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*Supplement of*

## **Variations of deep soil moisture under different vegetation types and influencing factors in a watershed of the Loess Plateau, China**

**Xuening Fang et al.**

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## S1 Distribution of the mean annual rainfall across the Ansai watershed

The mean annual rainfall (2006-2013) was determined using 29 rain gauges in or around the Ansai watershed, and the Inverse Distance Weighted (IDW) interpolation method was performed in ArcGIS10.0 to obtain the mean annual rainfall at each sampling site.

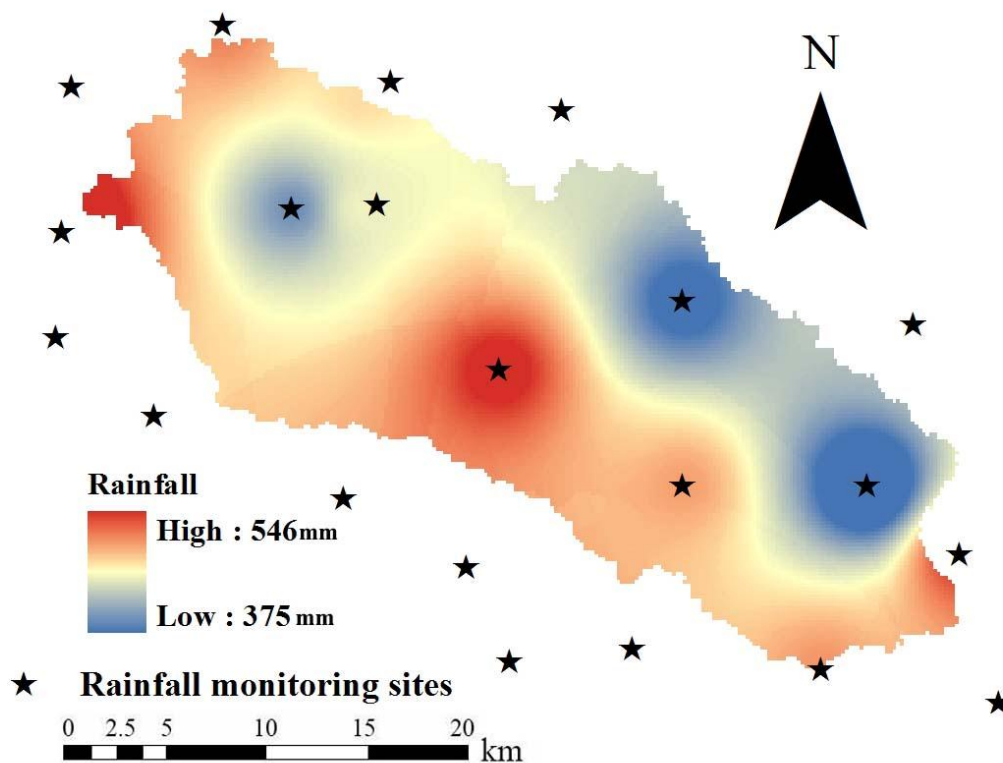


Figure S1. The spatial distribution of the mean annual rainfall (2005-2013) in the study region.

## S2 Distribution of the soil particle compositions across the Ansai watershed

The soil particle size distributions were measured using a laser scattering particle size distribution analyzer (BT-9300H, Dandong, China). The proportions of clay (<0.002 mm), silt (0.002-0.02 mm), and sand (>0.02 mm) were then calculated for 151 sampling sites, and the Ordinary Kriging interpolation method was performed in

ArcGIS10.0 to obtain the distribution map of the soil particle compositions across the Ansai watershed.

