A protocol for developing a carbon stock product based on the OCO-2 MIP activities

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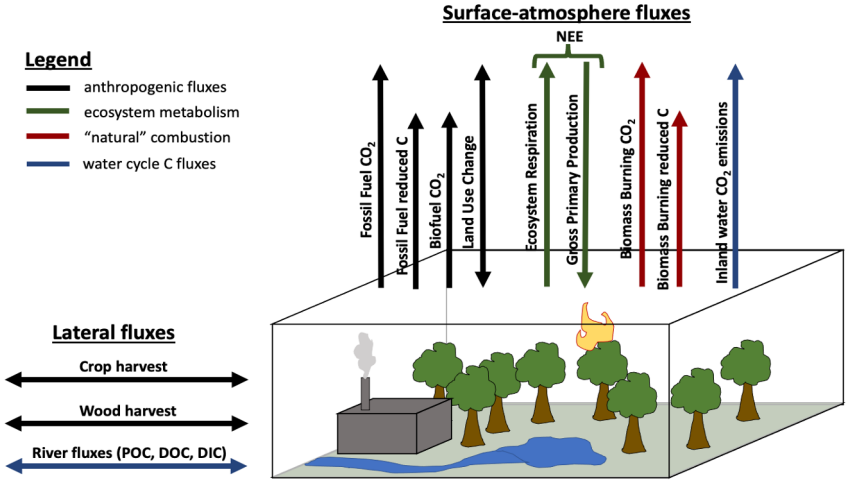
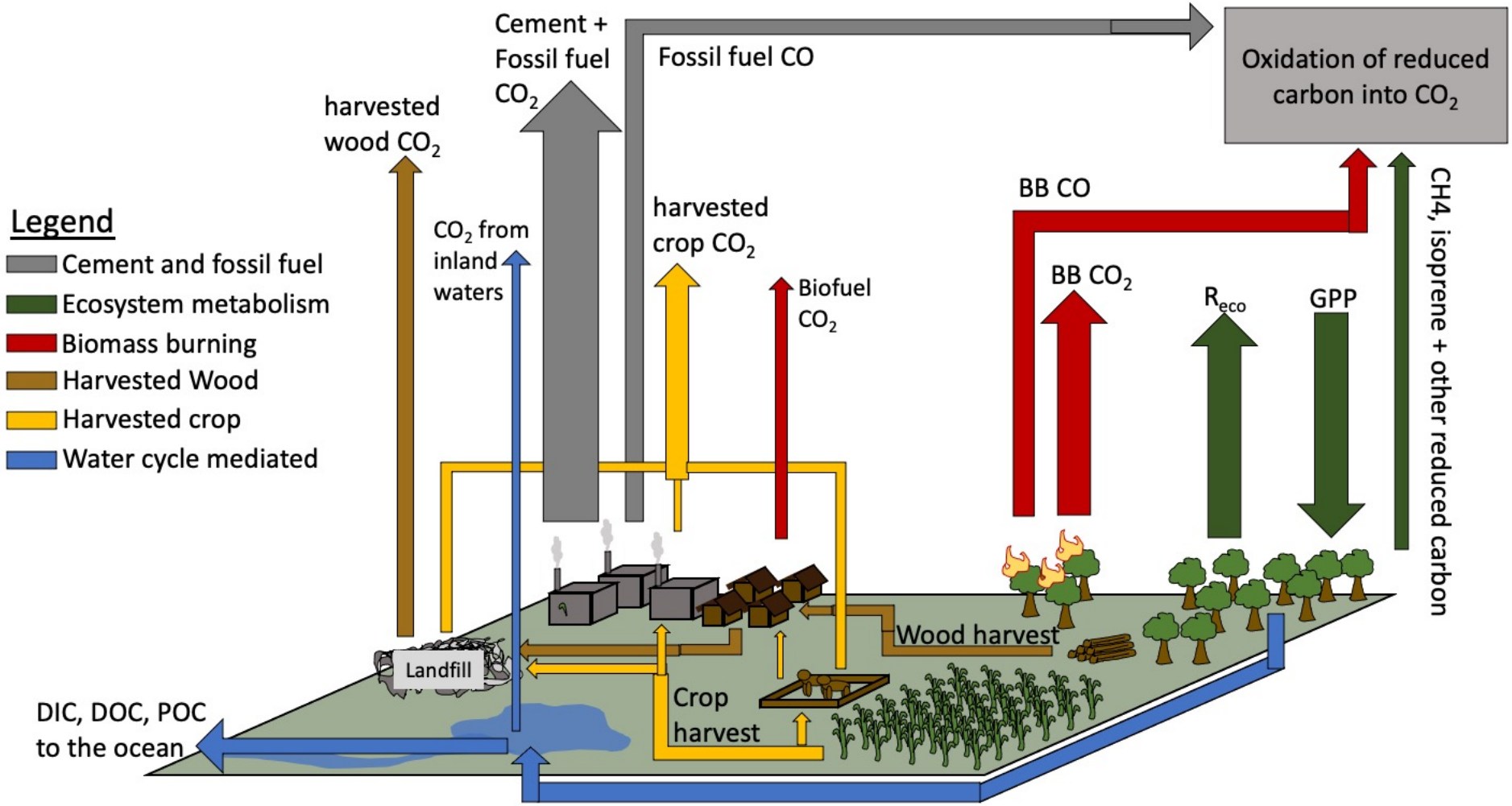
To follow progress ask Brendan to join the oco_stock@jpl.nasa.gov mailing list.

