Space-based Observations of CO_2 with the NASA Orbiting Carbon Observatory-2 (OCO-2)

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The NASA Orbiting Carbon Observatory-2 (OCO-2) was launched from Vandenberg Air Force Base in California on 2 July 2014. By early September 2014, its spectrometers were routinely returning almost one million soundings over the sunlit hemisphere each day. About 10% of these soundings are sufficiently cloud free to yield full-column estimates of the column-averaged CO_2 dry air mole fraction, XCO_2. The OCO-2 team started delivering an initial data product (version 7/7r) to the Goddard Earth Sciences Data and Information Services Center (GES-DISC) in early June 2015. Preliminary, global maps of XCO_2 compiled from this product reveal some of the most robust features of the annual atmospheric carbon cycle, such as the intense northern hemisphere spring drawdown across Eurasia and then across North America, as land plants rapidly absorbed CO_2 to form new leaves, stems, and roots. They also show enhanced XCO_2 over regions with intense fossil fuel combustion, such as the east coasts of China and the U.S., and regions of intense biomass burning in the tropics. Comparisons of OCO-2 XCO_2 estimates with Total Carbon Column Observing Network (TCCON) results and other standards indicate single sounding random errors near 0.5 ppm, and absolute accuracies better than 2 ppm over most of the globe. However, there are some regions where this initial XCO_2 product appears to be anomalous, such as over the ocean at high southern latitudes during southern winter. These anomalies are currently under investigation.

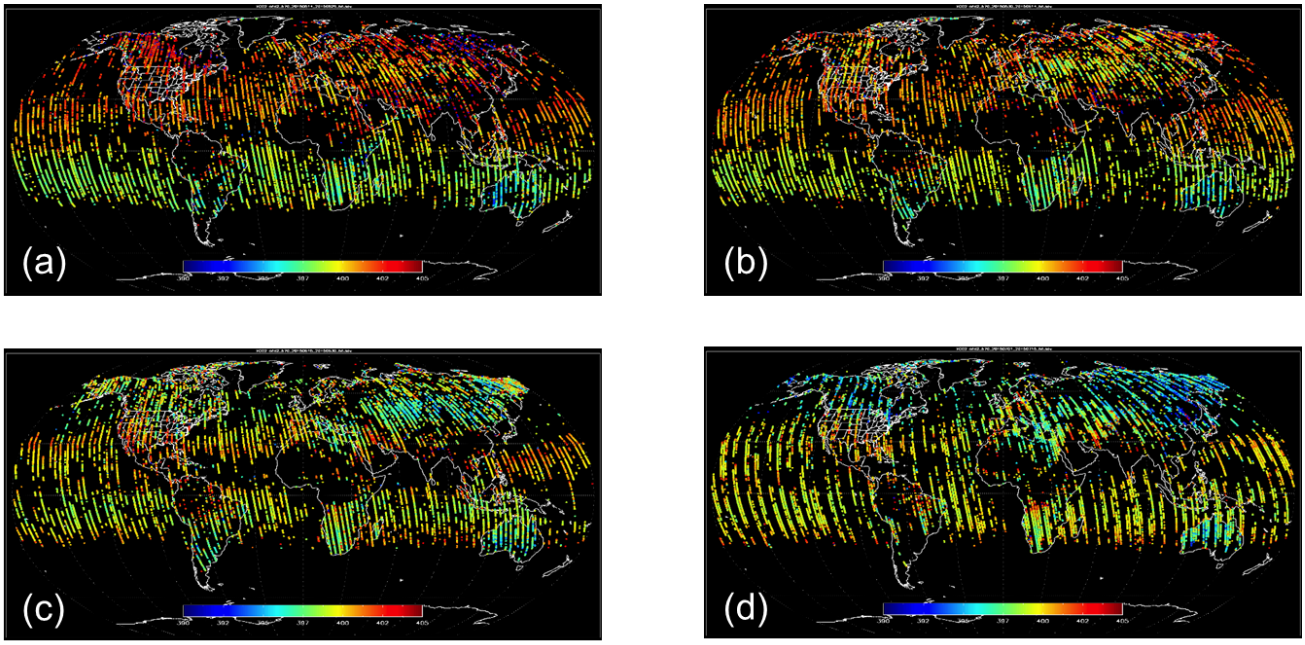

Figure 1. Global maps of XCO_2 for (a) 14-29 May, (b) 30 May to 14 June, (c) 15-30 June and (d) 1-15 July, produced from OCO-2 observations. The range of latitudes in the southern hemisphere is limited during this season because the sun is near it northernmost latitude. Large-scale reductions in XCO_2 are clearly seen in the northern hemisphere, as the land biosphere becomes active and rapidly absorbs CO_2.