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Hydrology and Earth System Sciences Discussions

Interactive comment on "Watershed discretization based on multiple factors and its application in the Chinese Loess Plateau" *by* Y. Xu et al.

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Response to Professor Ya Ning Chen:

Comment 1): It is mentioned for several times that the slope in the watershed "range from 0° to 66.2°". This must be a result of GIS software calculation based on DEM. However, the slope in the Loess Plateau can be more than 66.2° in some area such as gully head and landslides.

Answer: The slope in the watershed "range from 0° to66.2°" was indeed a result of ArcGIS calculation based on DEM. Actually, the steepest slope can be near or equal 90°. It's a mistake in the article. The parts in which "66.2°" was mentioned had been

corrected in the manuscript.

Comment 3): Table 2 shows that the third and fourth slope classes (15°-25° and 25°-35°) take more than 60% area of the watershed. When the area percentage thresholds increased, flats (<15°) and steep area (>35°) will be excluded. It may be a disadvantage of this method, especially in different types of erosion simulation (which is mentioned in discussion). It may be better that reducing the slope classes and using the critical slope gradient as partition. It's also helpful for reducing the computation amounts.

Answer: Slope was reclassified according to comment 3). Three equal partitions of slope were delineated by their area (shown in table 1). So that when the area percentage thresholds increased, these three slope partitions would be excluded synchronously. The results were more reasonable (shown in table 2). The computation amounts were reduced at the same time.

Comment 2): Meteorological data for this study are "The daily precipitation data, maximum and minimum temperatures, average wind speeds and relative humidity". The solar radiation data are missed. It may cause some error when the PET (potential evapotranspiration) is simulated by Penman-Monteith or Priestly-Taylor method. You'd better use Hargreaves method for PET simulation.

Answer: Thanks for the reminding in comment 2). The solar radiation data were not monitored or published by the meteorological stations in the study area. The Hargreaves method, which uses air temperature only, should be selected to estimate Potential evapotranspiration (PET). After applying the Hargreaves method, the results showed a little different from the Penman-Monteith method, which is the default method in SWAT.

After modification, new results were gained. The land type units could still get better simulation results. In order to further exclude the influence of unit amounts on the runoff simulation, the three thresholds were adjusted from 0, 5 and 15 to 0, 5 and 12. After which the unit amounts were 1547, 256, 285, 83, 85 and 60. When the unit amounts increased, the simulation performance degraded. The degradation for land type units simulation was slighter compared to hydrological response units simulation. The new results were shown in table 2.

References: Neitsch, S. L., Arnold, J. G., Kiniry, J. R., Williams, J. R., and King, K. W.: Soil and water assessment tool (SWAT) theoretical documentation, Blackland Research Center, Texas Agricultural Experiment Station, Temple, Texas (BRC Report 02-05), 2005. NRCS: Urban Hydrology for Small Watersheds, Technical Release 55 (TR-55), Natural Resources Conservation Service, US Department of Agriculture, Washington, DC, 1986.

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