

## ***Interactive comment on “The carbon budget of South Asia” by P. K. Patra et al.***

**Anonymous Referee #2**

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Manuscript have unique scientific importance in assessing carbon budget of south Asia by synthesis of results of bottom-up and top-down approaches. Manuscript have significant scientific value with respect to addressing regional carbon budget with existing diverse sources of data and model outputs. However, manuscript appears to be more like compilation of results and model data of past studies for drawing conclusions. Overall manuscript can be rated as good but need more improvement with respect to presentation of results and discussion. Following are some issues that needs to be addressed

Land use flux emission & Biome-inventory Different sources of data with different scale and methodology followed in inventory estimates. No. of plots laid out for diverse biome type in different regions. These inventory estimates (table 3) are sporadic and not consistent done over years. How these estimates area comparable over different time periods ? and with ecosystem models (0.5 degree grid) for assessing contribution

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of land use change to net carbon flux (Table 3).

Moreover, increased sink capacity of carbon in South Asia from 1980s, to 1990s and 2000s perhaps more linked to climate signal (El Nino). In 80s, more prevalent drought episodes may be the reason for more release of C and more wetter years in 1990s could have strengthen C sink. More discussion is needed to exclusively single out contribution of land use change.

Inter-annual variability of carbon fluxes Results presented does not clearly brings out role of increasing atmospheric CO<sub>2</sub>, land use change and climate in controlling variability of net carbon flux. Clarity on relative contribution from these factors is more important in evaluating carbon budget particularly in monsoon regions where all three factors interplay and affects on CO<sub>2</sub> budget in integrated manner. It would be interesting if author addresses role of land use changes (crop establishment and crop intensification predodimantly taking place in south Asia) in carbon budget. Can Ecosystem model simulations (LPJ or trifu) of varying climate and constant LUC and vice-versa is possible to present in results. It would be interesting to have atleast inter-annual variability of total NEP for top-down and bottom-up approaches (best of ecosystem models) and their comparison with past studies over south Asia region (Tian et al., 2003, Global planetary Change 37:201-217)

Seasonality of carbon fluxes

Page 13577 fig. 3. X-axis is it total NEP of South Asia ? On monthly basis, why unit on X-axis is Tg C per year. Decadal averge of Annual mean NEP ranges from 193 to 220 Tg C per year (Page 13552 line 20-21). Monthly CO<sub>2</sub> flux or NEP on X-axis is unrealistic. It is advised to present mean NEP (g c m<sup>-2</sup> per month) and discuss results for for seasonality of CO<sub>2</sub> flux.

Page 13548 line 13 : is it 2009 or 2002 (see table 3) Page 13555 line 25 remove “and” after the Page 13555 line line 7-9 cite reference of ensemble results for south asia.. Agreed GPP in monsson belt controlled by seasonality linked to precipitation but

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in this study some models are not reflecting dominant control by climate particularly precipitation..

#### References

page 13562. Chhabra et al. (2009a) not in text page 13563. Fekete et al. (2010) not in text page 13564. Kucharik et al. (2010) not in text page 13564. Lele and Joshi (2009) not in text page 13573, line 16?. Patra et al. (2011) not in references

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