Temporal characteristics of atmospheric CO_2 over fire affected regions based on GOSAT data

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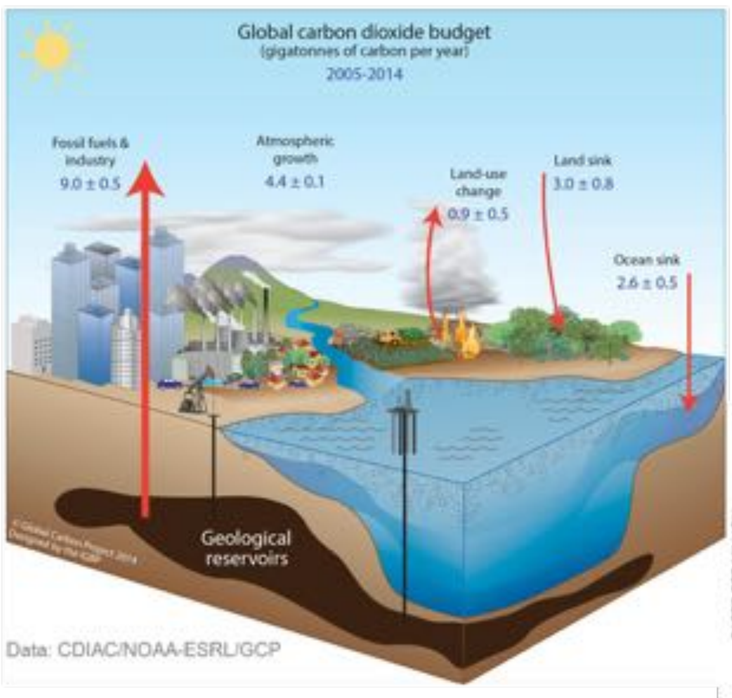
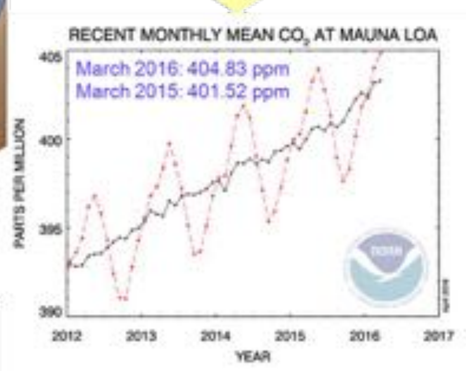
GOSAT-2 PROJECT
AT THE NATIONAL INSTITUTE FOR ENVIRONMENTAL STUDIES

1. Introduction



Source	
Fossil fuel industry	9.0±0.5
Land use change	0.9±0.5
-- Fire	0.5±0.5
Sink	
Land	3.0±0.8
Ocean	2.6±0.5
Atmospheric growth	4.4±0.1



To analyze the temporal characteristics and correlations between fire CO_2 emissions and GOSAT XCO_2 changes.