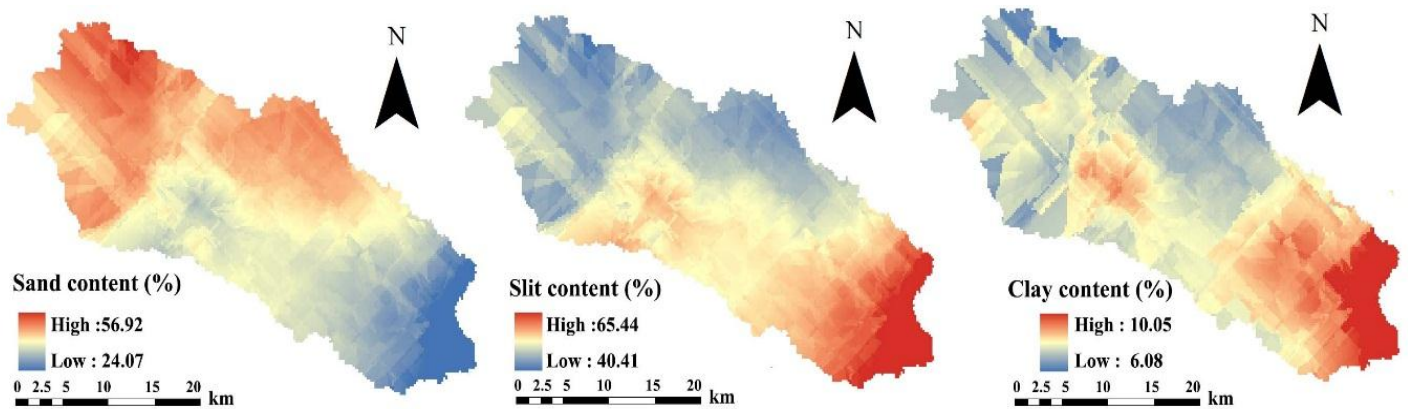


Figure S2. Prediction map of different soil particle compositions in the study region

### S3 Meteorological data during the sampling period

Meteorological data were obtained during the sampling period using the MILOS520 weather station at the Ansai Research Station of Soil and Water Conservation (109°19'23"E, 36°51'26"N).

