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The seasonal cycle of atmospheric CO_2 in Australia over the last ten years seen by GOSAT

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Satellites and inverse models show significant and periodical discrepancies in XCO_2 in Australia

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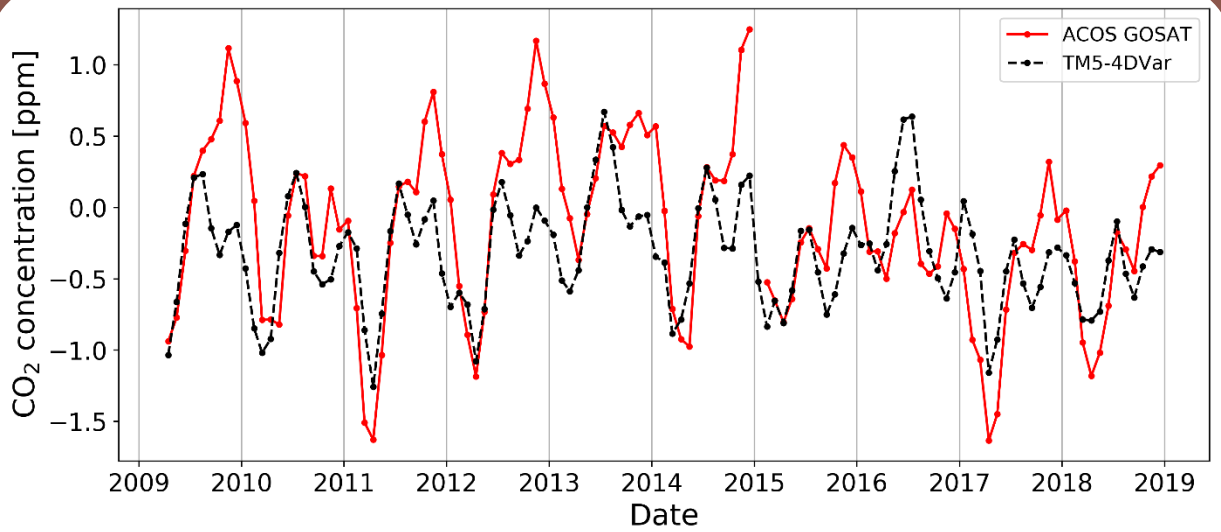
Method: Detrending by subtraction of background with NOAA growth rates and different offsets, average over the transcom region Australia

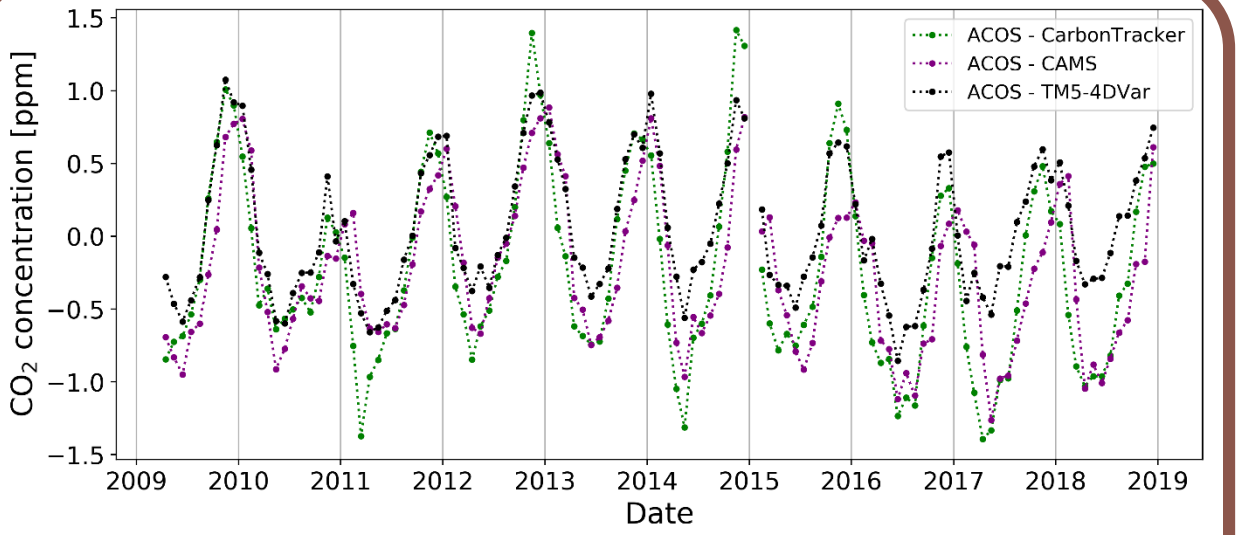
1 Detrended monthly mean XCO2



- ACOS shows maximum XCO_2 at the end of the year, not captured by TM5-4DVar.