2. Data and methods

2.1 GOSAT FTS SWIR Level 2 CO_2 column abundance (column-averaged mixing ratios of CO_2) (July 2009 - June 2015).

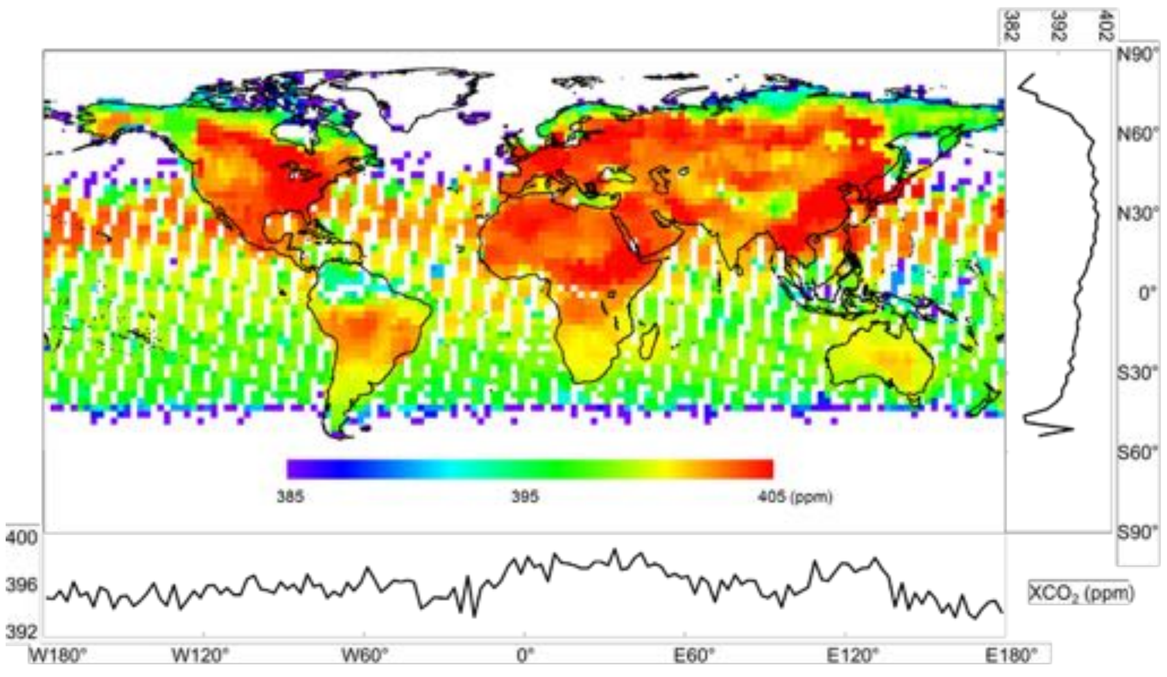


Fig.1. Maximum of multi-year monthly averages of XCO_2 in 2.5° mesh and amounts along latitude (longitude).

2.2 Fire CO_2 emissions

(*Global Fire Emission Database 4 (GFED4) biomass burning emissions*)

2.3 Net Primary Productivity (NPP)

2.4 Precipitation (*Global Precipitation Climatology Project 2.2 (GPCP2.2)*)

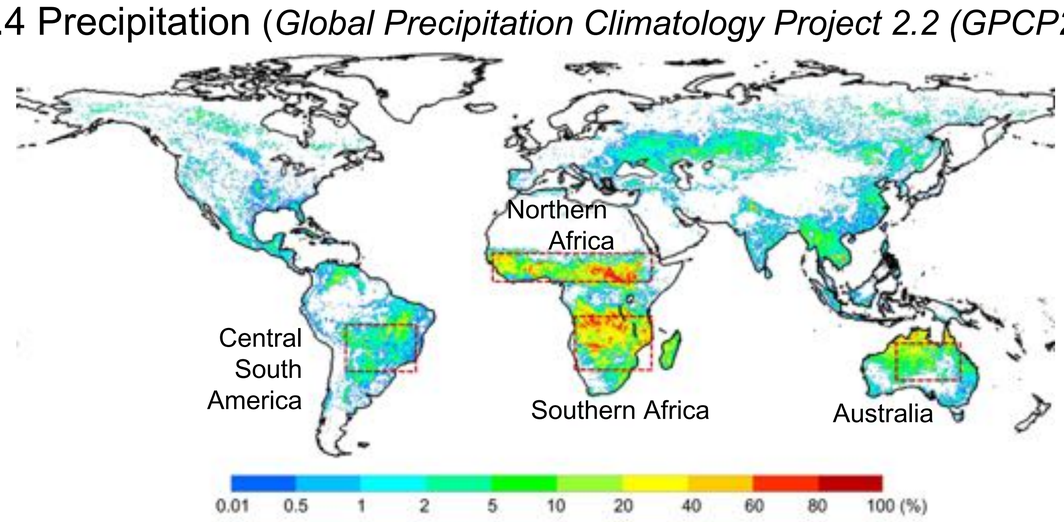


Fig.2. Burned area fraction (%) per year from GFED4 averaged over 2009-2014.