1. Net C stock changes depend on the net biosphere exchange (NBE) and other anthropogenic (e.g., farming) and natural (e.g., rivers) fluxes of carbon.

2. This poster describes progress on estimating net stock changes based on OCO-2 MIP estimates of NBE.



Schematic diagram of the terrestrial carbon cycle



Estimates of lateral fluxes

- Model estimates: We will estimate lateral C flux from rivers to ocean using the DLEM model
- Inventory estimates: We will apply inventory based methods to estimate lateral crop and wood harvest fluxes.
- Still investigating how to account for spatial differences in the sink due to neglecting atmospheric chemistry.
- Suggestions of other gridded datasets of lateral flux estimates are welcome!

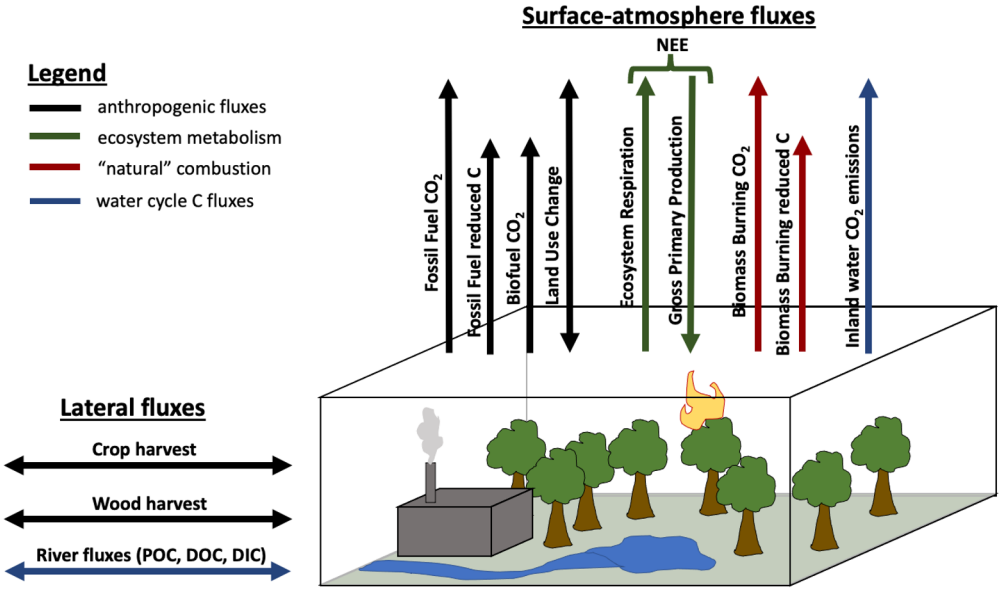


Figure 2. Schematic illustration of carbon fluxes between a land grid box, the atmosphere, and adjacent grid boxes

Our starting point:
The OCO Model intercomparison project (MIP)

- ~10 groups running flux inversions of OCO-2 and *in situ* data.
  Ensemble helps quantify systematic errors (transport model, prior constraints)

- Have several experiments that assimilate different datasets
  Most relevant are *in situ* (IS) and OCO-2 land nadir + land glint (LNLG) flux inversions

- Recently completed OCO-2 v9 MIP “MIPv9” covers 2015-2018.