➡ Different shape of seasonal cycle of XCO_2

2 ACOS GOSAT – Inverse models



- Clear seasonal difference pattern with the largest discrepancy of up to 1.5 ppm between October and December

Assimilating ACOS GOSAT additionally to in-situ data results in more dynamic net carbon fluxes

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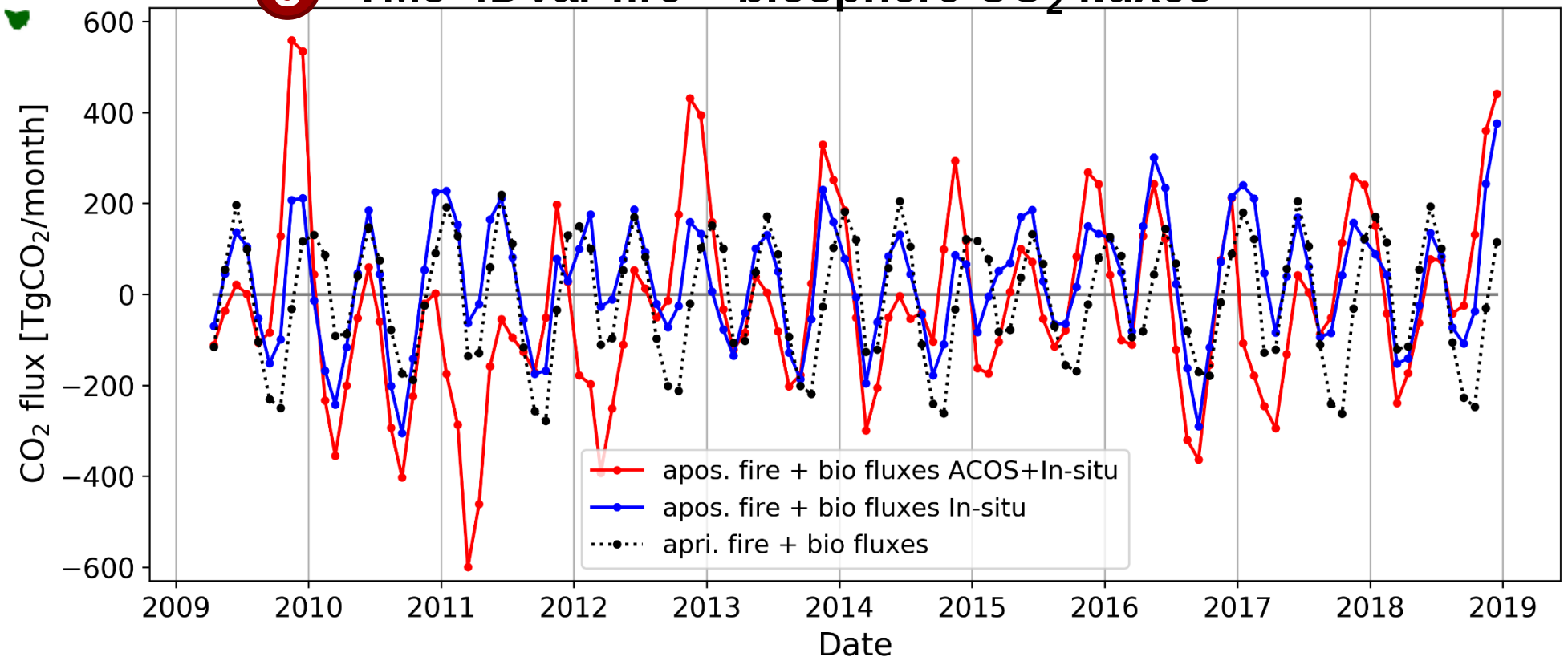
3 TM5-4DVar fire + biosphere CO_2 fluxes