3. Results and discussions (1)

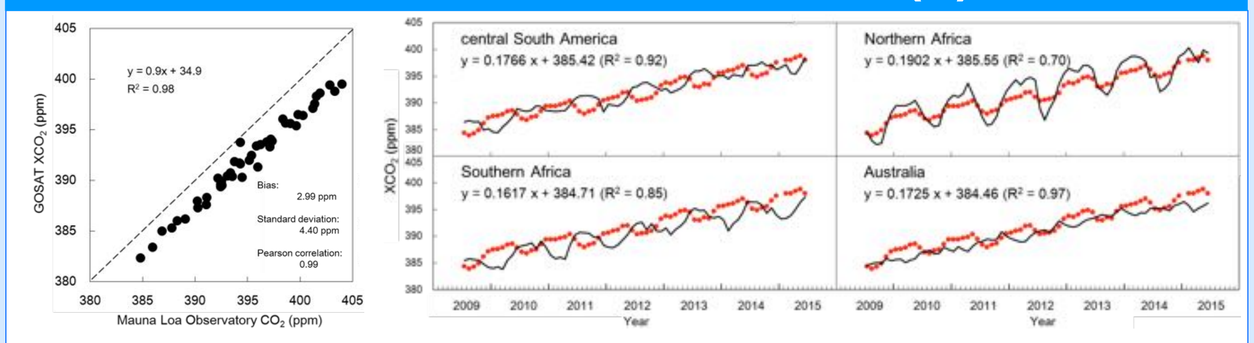
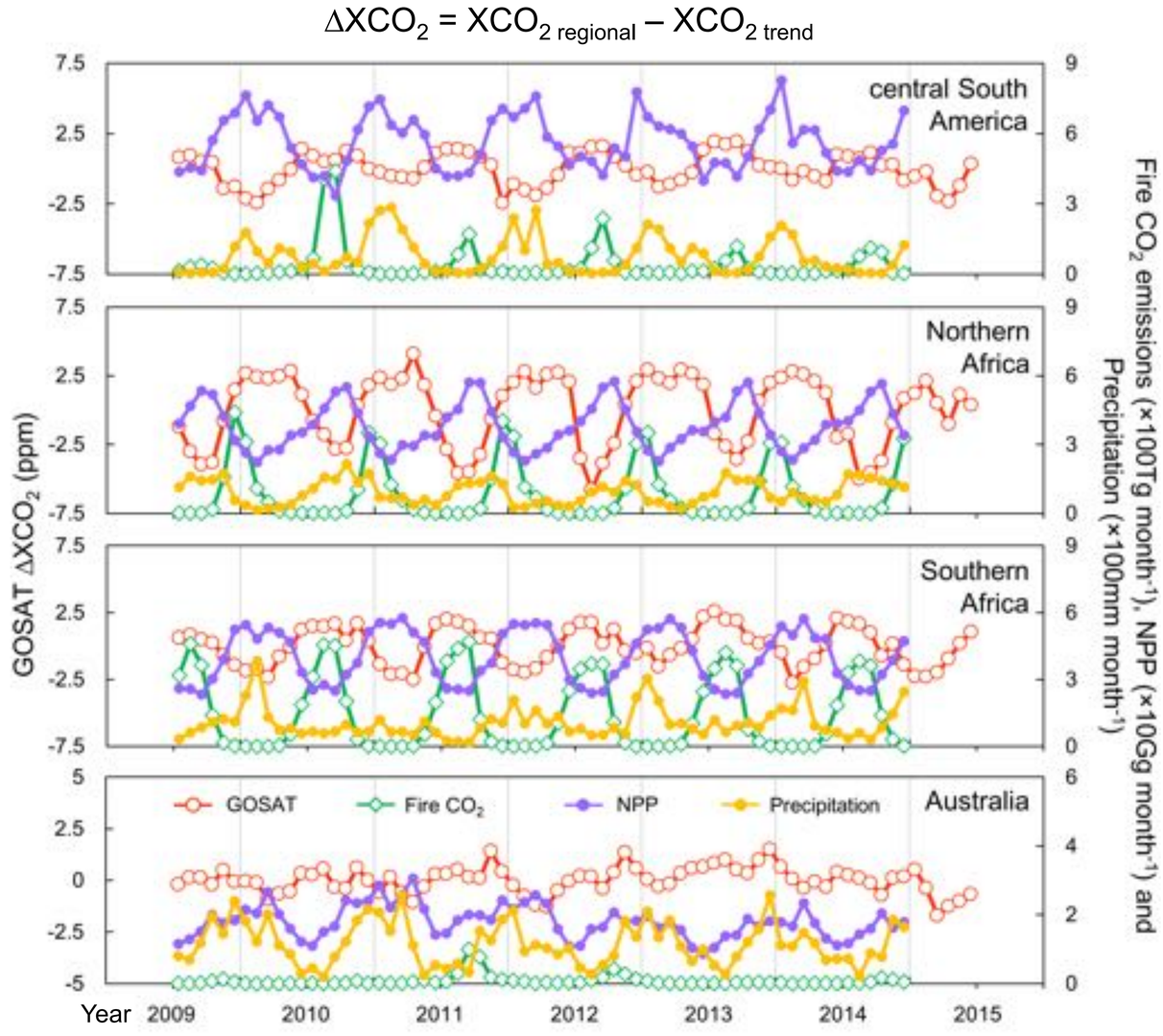


