

Interactive comment on “On the social dynamics of moisture recycling” by Patrick W. Keys and Lan Wang-Erlandsson

Anonymous Referee #4

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Major comments

The authors investigated terrestrial moisture recycling in three inland countries, namely, Mongolia, Niger, and Bolivia, by focusing on land-use change in moisture-source regions. By investigating land-use change policy of the countries in question and surrounding countries, the authors tried to explore the social dynamics of moisture recycling. Although I found the attempt quite interesting and novel, the manuscript in present form lacks clarity and quantitative evaluations in many parts. Hope the comments below are useful for further improvements.

Specific comments

Page 1 line 8 “We find that the sources and sinks of moisture can experience very differ-

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ent levels of human well-being, suggesting that power discontinuities must be included in the description of MRSES dynamics”: How moisture “can experience different levels of human well-being”? What are “power discontinuities”?

Page 1 line 11 “This exploration of the social dimensions of moisture recycling”: It seems an important precondition of this work that the “social dimension” plays an important role in terrestrial moisture recycling, but this is hardly proved (quantified) in text. I suppose the direct impacts of land-use change on the terrestrial hydrological cycle would be marginal. Exceptions are the cases for quite intensive irrigation (e.g. DeAngelis et al. 2010; Puma and Cook, 2010) and land-use change at continental- and century-scale (e.g. Takata et al. 2009).

Page 4 line 3 “2.2 Tracking the sources of moisture”: The authors applied the WAM-2layers model to estimate the evaporation and precipitation of their study domain. First, I would suggest providing more detailed information on the boundary condition (i.e. simulation period, land-use assumption, validation data). Second, I would suggest conducting some additional simulations under counterfactual land-use which implies historical land-use change mentioned in Section 3.4. Such simulations would be highly effective to convince readers how significantly “social dynamics” would change precipitation or evaporation.

Page 8 line 26 “in general evaporation arising from relatively wealthier, less hungry areas falling out as precipitation in poorer hungrier areas”: This part sounds very subjective. Add figures and tables to make this part quantitative and concrete.

Page 10 line 3 “However there is a flow of moisture from wealthier areas to poor areas (relative)”: Same comment as above.

Page 10 line 7 “Within Bolivia itself, there is a cluster of wealthier rangelands and populated woodlands, and a cluster of much poorer remote and wild forest systems” Same comment as above. What is a cluster?

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Page 10 line 8 “Surprisingly”: Explain what is surprising. The authors tend to connect factor and factor subjectively. What are the solid knowledge based on established evidence here? In what sense surprising?

Page 11 line 10 “affect moisture recycling policy”: What is moisture recycling policy? In my view, the impact on moisture recycling is one of many (often unintended) secondary-impacts of land-use/industrial policy.

Page 14 line 29 “Construction of archetypes”: Although it is an interesting idea that inland moisture recycling could be subdivided into three categories, I’m wondering how to find thresholds among them. Any region is neither fully isolated nor fully tele-connected. What to do with regions in between?

Page 18 line 15 “in isolated systems (e.g. Mongolia) there can still be a wide range of well-being (e.g. wide range in poverty and malnutrition)”: I couldn’t follow the authors’ logic. In every isolated systems the authors’ claim holds true? Which figures/tables/sub-sections clearly do clearly support this claim?

Figure 3: Very hard to understand. What does each plot represent (grid cells of each nation or those for each precipitationshed)? Also clearly indicate in text what we should focus on. These panels look random scatter without meaningful information at first glance.

References

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Takata, K., Saito, K., and Yasunari, T.: Changes in the Asian monsoon climate during 1700-1850 induced by preindustrial cultivation, *P. Natl. Acad. Sci. USA*, 106, 9586-

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