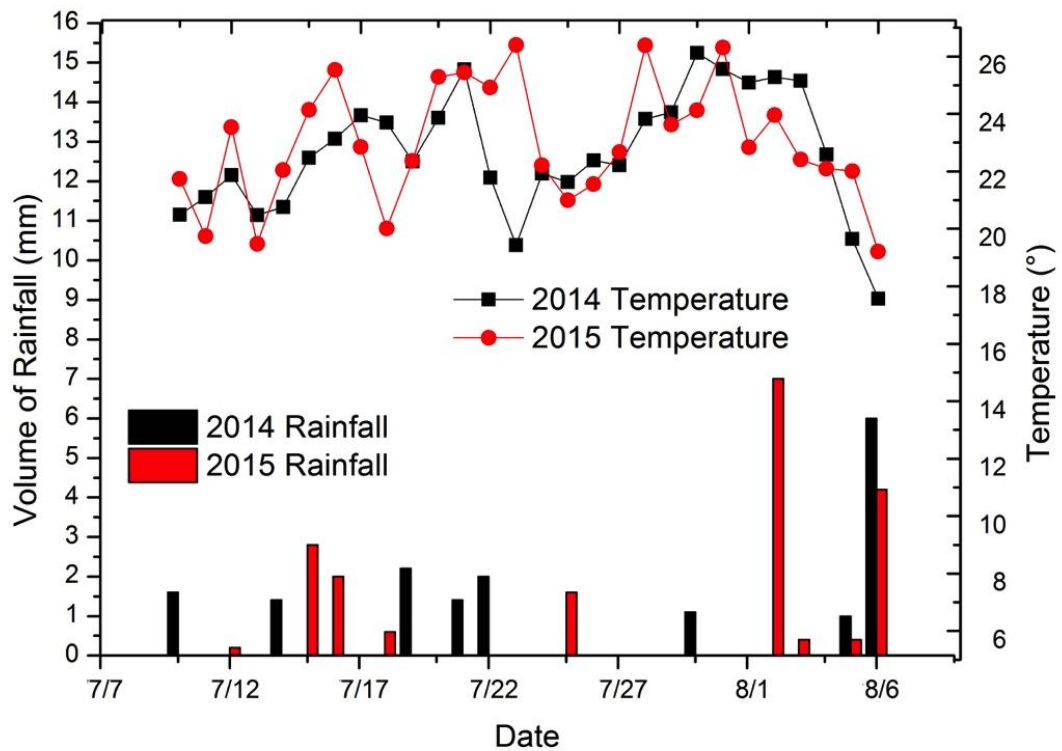


Figure S3. Rainfall (mm) and air temperature ( °C) during the sampling period.

**S4 Profile distribution of deep soil moisture (DSM) coefficient of variation for different vegetation types.**

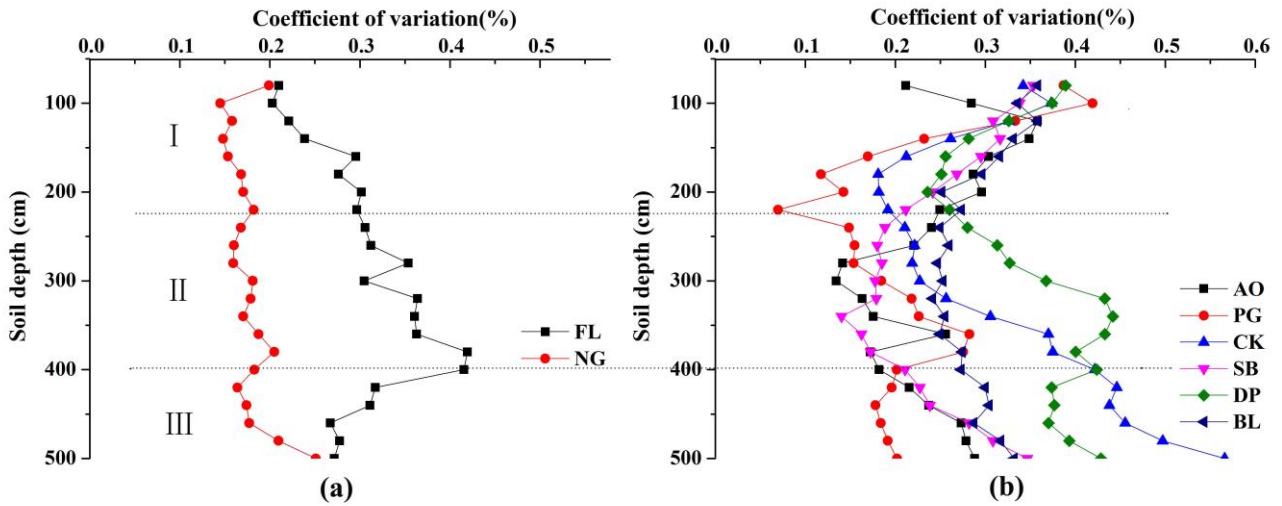


Figure S4. Profile distribution of deep soil moisture (DSM) coefficient of variation for different vegetation types. Notes: (a) shallow root system vegetation (FL-farmland; NG-native grass), and (b) deep root system vegetation (AO-apple orchard; PG-pasture grasses; CK-*Caragana korshinskii*; SB-sea buckthorn; DP-David peach; BL-black locust ). I-III: DSM at different soil layer depth ranges (I: 80-220 cm, II: 220-400 cm, and III: 400-500 cm). The dashed lines are the boundaries of different soil layer depth ranges.

**S5 Spearman correlation coefficients between deep soil moisture and selected environmental variables.**

Table S1. Spearman correlation coefficients between deep soil moisture (grassland, farmland and pasture grassland) and selected environmental variables.