Method: Assimilation of in-situ (blue) and in-situ + ACOS (red) in TM5-4DVar to obtain carbon fluxes

- In-situ assimilation mainly follows the prior fluxes.
- Additionally assimilating ACOS results in stronger positive fluxes at the end of the year

Bottom-up NBP shows same seasonality but differs by a factor of up to 3 from our top-down estimate

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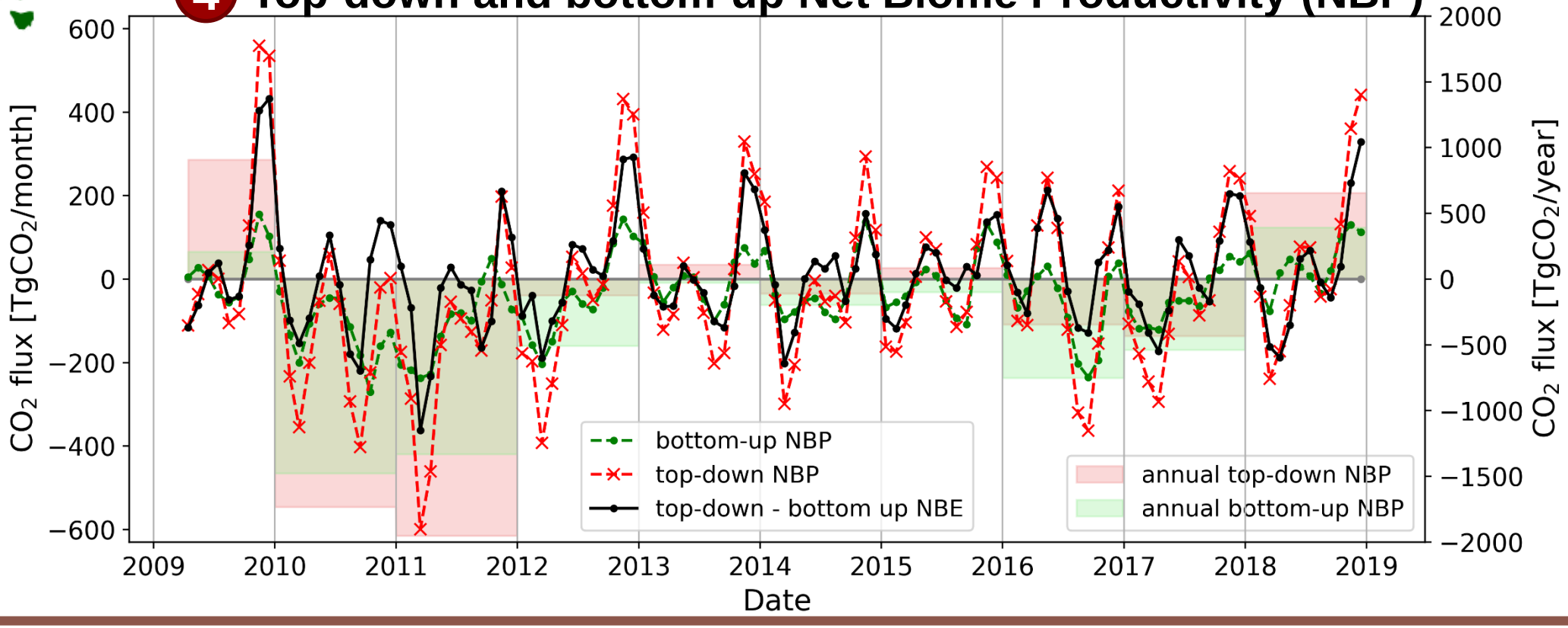
4 Top-down and bottom-up Net Biome Productivity (NBP)



Method: Top-down NBP: apos. biosphere and fire fluxes of TM5-4DVar (ACOS+In-situ)
Bottom-up: Fluxcom Net Ecosystem Exchange + emissions of the Global Fire Emission Database

- Top-down and bottom-up estimates have similar structure and similar interannual variations.
- But they differ in their amplitude and annual carbon fluxes