The Orbiting Carbon Observatory (OCO-2 and OCO-3) missions

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Both OCO-2 and OCO-3 successfully passed the NASA operating missions Senior Review this year and authorized to continue for the next three years.

**OCO-2 “aging like a fine wine”**
- 9+ years of global XCO₂ and SIF measurements
- Instrument and spacecraft are in excellent health!
- Outgassing/icing impacts diminishing as the mission extends in time

**OCO-3 “the youngest child syndrome”**
- 4+ years of XCO₂ and SIF measurements between 52°N - 52 °N
- Payload is healthy and operating nominally!
- ISS is a busy and dynamic environment with LOTS of activities that our ops need to account for

Due to budgetary constraints, temporary loss of science data over weekends-only between Oct. – Nov. 2023 (~ 8 Saturdays data is lost).

Will be in storage from Nov. 2023 – May 2024 to let another NASA mission complete its prime mission.

Following reinstallation on ISS, OCO-3 will continue science operations till the “lifetime of ISS”
Thousands of soundings per day measuring XCO$_2$...
SIF shows where and when carbon uptake by plants is occurring.
Delivering insights into fundamental carbon cycle science questions & providing CO₂/SIF data for actionable information

What are the magnitude and distribution of global and regional carbon sources and sinks? What are their year-to-year variations?

See Crowell et al. 2019, Piero et al. 2022, Phillips et al. 2022, Byrne et al. 2023, among others

How does the global carbon cycle, terrestrial and aquatic ecosystems respond to extreme events and climate variability?

See Liu et al., 2017, Chatterjee et al., 2017, Yin et al., 2020, Feldman et al. 2023, among others

What are the effects of human activities on atmospheric CO₂ concentrations? How are CO₂ emissions evolving? Can we track those changes?

Greenhouse Gas Monitoring & Measurement Interagency Working Group - Overview

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Background, Rationale

WMO GLOBAL GREENHOUSE GAS WATCH

10/27/2023

Contributions to the Global Stocktake & various GHG initiatives

Timeline for the Paris Agreement Ambition Mechanism

Starting Now

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Global Carbon Budgets and the Global Stocktake

Efforts toward climate mitigation...
Deeper, stronger roots brings high-quality fruits ...

Need to nurture all parts of the mission tree “equally”
NASA’s OCO missions are key elements of a global greenhouse gas observational network to meet the needs of scientific understanding and mitigation policies.

Between the two OCO missions, we have:
- 9+ years of data from OCO-2 and 4+ years of data from OCO-3
- atmospheric CO$_2$ measurements with high precision, accuracy, resolution, and coverage
- solar-induced chlorophyll fluorescence (SIF) measurements

These measurements have now been used to:
- capture spatial (facility scale → global) and temporal (diurnal → decadal) trends in CO$_2$
- quantify how CO$_2$ emissions are being offset by natural carbon sinks
- show two-way interactions between carbon and climate
- demonstrate that spaceborne measurements can be used to accurately quantify CO$_2$ emissions from anthropogenic hotspots
- finding a growing number of stakeholders and applied users
OCO Science Team Meeting, October 2023, Boulder, USA

QUESTIONS
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