Fig.3. Comparison of monthly mean XCO_2 from GOSAT and Mauna Loa Observatory.

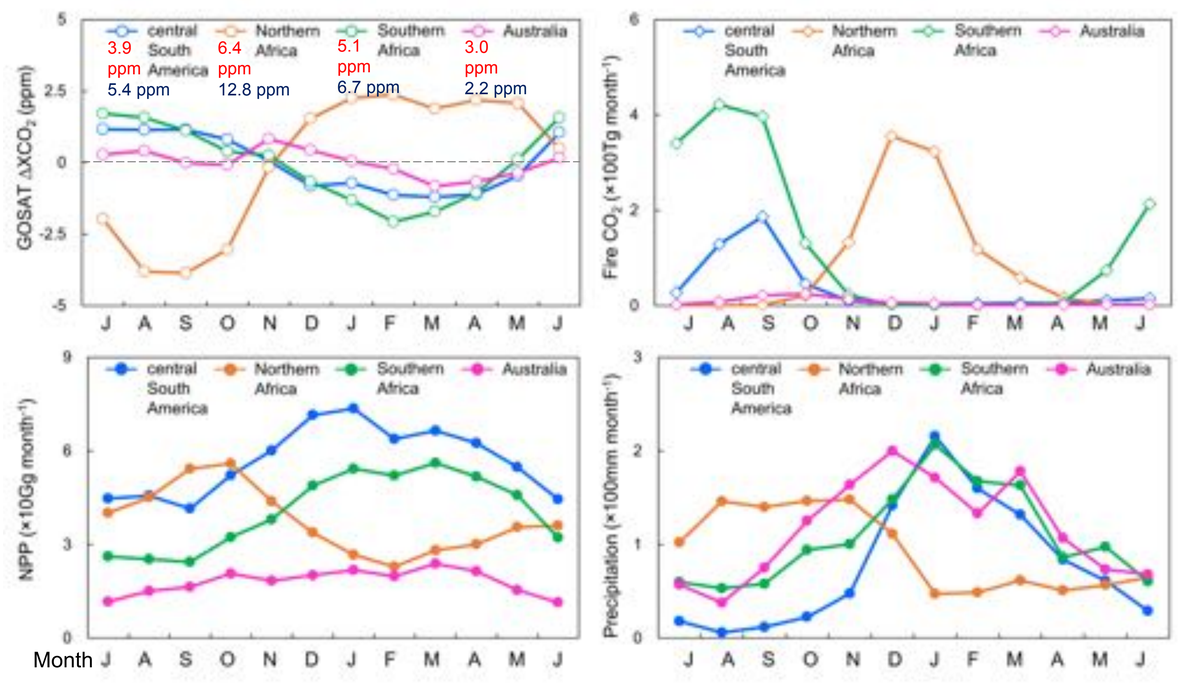
3. Results and discussions (2)

