Advance in Flood Disaster Assessment and Risk Management

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Objectives

Surface soil moisture, as one of the soil erosion resistance factors, is closely related to soil erosion and flood risk management, and the moisture in the soil forms a water film layer in the surface layer, which increases the adhesion between soil particles and enhances the soil erosion resistance. Studying the response of soil moisture content to precipitation and its temporal stability under different land use modes is of great significance for improving regional land productivity and regional ecological environment.

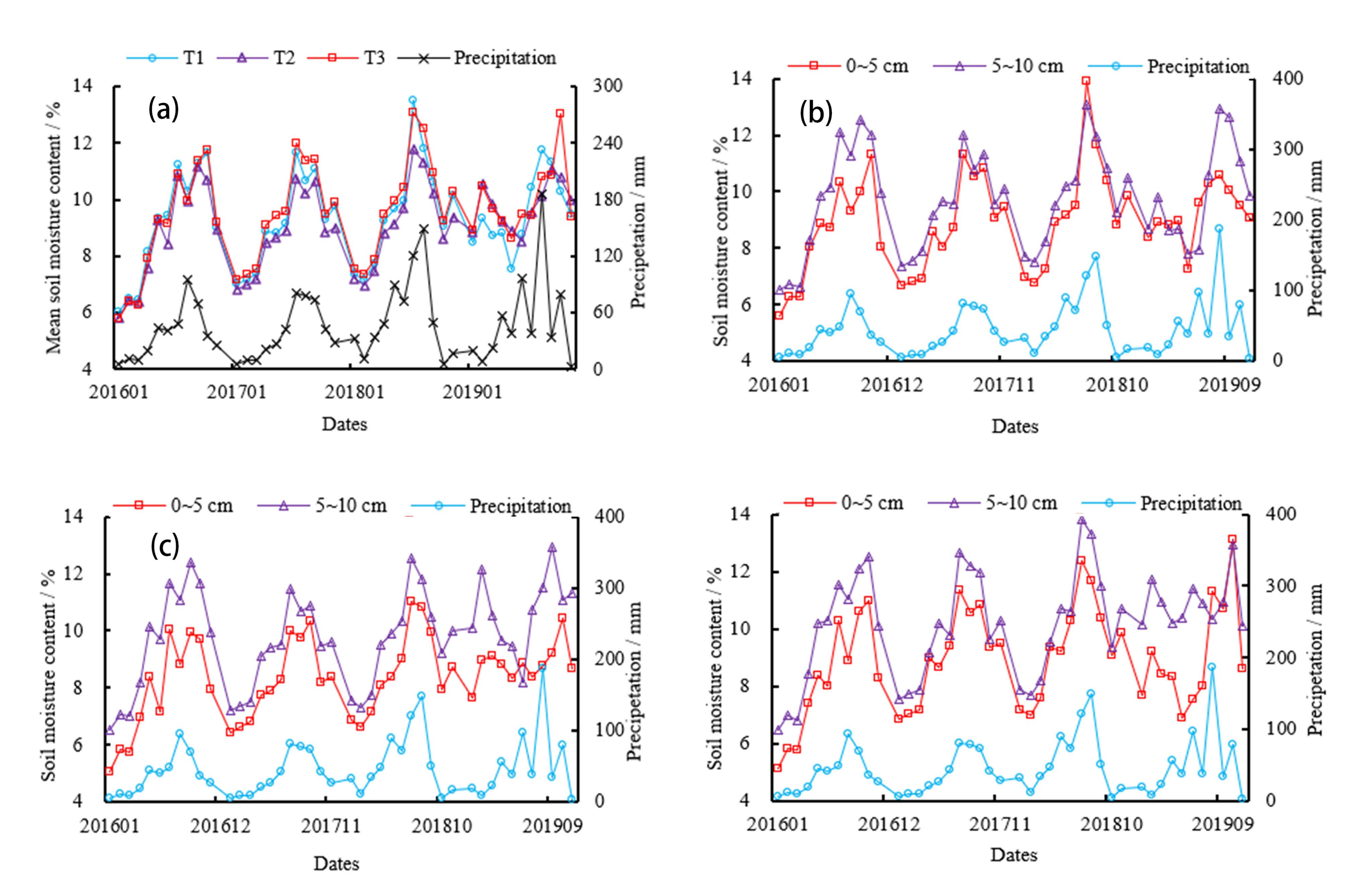

Figure 1. Relationship between soil moisture dynamic changes and precipitation under different land uses ：(a) The dynamic change curve of the average soil moisture content of 0～10 cm ; (b)、(c)、(d) are soil moisture dynamic changes of 0 ~ 5 cm and 5 ~ 10 cm under T1、T2、T3, respectively.

Methods

In this study, three experimental treatments were set up in the wind-sand area of the Yellow River Flood Plain, farming area (T1), bare area (T2), and natural restoration area (T3). In 2016—2019, the soil depth of 0～5 cm and 5～10 cm was used. Dynamic monitoring of water content and local rainfall, statistical analysis of different land use methods, dynamic changes of soil water content of different soil layers and response to precipitation, and relative difference method to analyze the time stability of soil water content.

