rapid increase of soil moisture. Based on the observations of precipitation and soil moisture, we deduce that the gully walls collapsed in the rainfall events, in 2008, 1) 19:32 12/June-02:23 13/June in local time (total 14.6 mm), or 2) 11:18 29/June-00:11 30/June (18.2 mm); in 2009, 17:44 27/July-20:26 27/July (12.8 mm), respectively. In 2010, the rainfall event resulting in the gully extension is considered to be 1) 19:59 02/Aug.-3:12 03/Aug. (18.4 mm, 2.49 mm/hr) or 2) 05:12 07/Aug.-11:12 07/Aug.(39.6 mm, 6.61 mm/hr).

In each year, the almost first rainfall event in the warm season attaining approximately 10 mm in total or more, led to the collapse and retreat of gully walls at one time. Thawing seasonal permafrost possibly has relationship with the lowering ground intensity, and further studies including this are necessary.

Keywords: Land Condition, Gully Erosion, Sheetwash, Rainfall Event, Inner Mongolia