3.1 Interannual variations of ΔXCO_2, fire CO_2, NPP and precipitation.

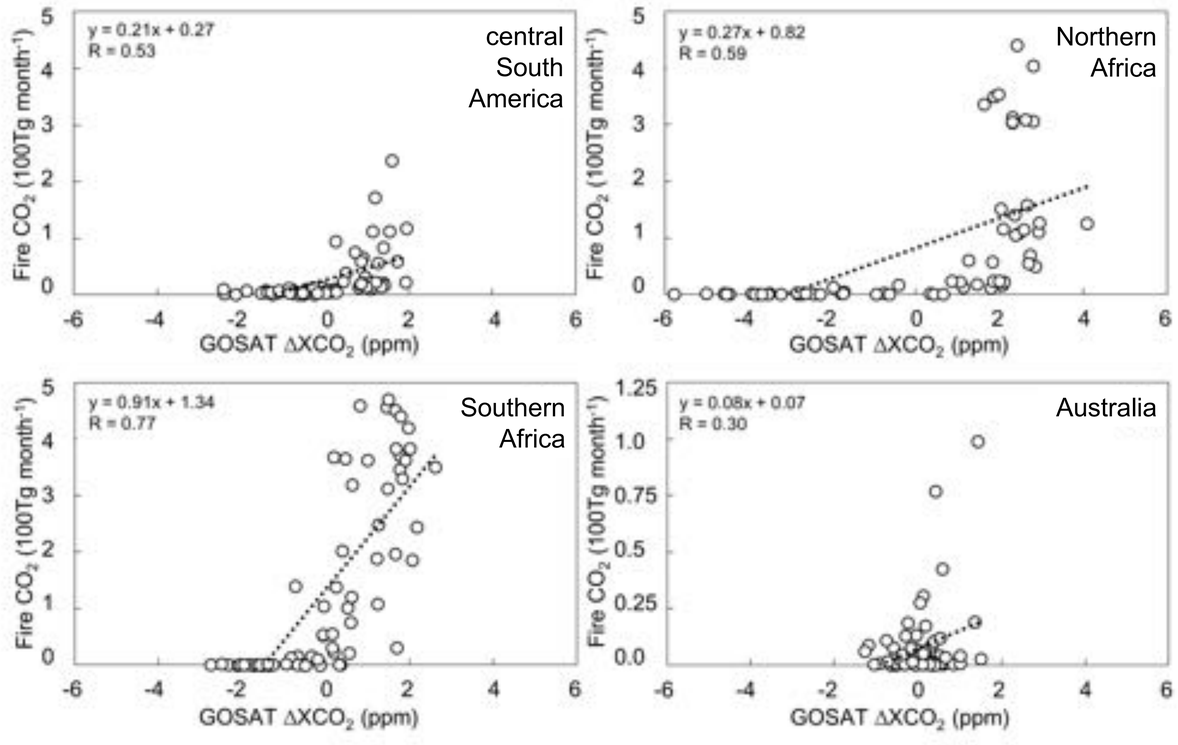
$$\Delta XCO_2 = XCO_{2\ regional} - XCO_{2\ trend}$$



3.2 Seasonal cycle of ΔXCO_2, fire CO_2, NPP and precipitation.



3.3 Pearson correlation coefficient.



4. Conclusions

- The annual mean CO_2 concentration continually rose, with seasonal fluctuations and cycles due to fire activities and plant photosynthetic activity.
- The faster increase of regional ΔXCO_2 in fire seasons was caused by fire CO_2 emissions in four fire affected regions, but with different seasonal variabilities.
- The temporal correlation coefficients between XCO_2 change and fire CO_2 emissions achieved best in Southern Africa.