- Inversions are starting now for MIPv10, which covers 2015-2020.
  Will have a combined LNLGIS inversion

MIP results - 1°x1° maps

- Maps show (2015-2018) annual net fluxes across IS and LNLG ensembles (illustration purposes, under consideration)

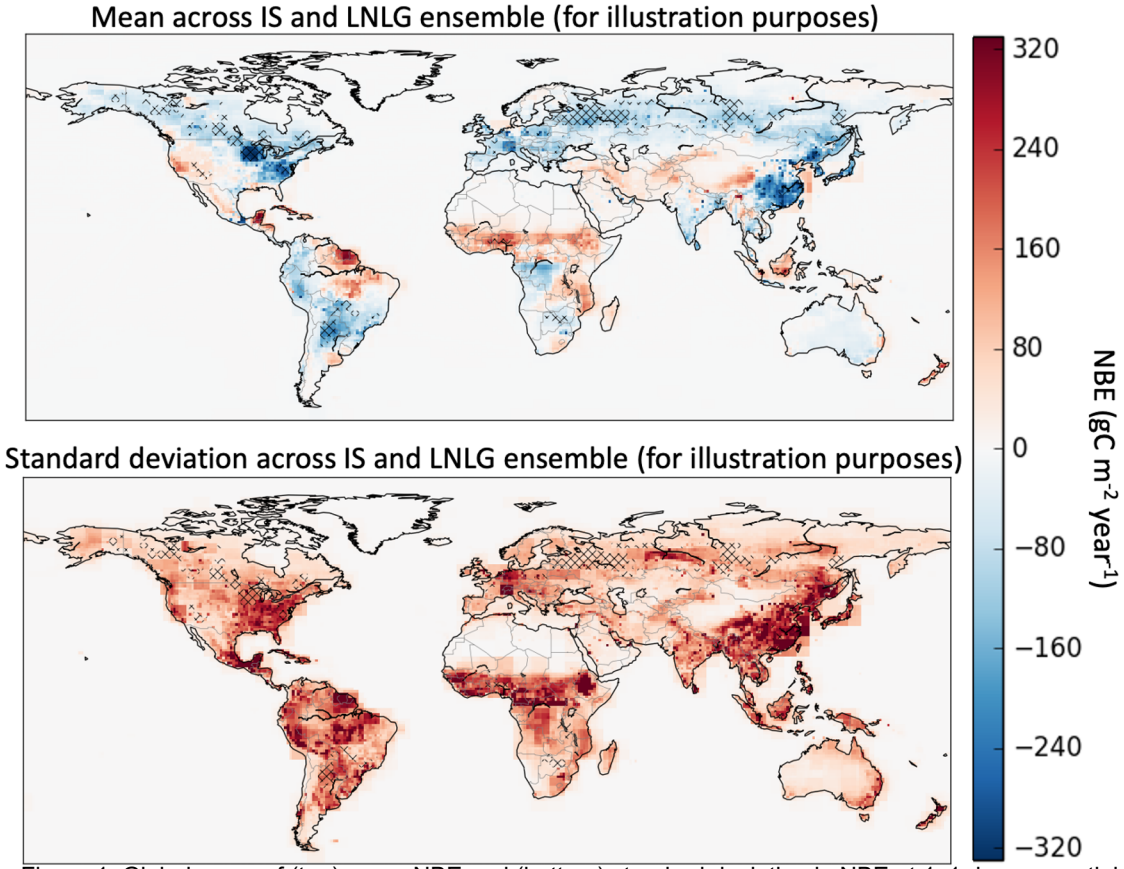


Figure 1. Global maps of (top) mean NBE and (bottom) standard deviation in NBE at 1x1 degree spatial resolution across all ensemble members in both the IS and LNLG experiments. Hatching shows where the mean sink/source exceeds one standard deviation.

