

# The seasonal cycle of atmospheric CO<sub>2</sub> in South America over the last ten years seen by GOSAT

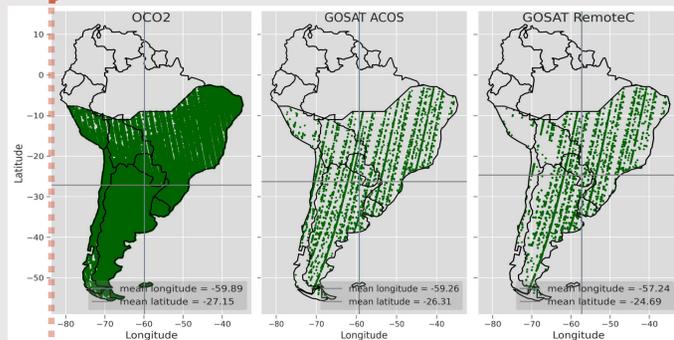
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Motivation

- Limited number of in-situ CO<sub>2</sub> measurements in South America.
- Satellite-based XCO<sub>2</sub> measurements can improve & validate carbon cycle models.

Data

- Comparison of CO<sub>2</sub> concentrations of GOSAT ACOS, GOSAT RemoTeC (RT), in-situ (IS) and OCO<sub>2</sub>.
- Comparison of CO<sub>2</sub> fluxes from the inverse model TM5-4DVar assimilating different measurements in the South America Temperate (SAT) region.



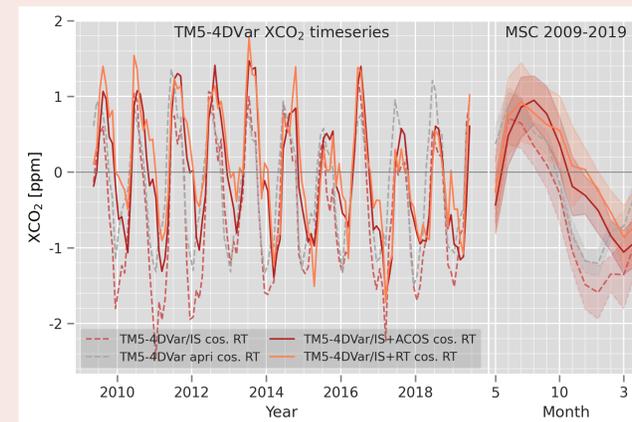
Methods

- Comparison of atmospheric inversion fluxes and concentrations:
- TM5-4DVar assimilating IS and GOSAT+IS
  - Model intercomparison project (MIP) assimilating IS and OCO<sub>2</sub>+IS

- Satellite XCO<sub>2</sub> measurements provide **new information about the carbon cycle** in the South America Temperate region.
- Satellite based CO<sub>2</sub> concentrations and fluxes show a **different seasonal cycle in CO<sub>2</sub> concentrations and fluxes** compared to conventional inversions using in-situ measurements only.

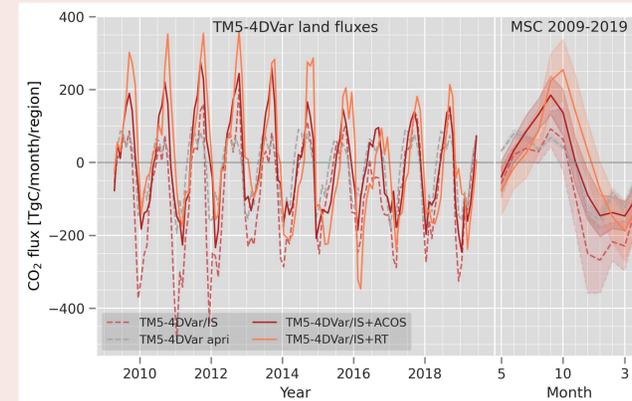
## XCO<sub>2</sub> concentrations

Assimilating satellite measurements **shifts the seasonal cycle** of XCO<sub>2</sub> in time by 1-2 months compared to in-situ assimilation only and a priori.



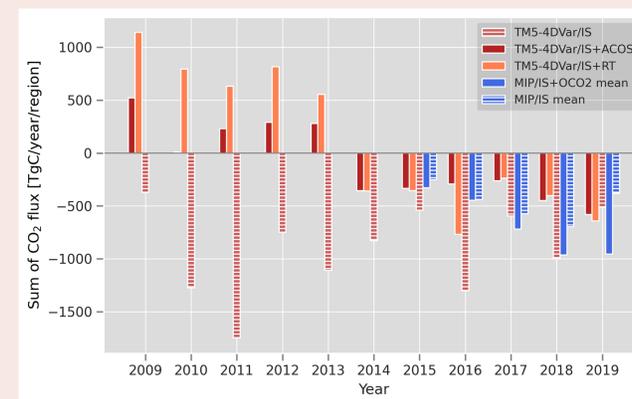
## CO<sub>2</sub> fluxes

- Seasonal CO<sub>2</sub> flux from in-situ assimilated model shows the **same seasonal cycle** as satellite assimilated model when using ACOS retrieval.
- But different satellite retrieval shows **different seasonal cycle** by 1-2 months.

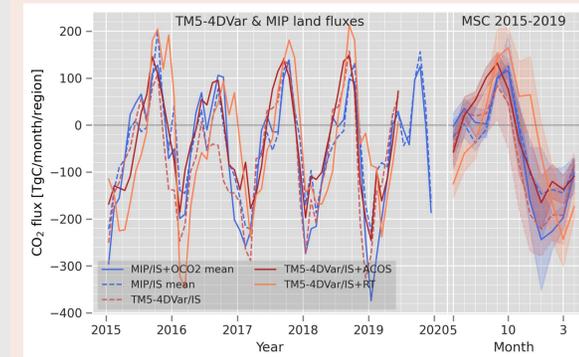
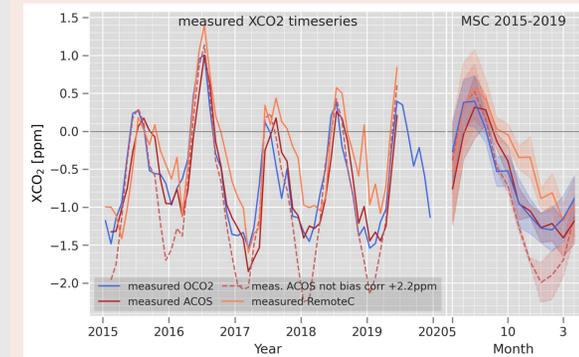


## Trend

- Satellite based **fluxes switch sign** from positive to negative fluxes in 2014.
- In-situ assimilation has smaller negative flux after 2014.



## Validation



## Further Questions

- Why do satellite based fluxes show differences among each other?
- Where does the trend in annual fluxes come from?

## What's next

- Investigate sampling bias by looking into subregions.
- Look at surrounding TRANSCOM regions.

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