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Hydrology and Earth System Sciences Discussions

Interactive comment on "Spatial modelling of the variability of the soil moisture regime at the landscape scale in the southern Qilian Mountains, China" *by* C.-Y. Zhao et al.

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First authors thank the anonymous referee #1 who has given good suggestion to improve our manuscript. According to the comments, we have revised the manuscript as follows: 1. Referee: "The introduction starts with a general description of the study area and it is hard to follow for a reader who is not a Chinese. Thus, I suggest, at least, revising Figure 1 in order to illustrate the location of the study area with respect to China" Authors: "Figure 1 has been changed to illustrate the location of the study area with respect to China" 2. Referee: "Figure 3 refers to the whole study

area. Why in the text (page 6342, line 21) the authors state that the figure is for Pailugou catchment?" Authors: "at page 6342, line 21, 'Pailugou catchment' should be changed 'the southern Qilian Mountains'. It has been changed in the revised manuscript" 3. Referee: "Does Figure 5 refer to the year 2003? In section 2.2 the authors refer to the period May–September 2003 and 2004. Why September is missing in Figure 5? Please clarify the time period under study both in the text and all figure captions" Authors: "Figure 5 refers to mean monthly precipitation of 39 years, not 2003. Ecologically meaningful time period, i.e., growing seasons approximately is from May to August, so September was not considered in the study. The time period under the study is clarified in text at page 6344, line 1." 4. Referee: "Why Figure 6 shows only results for June? Please include also the ones for the other months considered. Moreover, lines 20–24 at page 6344 are confused, please revise the text" Authors: "We add the scatter plots of July, August, and May. Lines 20-24 at page 6344: [To test the spatially-modeled results of the soil moisture status in the catchment, we compared the observed soil water content for 4 months at 22 sample plots with the spatially-modeled results for the corresponding months at 22 plots. The correlation coefficient is quite high (e.g. R2=0.76 in June) (Fig. 6), assuring our confidence in the spatially-modeled results of the soil moisture status.] changed as [To test the spatially-modeled results of the soil moisture status in Pailugou catchment, we compared the observed results for 4 months at 15 sample plots with the spatially-modeled results for the corresponding months and sample plots. The correlation coefficients (R2) are from 0.60, 0.76, 0.67, 0.69 for May, June, July and August respectively (Fig. 6). These assure our confidence in the spatial model (i.e. equation 3) of the soil moisture status]" 5. Referee: "Why in Figure 6 the soil moisture status has very different values compared to the ones shown in Figure 7? I suppose that in Figure 7 units for IN3 are mm, while in Figure 6 units are different since soil water content has been considered. If it is so, please render consistent figures and text" Authors: "Figure 6 the soil moisture status has very different values compared to the ones shown in Figure 7, because Figure 7 was calculated with precipitation in

meter unit. Figure 7 units for IN3 has been changed as mm for the same as that in Figure 6 " 6. Referee: "I suggest re-plotting Figure 7 using the same range values, otherwise no differences are noticeable from one month to the other" Authors: "We have re-ploted Figure 7 using the same range values" 7. Referee: "Page 6346, line 3–4: Which important factor has been excluded in the model?" Author: "vegetation type is an important factor has been excluded in the model. At Page 6346, line 3–4 is 'But one important factor affecting soil moisture and vegetation types was excluded in the model'. We have changed the sentence as 'But one important factor affecting soil moisture is vegetation types which was excluded in the model ' " 8. Referee: "The authors quote three papers written in Chinese (only the abstract in English). I strongly suggest removing those references and substitute them with other ones written in English. This is because HESS is an international journal and any reader must be able to access to the quoted manuscripts" Authors: "Three papers written in Chinese (only the abstract in English) have been removed and substituted by other ones written in English as follows" ïijĹ1ïijL' Ji, X., Kang, E., and Chen R.: Analysis of Water Resources Supply and Demand and Security of Water Resources Development in Irrigation Regions of the Middle Reaches of the Heihe River Basin, Northwest China, Agricultural Sciences in China, 5, 130-140, 2006. ïijĹ2ïijL' Wang, J.S., Feng, J. Y., and Yang, L. F.: Runoff-denoted drought index and its relationship to the yields of spring wheat in the arid area of Hexi corridor, Northwest China, Agricultural water management, 96, 666-676, 2009. ïijĹ3ïijL' Zhao, W.Z., Liu, B., and Zhang, Z. H.: Water requirements of maize in the middle Heihe River basin, China, Agricultural water management, 97, 215-223, 2010. 9. Referee: "The soil moisture model results have been validated against observations for a small catchment (Pailugou) within the area. Why the catchment is considered representative of the whole area? Which is the physical basis of this assumption? Have the authors considered the possibility to use other sources of data for validation purposes?" Author: "Pailugou catchment is only one of typical catchments in Qilianshan mountainous region. It can not be considered representative of the whole area. Long Term Ecological Research station has been built in the

