**Biogeosciences
Discussions**

Interactive
Comment

Interactive comment on "An estimate of the terrestrial carbon budget of Russia using inventory based, eddy covariance and inversion methods" *by* A. J. Dolman et al.

A. J. Dolman et al.

han.dolman@vu.nl

We thank the reviewers for their kind remarks and comments. There are a large number of editorial remarks, for which we apologize making them. We do not list them here, but rather wish to discuss three items that the reviewers appear most concerned about. All other comments, including adherence to sign conventions, will be dealt with in the revised manuscript.

What constitutes a terrestrial carbon budget, and what constitutes a carbon budget of a region, more precisely which terms should be accounted for and which should not? How does one calculate an error or uncertainty estimate when the component terms

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

are not all Gaussian distributed? What information is contained in Dynamic Vegetation Models that is appropriate to use them for the RECAPP budget analysis

Ad 1) The outline of the carbon budget in RECAPP is given in the soft protocol and a figure describing this can also be found in Luysaert et al (2012). The main budget equation for a bottom up budget comprises exchange fluxes to the atmosphere (GPP,NPP,TER) minus their disturbances (fire, insects, harvest) and lateral exchanges: import and export through trade and export from rivers (see also Enting et al., 2012, who provide this as their hierarchical Table 1).

When comparing bottom up estimates with top down estimates, in principle only the atmospheric fluxes need to be accounted for, unless there is import from materials that is respired inside the domain. For a full carbon accounting, i.e. deriving the closed carbon budget of Russia we also need to take care of the lateral fluxes, hence they are estimated as well (wood and trade). The disturbance fluxes fire, harvest and pest are needed when we scale up from eddy covariance estimates to the atmosphere as they represent fluxes that have to be taken off the NEE as observed by the eddy covariance sites. In our overall comparison we took care to make sure that we compare like with like. We emphasize this in the revised text.

Ad 2) The classic way of accounting for multiple errors e1.. en is to assume that they are independent and Gaussian distributed. There are several problems when applying this to the RECAPP data of Russia. In a model ensemble, such as that of inverse models, the errors are not Gaussian, and the mean of a model ensemble does not necessarily have any physical meaning. We therefore use the range to express the degree of uncertainty in the case of models (DGVMs, Inversion models).

Where for some estimates, it is possible to derive an integrated error estimate based on the component estimates, such as in the LEA, we have done that in the revised version. In deriving an error of the mean flux, we stumble on the problem of not having a standard deviation for the inverse models but a range. There are two ways to solve

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

this, either one takes the standard deviation of the mean, or we do not derive a best estimate. We have now chosen the latter in the revised version, but give more detail on the error estimates of the LEA, eddy covariance and the range of the DGVM and inverse models.

Ad 3) Both reviewers mention that our use of DGVMs is not reflecting their potential. We note that the DGVM's use present day land use, but none of them a permafrost module. We added a new figure that shows the trend of the DGVMs used for NEE and their mean. We stress however that the mean has no physical meaning. To be able to convert this estimate in an bottom up estimate we would need to subtract fire emissions, and lateral export through rivers, and harvest. While some of these processes are part of the model, in others they do not occur, so a direct comparison and use in a bottom up estimate is difficult. This is the main reason why we choose to be careful in the treatment of these results.

References

I.ÂăG.ÂăEnting, P.ÂăJ.ÂăRayner, and P.ÂăCiais, 2012 . Carbon Cycle Uncertainty in REgional Carbon Cycle Assessment and Processes (RECCAP). Biogeosciences,Âă9,Âă2889-2904.Âă

S.ÂăLuyssaert, G.ÂăAbril, R.ÂăAndres, D.ÂăBastviken, V.ÂăBellassen, P.ÂăBergamaschi, P.ÂăBousquet, F.ÂăChevallier, P.ÂăCiais, M.ÂăCorazza, R.ÂăDechow, K.-H.ÂăErb, G.ÂăEtiope, A.ÂăFortems-Cheiney, G.ÂăGrassi, J.ÂăHartmann, M.ÂăJung, J.ÂăLathière, A.ÂăLohila, E.ÂăMayorga, N.ÂăMoosdorf, D.ÂăS.ÂăNjakou, J.ÂăOtto, D.ÂăPapale, W.ÂăPeters, P.ÂăPeylin, P.ÂăRaymond, C.ÂăRödenbeck, S.ÂăSaarnio, E.-D.ÂăSchulze, S.ÂăSzopa, R.ÂăThompson, P.ÂăJ.ÂăVerkerk, N.ÂăVuichard, R.ÂăWang, M.ÂăWattenbach, and S.ÂăZaehle, 2012. The European land and inland water CO2, CO, CH4 and N2O balance between 2001 and 2005. Biogeosciences,Âă9,Âă3357-3380.

Interactive comment on Biogeosciences Discuss., 9, 6579, 2012.