Measuring Carbon Dioxide from the International Space Station: An Overview of the OCO-3 Mission

Annmarie Eldering[1], Christopher O'Dell[2], Brendan Fisher[1], Matthäus Kiel[1], Robert Nelson[1], Tommy Taylor[2], Peter Somkuti[2], Greg Osterman[1], Ryan Pavlick[1], Thomas Kurosu[1], and Gary Spiers[1]

[1]JPL/Caltech, Earth Atmospheric Sciences, Pasadena, United States of America (annmarie.eldering@jpl.nasa.gov)

[2]Cooperative Institute for Research in the Atmosphere (CIRA), Colorado State University, USA (odell@atmos.colostate.edu)

The Orbiting Carbon Observatory 3 (OCO-3) was installed on the International Space Station (ISS) in May 2019 and began routine operations in August 2019 to continue global CO_2 and solar-induced chlorophyll fluorescence (SIF) observations using the flight spare instrument from OCO-2. The first version of the data, called vEarly, was released in early 2020, and an update, v10, is being prepared.

The growing OCO-3 dataset includes the standard ocean and land measurements, as well as a large set of validation measurements over TCCON stations and a new locally focused measurement. The new Snapshot Area Map (SAM) mode, where 80km by 80km areas are sampled with 2km by 2km footprints in 2 minutes is measurement approach unique to OCO-3. This is a new observation mode made possible by the agile pointing mirror assembly of OCO-3. Data has been collected over hundreds of cities, volcanos, over areas of interest to the terrestrial carbon community, and in coordination with field campaigns.

The cross comparison of OCO-3 and OCO-2 data, for radiances, XCO_2, and SIF is underway to gain insights into data quality and to create and OCO-3 dataset that can be used seamlessly with OCO-2 measurements. We will discuss these intercomparisons, highlighting a few examples, such as the OCO-2 and OCO-3 target and SAM measurements in Los Angeles that were collected on the same day. Highlights from validation activities and global XCO2 data characteristics will be presented, as well as details of the SAM collection statistics and most sampled regions. The value of the OCO-3 dataset for characterization of diurnal patterns will also be shared.

Highlights of the key scientific findings from the mission to date will be included. Finally, looking forward, I will also discuss the mission status, including the expectations for the remaining mission life and progress on developing an improved data version to be released in late spring/early summer 2021.