The discussion paper by Foti and Ramirez analyses the underlying mechanisms of vegetation pattern formation in drylands. They developed a spatially explicite simulation model of water and vegetation and are able to reproduce patterns at different sites. Afterwards they thoroughly investigate the impact of different processes and process parameterization on pattern formation.

General comments

The emergence of vegetation patterns has already been largely discussed and simulated in the literature. But with the thorough analyses that the authors present in this discussion paper it provides valuable new insights how different processes contribute to pattern formation. The authors try not only to reproduce existing patterns, but analyse various underlying mechanisms and under which conditions patterns may form.
I very much enjoyed reading the paper, since it is well written and most parts are described very clearly. Only the methods section needs some clarifications for some equations, but the model itself seems to be sound and the analyses are well chosen.

Methods

1. Figure with a schematic overview of the model and its processes would help, this figure could substitute Figure 2
2. Climate input: problematic to use mean values for climate input, since the few large pulses mostly drive the biotic system dynamics – this should be discussed
3. Vegetation densitiy plays a crucial role in the model, but there seems to be no equation that describes the dynamics. This is crucial to understand the model!
4. Eq 3: Link from Y to Rsy is not clear

Simulation of the system

5. p 8750, 14-18: difficult to understand. Reasoning would be helpful, schematic figure would be helpful

Results and discussion

6. Describtion of PDF difficult to understand for readers that are not familiar with this concept. Short explanation of how to interprete result would be helpful
7. Eq 13: shows only the percentage of cells that are clusterd and not the size of the clusters. It would be good to have an additional measurement on this (i.e. many small clusters vs. few large)
8. Reproduction of patterns:
   Not clear if reproduced patterns are a result of model calibration or if there are ecological reasons for the parameters. Please clarify.
9. Suggestion for organisation of section 5.2.: first describe both sites and then show results. This could prevent explaining things twice
10. Labyrinths should be discussed: why does the model not reproduce these? Are the processes not well parameterized? Are processes missing?
11. p 8757: Why did the authors not perform simulations with real topographic data? Was this not available?
12. Section 5.3: which site was simulated? Please state in text
13. 5..3.2 Title of section not well chosen. Authors didn't analyse the impact of the slope, but the phenomenon of pattern migration (or temporal dynamics)
14. Impact of slope would be very interesting to analyse, since pattern have been found for gentle slopes only), does the model reproduce this?
15. Section 5.3.4: Reference to Table 5 given in the text, but Table itself is missing

Tables and Figures

16. Table 1 and 2: data sources not given, reasoning for values missing
17. Table 3: add row "Cluster type"
18. Figure 6/9:: Provide short intros into figures. Caption too long to grasp immediately. Highly difference between "higher than" and "lower than"

Specific comments

1. p 8746, 10: definition of ds is missing
2. p 8747, 7-9: authors should say clearly that tehy don't account for dependence of albedo on vegetation!
3. p 8747, eq 5: kv has not been defined
4. eq 5: the the 4 refer to number of neighboring cells?
5. eq 6: can ζ be < 1?
6. p 8748, 14: in addition: soil porosity, slowdown of runoff
7. p 8749, eq 10-12: definition of mPA?
8. p 8752, 20-21 :"corresponding uniform binomial process" Does this mean: cluster size distribution of a random vegetation distribution? Please clarify
9. p 8755, 8: how was groundwater runoff calculated?
10. p 8760, 2: Add "Nearly": "Nearly all patterned fields..."
11. p 8760, 7: Which value for precipitation was chosen here?
12. p 8764, 18: Table ref is not correct (Tab. 4 and not Tab 1)
13. p 8764, 19: A = -0.3 (and not +0.3)
14. p 8771: 1: Reference Jeltsch, Zehe, et al is not correct (Tietjen, Jeltsch, Zehe et al.)
15. Fig 11: label of y-axis missing