Interactive comment on "Influence of climate variability on water partitioning and effective energy and mass transfer (EEMT) in a semi-arid critical zone" by X. Zapata-Rios et al.

Anonymous Referee #2
Received and published: 16 October 2015
This manuscript presents the detailed analysis of the trends in climate variables which is robust and interesting, and subsequently the trend in EEMT which is also interesting but could be deepened with more process understanding.

Thank you for this supportive comment on our paper. Our revisions in response to your specific request below as well as comment by reviewer 1 have been developed to provide deeper process understanding and strengthen the manuscript

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
There is a need to clearly demonstrate what is the innovative scientific understanding on EEMT gained from this site and can be generalized to other regions. For example, the abstract and summary are somehow dominated by the increasing/decreasing trends of climate variables, which seems a bit trivial. More unique insights on EEMT itself and its linkages to the critical zone structure and processes would be very helpful.

The abstract and summary have been modified. The discussion about trends in climate were erased from the abstract

It is still uncertain how the CZ evolve over time and how climate, lithology, and biota influence the function of the CZ (Chorover et al., 2011). We postulated that a measure of the energy inputs into the CZ drive CZ evolution and their quantification can be related to functions and processes within the CZ. The energy inputs and mass transfer have been integrated in a single and transferable metric (EEMT) quantified as water and carbon fluxes that can be easily transferred and quantified in different ecosystems and regions around the World (Rasmussen and Tabor, 2007; Rasmussen et al., 2011). This allows to compare energy inputs to the CZ in a broad range of sites, climates and ecosystems. Investigations relating EEMT quantifications with CZ processes in the western US have proved that EEMT is a good predictor of CZ processes (Pelletier and Rasmussen, 2009a,b; Rasmussen and Tabor, 2007; Rasmussen et al., 2005; Rasmussen et al., 2011; Zapata-Rios, 2015a). Therefore, EEMT can be used as a tool to provide an initial identification of landscape locations subjected to higher energy influx (as a result of water and reduced carbon throughputs) or locations where EEMT is changing over time as it has been indicated in the present study. Consistent changes in EEMT can be an indicator of alteration in the function of the CZ such as weathering process, hydrochemical and hydrologic response among others. In regions where temperature, precipitation, water availability and vegetation are changing a quantification of EEMT can provide an initial assessment and metric to evaluate changes in the CZ. The EEMT model has a limitation in that it does not provide information on how energy is distributed within the CZ and does not provide mechanistic insight into CZ processes. However, it can be used to identify research sites for further instrumentation and measuring CZ processes. (Lines 470-487)

Figure 1a is not of good quality so should be improved.
C4305

We have increase the quality of figure 1a