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Interactive comment on "Length and time scales of atmospheric moisture recycling" *by* R. J. van der Ent and H. H. G. Savenije

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The manuscript represents an extension of the authors' previous work with recycling ratio diagnostics, developing time and space scales with the moisture transport maps. In general the derivation is mostly reasonable (see below for one concern) and the results are reasonable, except that it's not clear what advantage the calculation brings.

Firstly, in my experience with bulk recycling estimates, I find that they can provide relative estimates, but those should be interpreted as and index contingent on the assumptions of the method and the input data, rather than a verifiable estimate. That notion should also apply to these length and time scales as well. The value itself isn't as important as the relative comparison among regions and seasons.

In that sense, there are limitations to the time and space scale that is computed. The ERA Interim is used for the period 1999-2008 are used. The time frequency of the reanalysis is not mentioned in section 2.5, so I'll assume it's monthly average (typical input for bulk methods). Does the monthly mean data affect or limit the time and space scale, considering that recycling is usually large in summer seasons when convective processes dominate (short time scales and small length scales)? Land at interactions take place at the hourly-daily time scale, and would not be represented.

My interpretation of the length sales is that it quantitatively incorporates moisture transport into the recycling diagnostic. if that is so, then what is gained over a thorough budget analysis including an evaluation of the moisture transport? On Page 9 lines 5-6: "We believe that these length scales (Fig 5) have more physical meaning than the scaled regional recycling ratios." In this case the more seems to be the moisture transport, but that could be identified without the length scale calculation. Mostly I'm just trying to clarify what is gained from the calculation, and so weigh the significance of the paper and results.

There is another uncertainty that is introduced but not discussed in the paper. The precipitation, evaporation and moisture transport from ERA-Interim reanalysis are used to compute the recycling and length scale. The recycling and hence the length scale are derived from the atmospheric water budget. However, Interim's water budget does not balance, as it also includes the influence of the data assimilation (e.g. Bosilovich and Schubert, 2001, J. Hydromet. 26-35). The data assimilation can either be contributing to precipitation or evaporation biases, or trying to correct them. Since the input data is not balanced to a significant level, how does this affect the calculation and results? The degree of imbalance can be checked by computing E-P global average or comparing E-P with moisture convergence over long periods.

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