catchment by Chinese forestry administration, belonging to CFERN. The data of soil water content was observed in 2003 and 2004, no observation in other catchments. We are considering the possibility to use remote sensing data for validation purposes " 10 Referee: "In the conclusions, the authors should discuss the possibility, if any, to extend the analysis to other contexts (areas) having different hydrological regimes or orography." Authors: "In the conclusions, the authors add discussion about possibility to extend the analysis to the Chinese Loess Plateau, adjacent to Qilian mountains, having different hydrological regimes or orography. The addition part as 'Care must be exercised in applying the equation (3) to predict the distribution of soil moisture status at large scale in Chinese Loess Plateau due to three natural factors: steeply-sloped topography with gullies, fine-textured loessial soils and most importantly, unique hydrogeomorphic conditions. The unique hydrogeomorphic conditions refer to the rainfall intensity often exceeds the soil infiltration capacity. Gullies are ubiquitous landscape features on natural slopes, which affect water divergence and convergence. It is impossible to obtain high accuracy of DEM to depict slope (β), aspect (A), and the contributing area (α). The unique hydrogeomorphic conditions can not make initial surface saturation occurs.. The unique hydrogeomorphic conditions can not make initial surface saturation occur.' 11. Referee: "Finally, in several points I found the text hard to follow. This is probably because the English is not fluent and the complex structure of several sentences (see for example, lines 17–23 in the abstract or point 3 in the conclusions). I suggest revising the text using simple and clear phrases." Author: "lines 17-23 in the abstract changed as 'Therefore the modelled distribution of the soil moisture status reflected the interplay of the local topography and landscape climate processes.The driest sites occur on some ridges in northern part and western part of the study area, where have small accumulating flow areas and low precipitation rates. The wettest sites are registered in the low river valley of the Heihe River and its major tributaries in the eastern part due to large accumulating flow areas and higher precipitation rates.' point 3 in the conclusion changed as 'A series of soil moisture status maps were obtained by Eq. (3). Generally, the gentle bases of long

hill-slopes had more moisture than the steep short sites because they had larger catchment areas. The south-facing slope had less moisture than the north-facing slope because it got more insolation on the dryness of the matrix soil water. The driest sites occurred on some ridges in the northern part and the western part of the study area, where have small accumulating flow areas and small precipitation. The wettest sites were registered in the low valleys of the Heihe River and its major tributaries in the eastern part due to large accumulating flow areas and more precipitation.'

Please also note the Supplement to this comment.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 6335, 2009.

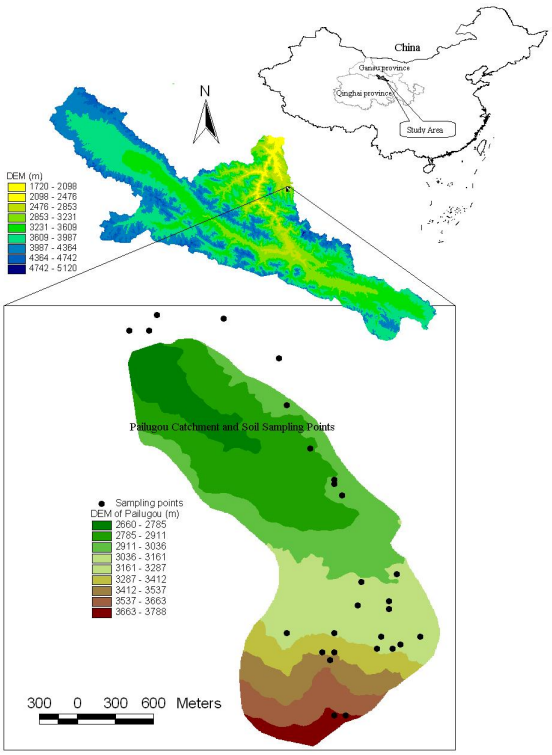

Fig. 1.

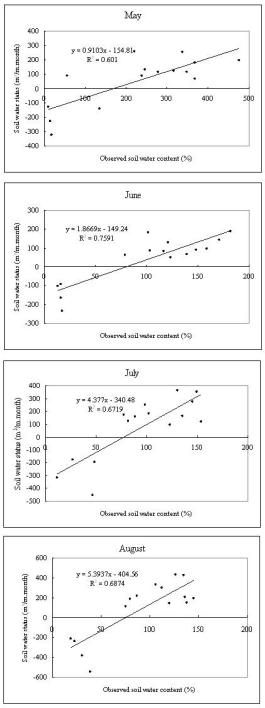
May
y = 0.9103x - 154.81
R² = 0.601
Soil water status (m³/m³/month)
Observed soil water content (%)
June
y = 1.8669x - 149.24
R² = 0.7591
Soil water status (m³/m³/month)
Observed soil water content (%)
July
y = 4.377x - 340.48
R² = 0.6719
Soil water status (m³/m³/month)
Observed soil water content (%)
August
y = 5.3937x - 404.56
R² = 0.6874
Soil water status (m³/m³/month)
Observed soil water content (%)

Fig. 2.

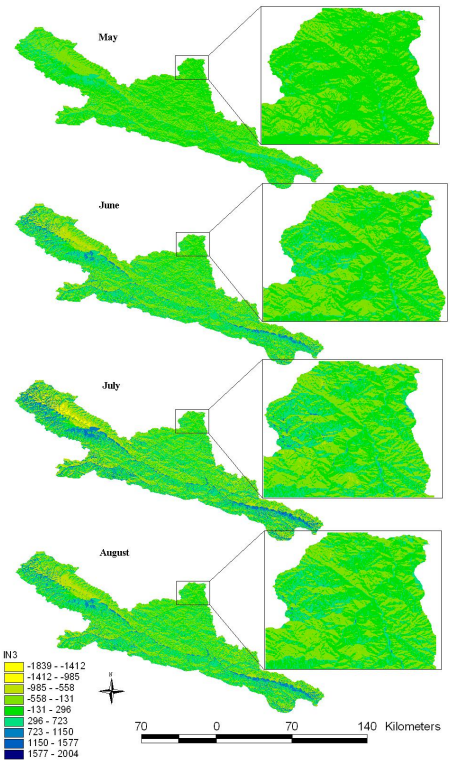
May
June
July
August
IN3
-1839 - -1412
-1412 - -985
-985 - -558
-558 - -131
-131 - 296
296 - 723
723 - 1150
1150 - 1577
1577 - 2004
N
70 0 70 140 Kilometers

Fig. 3.