Hydrol. Earth Syst. Sci. Discuss., 5, S416–S420, 2008
www.hydrol-earth-syst-sci-discuss.net/5/S416/2008/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Observing soil moisture temporal variability under fluctuating climatic conditions" *by* A. Longobardi

A. Longobardi

Received and published: 20 May 2008

I would like firstly to thank the anonymous referee for contributing to the discussion and also acknowledge the need for an improvement of the language. I fully agree that the soil water content dynamic is nothing new and that it has been discussed in several other papers, but it is also true that illustrated results are based on a medium/long term experimental project dataset and not just on simple modeling results (of course, this would not be a point of merit). By the way, the focus of the paper was to observe and quantify the impact of meteorological conditions variability on observed soil moisture dynamic, as showed in section 4, and this issue was not surprisingly commented on by the anonymous referee: the main result was the description of soil water cycle characteristic phases for a typical Mediterranean system noting that, caused by extremely different climate conditions, some features of the cycle are preserved, such as

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

the existence of some of the phases, and some other are not, such as the switching of preferential states at the seasonal scale. Likely, the monitored period, even though not very long, was extremely variable and this allowed to observe and report on soil water content cycle forced by extremely different meteorological conditions: to me, this was a possibility to assess the impact of rainfall fluctuation, both at the annual and seasonal scale. It is worth to remember that Mediterranean climate is commonly characterized by strong inter-annual rainfall variability and associated to water-limited systems threatened, within the last years, by the broad desertification process and that it is important to measure, investigate and further model those systems dynamic for long time or, at least, for different meteorological conditions. Following are the answers to minor questions raised.

- Introduction, page 937, line 22-25. If during the warm season soil moisture is the result of the balance between precipitation and evapotranspiration, that means that drainage can be neglected. For a Mediterranean climate this may be true, but it is certainly not always so for temperate climates.

Many of the pattern features illustrated are indeed common to other experimental sites but they are undoubtedly also specific for a Mediterranean climate.

- The location of the rain gauge. If I understand Figure 1 correctly, the rain gauge is located right next to a number of trees. What impact is this location going to have on the quality of the precipitation observations?

The rain gauge is located next to probe 1 and this means that it is about 15 meters from the car parking bounds: location should not then be influent.

- Page 940, line 9. "Compared to mean regional values". Does that mean the averages for a large region for those three years, or the long-time average for this specific location?

With the aim to compare the monitored period meteorological conditions with average

HESSD

5, S416–S420, 2008

meteorological conditions, the mean regional value has been calculated as the average for a large region for several (30) years.

- Figure 4 is not necessary, it shows the same information as Figure 3. Further, In Figure 3 the maximum monthly precipitation does never exceed 200 mm, but in Figure 4 it reaches values of approximately 300. Unless I understand it wrong there is something not consistent here.

While Figure 4 shows observed cumulated monthly precipitation values, Figure 3 only shows the deficit and surplus rainfall values, referred to the mean regional values, giving an idea of how different, on average, the observed years are. Deficit and surplus are estimated subtracting the monthly average to the observed value and this is the reason why cumulate rainfall in Figure 4 is always larger than cumulate rainfall in Figure 3.

- I also don’t understand Table 1 and Table 2. Table 2 states that for 2004/2005 the total amount of precipitation is 43 x 22 + 10 x 15.36, or 1099.6 mm. Table 1 states that for the same year the total precipitation is 1237 mm. For 2005/2006 these totals are 1467.33 and 1622 mm, respectively. For 2006/2207 these are 645.64 and 841 mm, respectively. From Table 1 I conclude that the sum of the rainfall in the wet and dry periods has to be equal to the annual precipitation (this also follows from the definition of wet and dry period on page 944). Unless I made a mistake in my reasoning there is something very wrong here.

Precipitation characteristics have been computed for events larger than 5 mm, but with the intent to illustrate the differences between observed years, this should not have a great impact. By mistake it was not clearly stated when commenting Table 2.

- On page 942, line 7 and following, it should be stated clearly that this section discusses the results from profile 1.

Yes. The similarity between profiles (at different probes) has been mentioned: though

HESSD

5, S416–S420, 2008

differences do exist at the point scale, because of soil heterogeneity, soil water dynamics are however similar. Patterns from probe 1 have only been reported to shorten the results illustration.

- The section on page 942 is not consistent with what is written above. At the end of page 941 it is stated that evapotranspiration decreases with increasing soil depth, and that this causes the soil moisture to be higher deeper in the profile. Here it is stated that the deep soil moisture is higher and that this perhaps is caused by a different soil type.

The experimental site soil has been reported as a layered soil, with different characteristics at different depth. Soil characteristics, along with rainfall variability, affect the balance between recharge and depletion and thus the degree of saturation. However, since the focus of the study was to report on rainfall variability effects, soil type effect has not been quantified, but of course it does exist in a layered soil profile.

- In the same section it is stated that the soil moisture follows a sinusoidal pattern. Looking at Figure 6, this is not a sinusoidal pattern, it is just a temporal variability resulting, as the author states, from the balance between replenishing the soil and removal of water from the soil. Why would this be a sinusoidal pattern? Same remark for the beginning of page 943.

A “sinusoidal pattern” term is perhaps correct for other components of the hydrological cycle, and in this case it would have been more appropriate to discuss about a stationary-mean plus high-frequency fluctuation due to the recharge/depletion balance.

- I also have a problem with the way the variability in Figure 7 is calculated. A coefficient of variation is defined as the standard deviation divided by the mean. This is just a way to rescale the standard deviation. A dry soil and a wet soil with exactly the same temporal variability will show different coefficients of variation. To me, it would make more sense to analyze the standard deviations themselves.

HESSD

5, S416–S420, 2008

Interactive Comment

If the intent is to look at the temporal variability the standard deviation would be sufficient, but in Figure 7 four profile have been compared, which have different variability and also different mean value (both dry and wet states) and, in this case, a rescaled standard deviation could have more sense.

- Again, at the beginning of Section 4.1., it should be stated that the results shown are for profile 1 (at least this is the way I understand it).

See previous comment

- At the beginning of Section 4.2., again it should be clearly stated to which profiles the section refers.

See previous comment

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 935, 2008.