



Permafrost degradation in the source region of Yellow River, China

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A large part of the source area of the Yellow River is underlain by permafrost. Degradation of the grassland and lowering of the groundwater level are observed in the area, the major cause of which is attributed to degradation of permafrost. The study aims at mapping the permafrost area and simulating the ongoing degradation of permafrost due to climate warming. Obtained data are expected to be a good case to investigate the impact of permafrost degradation to the soil moisture conditions.

The study area is located in the southeastern part of Qinghai Province, where the elevation varies from 3260m to 4790m ASL. The landscape is represented by a peneplain in the elevation of 4200-4300m.

In the preliminary survey, the ground surface temperature measurements and seismic soundings were performed to estimate the permafrost distribution. The results suggest that stable permafrost occurs widely over 4300m ASL; that permafrost is mostly absent below 4000m; and that the terrains between 4000m and 4300m lack permafrost, or have "degrading" permafrost at depth (>5 m). Previous studies reported that the lower boundary of permafrost was ca. 4000m, and the whole plain area was included in a permafrost region in geocryological maps. Hence, the source area of the Yellow river currently faces a rapid loss of the permafrost area, because the elevations mostly belong to a transitional condition between permafrost and non-permafrost environments. Based on the observed depth of relict permafrost table, 1-D numerical experiments are performed to estimate the rate of degrading process.

In 2004, an observatory was established at the site of 4270m ASL, aiming at monitoring ground temperatures down to 8m and meteorological observations. Further investigations using borehole data are planned for 2005, to understand the present thermal state of the permafrost.