

## ***Interactive comment on “Appraising the capability of a land biosphere model as a tool in modelling land surface interactions: results from its validation at selected European ecosystems” by M. R. North et al.***

**Anonymous Referee #2**

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This manuscript uses observational data from a number of point locations to evaluate the performance of a land surface model SimSphere. The authors claim that this study is "an in-depth validation" of the model, but I find it a very restrictive validation. The periods of comparison between the model and the observations have been restricted to day-time, with clear skies, during the growing season and with "atmospherically stable conditions". Furthermore, although a number of sites with varying land cover have been studied, these sites are all within Europe. So there is little assessment of the model across a range of climates (e.g., semi-arid, tropical, ...).

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The authors have selected individual days from the observational datasets based upon energy balance closure of those days. However, energy balance closure is inappropriate on such timescales. The energy stored in the soil leads to both a strong diurnal cycle and a strong seasonal cycle. Hence energy balance closure can only be assessed on multi-year periods. If only one year of data is available, then assessing energy balance on this length of dataset would be acceptable, but not ideal. Timescales less than a year do not capture the seasonal cycle of the soil energy store and are hence inappropriate. Furthermore, such an assessment can only be made for observational datasets without long periods of missing data that could bias the closure calculations.

For the stated aims of the manuscript (an in-depth validation of the model), simulations should be undertaken for all periods (day-time, night-time, clear skies, cloudy skies, precipitation, all seasons, etc.) with valid observational data.

Minor comments:

p. 223 L10-14: In the introduction, the authors state that studies comparing models with in-situ data have been scarce and incomprehensive. However, the authors seem to be unaware of the community activities following the PILPS experiments that have been evaluating models over a range of sites, land cover types and climates, since the 1990s. Indeed, the latest PILPS experiment has even considered the urban environment (which is mentioned within the manuscript).

p. 229 - 230. There is no mention of how the soil temperature and soil moisture have been initialised for the simulations. It is well known that soil moisture can take multiple years to spin-up and incorrect soil moisture can have significant impacts on the sensible and latent heat fluxes. As such, the initialisation methodology needs to be described.

Technical comments:

p. 227 L 8: Data is plural, so "data was" should be replaced with "data were".

C44

p. 227 L 9: Data is plural, so "data was" should be replaced with "data were".

p. 228 L 1: Text references the "above equation" whereas the equation is actually below this statement. Use the equation number rather than its position relative to text.

p. 228 L 12, 13 and equation on 16: The terms "G" and "S" are used in the equations without being defined.

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Interactive comment on Earth Syst. Dynam. Discuss., 6, 217, 2015.