## Observations of the Tropical Land Biosphere response to the 2015-2016 El Niño with the Orbiting Carbon Observatory-2 (OCO-2) and Greenhouse gases Observing SATellite (GOSAT)

\*David Crisp<sup>1</sup>

1. Jet Propulsion Laboratory, California Institute of Technology

The first two years of the OCO-2 mission were dominated by the record-setting 2015–2016 El Niño. OCO-2 measurements were combined with GOSAT observations and analyzed to yield high spatial resolution estimates of the column-averaged dry air mole fraction,  $XCO_2$ , These products clearly resolved reductions in tropical ocean outgassing from net increases in  $CO_2$  emissions from tropical forests. These  $XCO_2$  estimates were combined with OCO-2 and GOSAT solar-induced chlorophyll fluorescence (SIF) measurements to trace the origin of the forest  $CO_2$  emissions to the impacts of drought, temperature stress, and fires. Observations acquired between 2017-2019 documented the atmospheric  $CO_2$  response following this El Niño when, unexpectedly, its  $XCO_2$  and SIF measurements showed that the natural carbon cycle never fully recovered to the state anticipated by most earlier carbon cycle measurements and models. In particular, tropical forests, once thought to be significant  $CO_2$  sinks, continued to be persistent net sources of  $CO_2$  throughout this period. Understanding these results and their implications for the response of the natural carbon cycle to climate change requires longer continuous records of  $CO_2$  and SIF.

Keywords: Orbiting Carbon Observatory-2, Greenhouse gases Observing SATellite, Carbon dioxide, Solar induced chlorophyll fluorescence