- At 1x1 deg, few regions show net sinks or sources greater than 1 standard deviation of model spread (hatching).
- Boreal forests have greatest confidence, tropics show least.
- However, this is largely due to limited information content and inversion configuration, constraints improve with aggregation….next slide

MIP results - Country level results

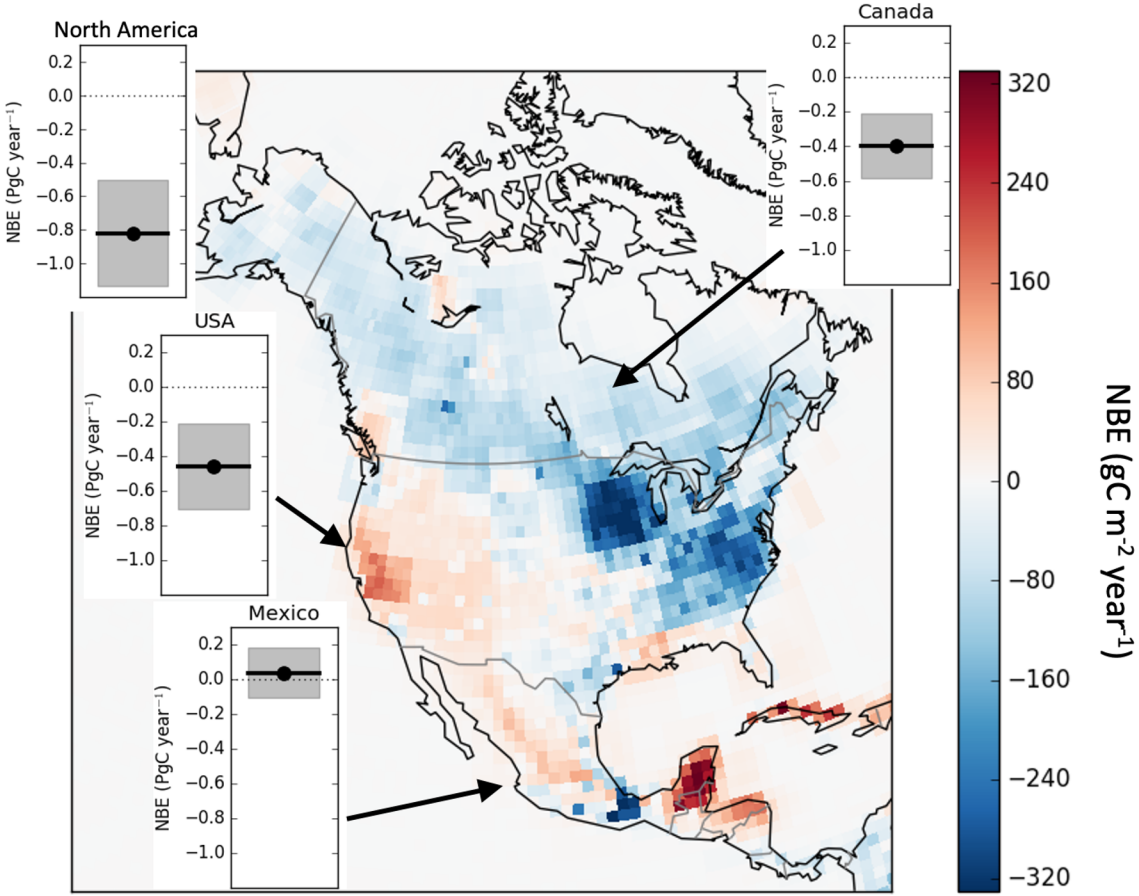


Figure 2. 1°x1° map and country level NBE for all ensemble members in both the IS and LNLG experiments. Bar plots show mean +/- 1 standard deviation

- Aggregating reduces uncertainties.
- NBE estimates for large extratropical countries (Canada, USA, Mexico) are reasonably precise.
- Smaller countries will have considerable uncertainties. We are working to refine with MIPv10. Providing regional NBE estimates may also be an option.

Acknowledgements

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