What information on contemporary terrestrial carbon dynamics can an integration of current geospatial data confidently provide?

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This is a major effort of producing improved global C stocks and fluxes data for a wide range of applications with some success. Yet the new data product have several drawbacks.

- Only MODIS products are assimilated, while ignoring ground observations. There are plenty of in-situ observations of fAPAR and GPP available from, e.g. Fluxnet. Satellite retrievals of fAPAR and GPP are indirect with limited resolution, hence subject to algorithm errors and uncertainties. Without ground observations (even at different resolution from those of satellite remote sensing observations), satellite retrievals of GPP, as well as other bio-ecological variables, may have unbounded systematic errors or biases.

- The theoretical foundation of this study is shaky as the data product is based on numerous assumptions. For example, parameter proposals are drawn from uniform prior ranges, CARDAMON analyses conducted for each pixel are repeated three times (chains), realistic approximation of parameter combinations is obtained when three chains are converging, the Gelman-Rubin convergence criterion is used, etc. There is no justification for these assumptions. For example, why are three chains instead of, e.g. five, chains needed? Why is the Gelman-Rubin convergence criterion suitable for this analysis?

- The concept of uncertainty propagation is confusing and needs elaboration. Why do uncertainties propagation "from individual pixels to the global scale"? Uncertainties are not some fluids that can flow from one place to another. Instead, uncertainty describes incompleteness of the available information about a variable/parameter. "… *we assume uncertainties are fully-correlated when propagating from pixel to global estimates*" does not make sense. What does "fully-correlated" mean? Why so?

- Since data assimilation uses certain parameterizations of physical processes such as surface fluxes of mass/energy and plant phenology, the systematic errors of models and the input data may cancel through tuning and/or parameter calibration, leading to improved estimates of C stocks and fluxes. It is unclear what, e.g. more realistic physical models or quality of input data, are responsible for the improvement of the new global C stocks and fluxes data.

- The production of the monthly new C data was driven by monthly meteorological and disturbance information. This is problematic due to the nonlinear response of C-dynamics to environmental drivers.

- A more severe limitation of this study is that the main objective of producing new C stocks and fluxes data is to reduce their uncertainty for the determination of global carbon sink/source distribution, among other purposes. Yet, focusing on uncertainty alone will not be sufficient to achieve the goal. Reducing biases is more important than reducing uncertainties. Imagine the estimates of wood and soil C storage have no uncertainty but substantial biases (systematic errors), which could lead to totally wrong sign and magnitude of net C sink/source. As a result, this effort missed the target.

- The authors did not give a definite and clear answer to the question in the paper title. The Conclusions section only summarizes the work and discusses briefly the potential applications of the new C data. This paper reads more like a technical report than a research article. If this paper is meant to be a technical report, using a question as the title may not be appropriate.