	Native grasses			Farmland			Pasture grassland		
	I	II	III	I	II	III	I	II	III
Altitude	<b><u>-0.52</u></b>	<b><u>-0.56</u></b>	<b><u>-0.53</u></b>	-0.27	-0.30	-0.19	-0.14	-0.06	0.08
Slope position	0.13	-0.11	-0.07	0.25	0.28	0.41	-0.15	-0.32	0.02
Cos (Aspect)	-0.32	-0.35	-0.44	0.16	0.03	0.21	0.07	0.64	<b>0.86</b>
Tan (Slope)	0.46	<b><u>0.67</u></b>	<b>0.59</b>	-0.22	-0.07	0.21	-0.32	0.09	0.34
Clay	<b><u>0.62</u></b>	<b><u>0.56</u></b>	<b>0.43</b>	0.35	0.37	0.22	0.23	0.54	0.46
Slit	<b><u>0.59</u></b>	0.37	0.27	0.26	0.38	0.38	0.15	<b>0.66</b>	0.59
Sand	<b><u>-0.68</u></b>	<b><u>-0.42</u></b>	-0.32	-0.23	-0.35	-0.35	-0.16	-0.58	-0.47
Organic matter	-0.14	-0.30	-0.19	0.18	-0.13	-0.23	-0.07	-0.28	<b>-0.64</b>
Soil bulk density	-0.16	-0.07	-0.04	<b>0.55</b>	0.31	0.34	0.12	-0.01	-0.16
Capillary porosity	0.09	0.06	0.05	-0.34	-0.26	-0.20	-0.33	-0.26	-0.12
Annual average rainfall	-0.03	<b>0.46</b>	0.37	-0.15	-0.11	-0.23	-0.39	0.15	0.36
Vegetation coverage	-0.21	-0.08	-0.02	0.18	0.11	0.26	-0.30	0.37	0.11
Grass biomass	-0.11	0.20	0.08	-0.06	-0.06	-0.06	-0.02	0.28	-0.10
Grass height	0.30	0.01	0.00	0.04	0.06	0.15	-0.15	0.46	0.32

Notes: Significant correlations ( $P < 0.05$ ) are shown in bold, and very significant correlations ( $P < 0.01$ ) are shown in bold with underlines. I-III: DSM at different soil layer depth ranges (I: 80-220 cm, II: 220-400 cm, and III: 400-500 cm).

Table S2. Spearman correlation coefficients between deep soil moisture (shrub land) and selected environmental variables.

	<i>Caragana korshinskii</i> Kom			Sea buckthorn		
	I	II	III	I	II	III
Altitude	-0.31	<b><u>-0.70</u></b>	<b>-0.59</b>	<b><u>-0.64</u></b>	<b>-0.56</b>	-0.33
Slope position	0.29	-0.08	-0.11	-0.22	-0.25	-0.35
Cos (Aspect)	0.32	0.34	0.32	0.23	0.34	0.07
Tan (Slope)	0.15	-0.10	-0.05	-0.45	-0.19	0.00
Clay	0.11	-0.24	-0.09	0.27	0.22	-0.02
Silt	0.16	0.32	<b>0.53</b>	<b>0.58</b>	<b>0.51</b>	0.41
Sand	-0.17	-0.23	-0.45	<b>-0.59</b>	-0.48	-0.37
Organic matter	0.08	<b>0.47</b>	<b>0.49</b>	0.25	0.28	-0.20
Soil bulk density	0.17	-0.23	-0.24	0.16	-0.28	-0.18
Capillary porosity	-0.02	0.13	0.14	-0.17	0.20	0.02
Annual average rainfall	<b>0.59</b>	0.23	0.19	0.17	0.22	0.18
Litter biomass	-0.14	-0.04	0.10	-0.29	-0.33	-0.39
Litter max water holding	0.32	<b>0.59</b>	<b><u>0.60</u></b>	-0.15	0.09	0.08
Vegetation coverage	-0.08	0.06	-0.03	-0.05	-0.14	-0.16
Grass biomass	0.27	0.42	0.45	0.35	0.26	0.31
Grass height	0.25	0.35	0.43	0.15	0.06	0.18
Plant height	0.26	0.24	0.23	-0.13	0.25	0.09
Crown width	0.27	0.24	0.30	-0.23	0.12	0.07
Basal diameter	-0.22	0.31	0.40	-0.25	0.06	-0.01
Plant density	-0.31	0.08	-0.09	<b><u>-0.66</u></b>	<b>-0.57</b>	<b>-0.56</b>