Results

①The soil water content during the monitoring period showed: T3 >T1 >T2 , and the average soil moisture content of 0～5 cm and 5～10 cm had significant differences (P<0.05), and the soil moisture content varied with the soil; ②There is a significant positive correlation between the soil water content of different soil layers and precipitation under different land use methods (P<0.01). The soil water content increases with the increase in precipitation. The greater the precipitation, the more significant the increase in soil water content. When the precipitation is less than 60 mm, the soil water content of 0～5 cm responds more significantly to the precipitation, and when the accumulated precipitation is greater than 60 mm, the precipitation mainly acts on the 5～10 cm soil layer; ③There are significant differences in the time stability of different soil layers. The standard deviation (*SDRD*) and time stability index (*ITS*) of the relative difference of soil water content of 0～5 cm soil layer of T1 and T2 are larger than 5～10 cm, and the time stability is poor, while that of 0～5 cm soil of T3 are relatively small, and the time stability is strong. There are also significant differences in the temporal stability of soil moisture between the same soil layer and different land use modes. The temporal stability of soil moisture in 0～5 cm: T3 >T2 >T1; the temporal stability of soil moisture in 5～10 cm: T2 >T1 >T3 .

Conclusions

Overall, a comprehensive consideration of soil moisture content and soil moisture time stability can be found that soil moisture content increases with soil depth, and the soil moisture content and time stability of T3 is relatively high and stable compared to T1 and T2.

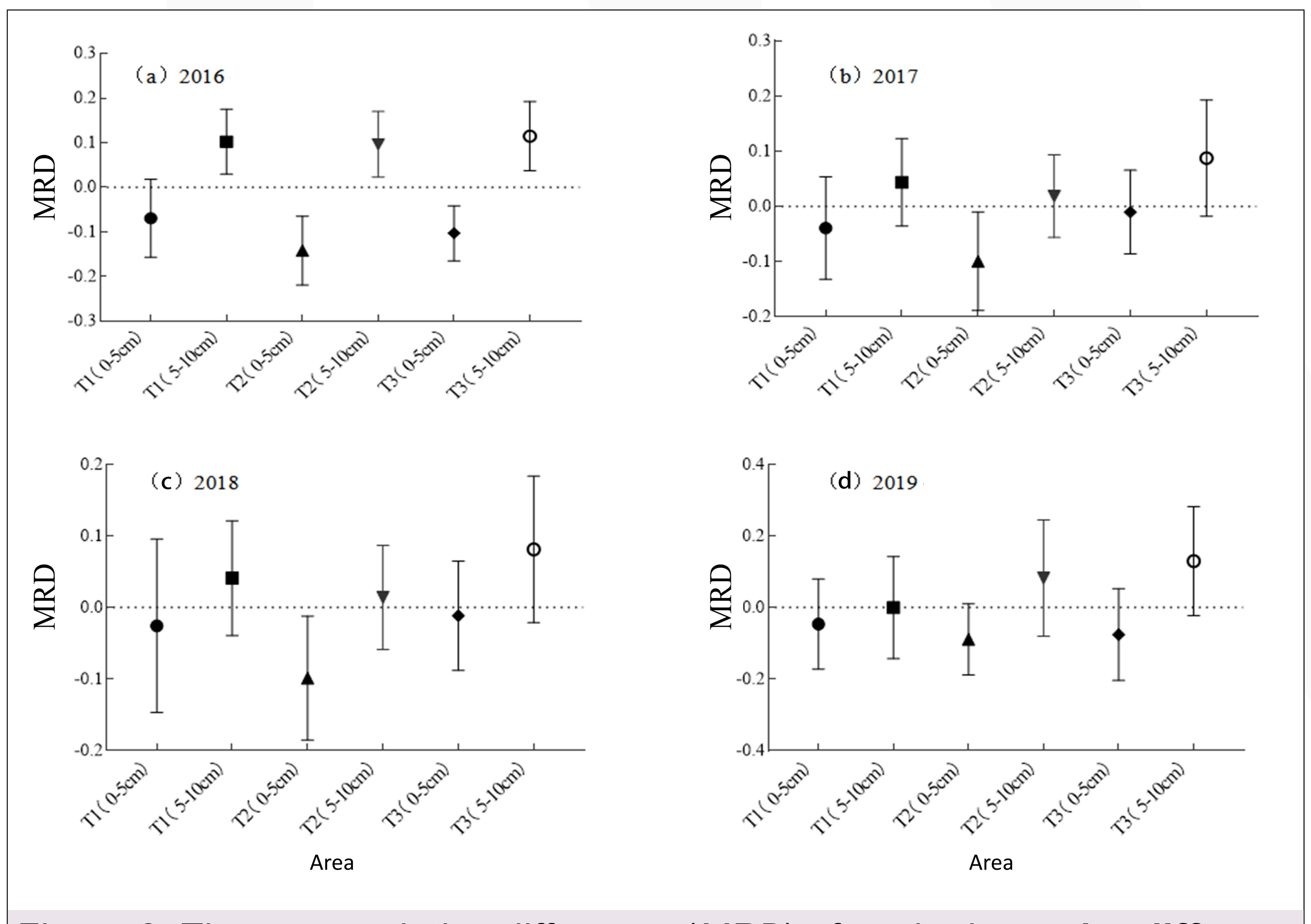

Figure 2. The mean relative difference (*MRD*) of each plot **under different land uses** and its relative difference standard deviation (*SDRD*)
**The error line in the figure indicates *SDRD*