Notes: Significant correlations ( $P < 0.05$ ) are shown in bold, and very significant correlations ( $P < 0.01$ ) are shown in bold with underlines. I-III: DSM at different soil layer depth ranges (I: 80-220 cm, II: 220-400 cm, and III: 400-500 cm).

Table S3. Spearman correlation coefficients between deep soil moisture (orchard land and forest) and selected environmental variables.

	Apple orchard			Black locust			David peach		
	I	II	III	I	II	III	I	II	III
Altitude	-0.58	-0.25	-0.16	-0.09	-0.07	0.20	-0.16	0.05	0.06
Slope position	0.13	0.34	0.14	-0.21	-0.22	-0.21	-0.32	-0.50	-0.55
Cos (Aspect)	0.04	-0.01	0.35	<b>0.44</b>	<b>0.34</b>	0.22	0.06	0.13	0.30
Tan (Slope)	-0.25	0.26	0.33	-0.17	-0.17	<b>-0.41</b>	-0.16	0.19	0.07
Clay	<b><u>0.88</u></b>	0.42	-0.25	0.20	0.13	-0.09	0.33	0.15	0.06
Silt	<b><u>0.85</u></b>	<b>0.67</b>	0.08	0.23	0.14	-0.15	0.42	0.42	0.27
Sand	<b><u>-0.83</u></b>	<b>-0.67</b>	-0.08	-0.25	-0.14	0.13	-0.46	-0.42	-0.27
Organic matter	<b>0.69</b>	0.38	0.13	0.01	0.02	-0.22	-0.13	-0.12	-0.35
Soil bulk density	<b>-0.64</b>	<b><u>-0.82</u></b>	-0.32	-0.23	-0.08	-0.06	-0.27	-0.43	-0.41
Capillary porosity	<b><u>0.89</u></b>	0.49	-0.06	0.21	0.14	0.00	0.35	0.52	0.30
Annual average rainfall	0.31	-0.07	-0.38	-0.12	0.26	-0.12	0.16	-0.11	-0.42
Litter biomass	0.24	0.47	<b>0.72</b>	-0.08	0.13	-0.03	0.11	0.08	0.08
Litter max water holding	0.31	0.08	0.33	0.22	0.21	0.20	<b>0.35</b>	0.13	0.27
Vegetation coverage	-0.51	0.10	-0.01	-0.14	0.11	-0.03	-0.35	-0.47	-0.41
Grass biomass	-0.23	0.03	0.39	0.11	0.07	0.30	0.44	<b><u>0.80</u></b>	0.55
Grass height	-0.13	-0.17	-0.62	-0.05	0.02	0.08	-0.42	-0.01	-0.01
Plant height	0.23	-0.09	-0.49	<b>-0.42</b>	0.11	0.05	-0.32	-0.11	-0.01
Diameter at breast height	0.64	0.31	0.04	-0.23	-0.03	<b>-0.34</b>	-0.33	-0.24	-0.15
Crown width	0.43	0.29	0.15	-0.25	0.07	-0.07	<b>-0.56</b>	-0.36	-0.29
Basal diameter	0.51	0.22	0.07	-0.27	0.03	-0.25	<b>-0.43</b>	-0.20	-0.07
Plant density	-0.52	-0.20	-0.15	0.09	0.03	0.18	0.04	0.05	-0.08

Notes: Significant correlations ( $P < 0.05$ ) are shown in bold, and very significant correlations ( $P < 0.01$ ) are shown in bold with underlines. I-III: DSM at different soil layer depth ranges (I: 80-220 cm, II: 220-400 cm, and III: 400-500 cm).