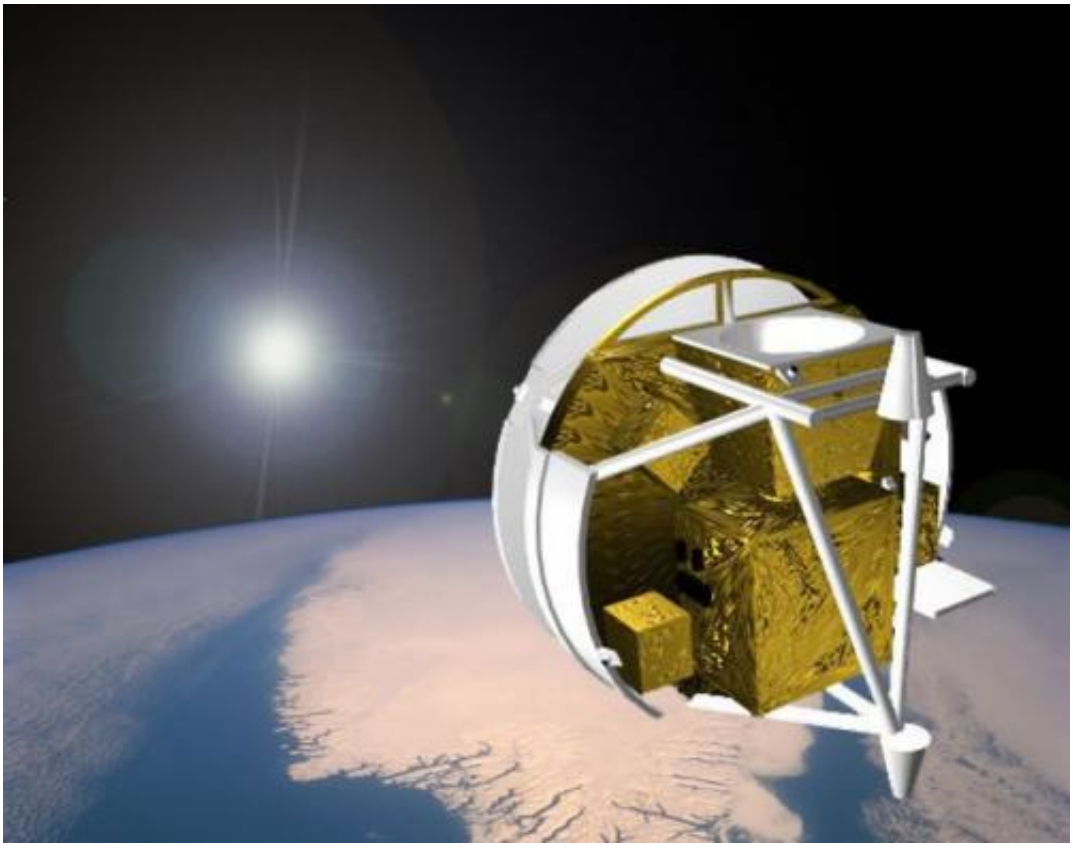
Scientists detect carbon dioxide accumulation at the edge of space (Update)

November 11 2012

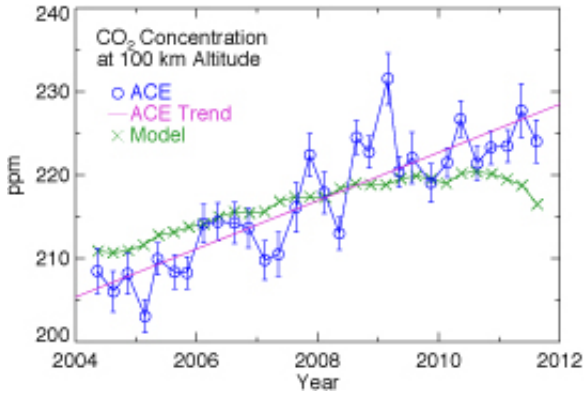


ACE satellite observing the sun through Earth's atmosphere. Credit: ACE website, University of Waterloo

(Phys.org)—A team of scientists from the Naval Research Laboratory, Old Dominion University, and the University of Waterloo reports the first direct evidence that emissions of carbon dioxide (CO2) caused by

human activity are propagating upward to the highest regions of the atmosphere. The observed CO2 increase is expected to gradually result in a cooler, more contracted upper atmosphere and a consequent reduction in the atmospheric drag experienced by satellites. The team published its findings in *Nature Geoscience* on November 11, 2012.

The team of Dr. John Emmert, Dr. Michael Stevens, and Dr. Douglas Drob from NRL's Space Science Division; Dr. Peter Bernath from Old Dominion University; and Dr. Chris Boone from the University of Waterloo in Canada studied eight years of CO2 measurements made by the Atmospheric Chemistry Experiment (ACE), a scientific satellite mission funded primarily by the Canadian Space Agency. ACE determines vertical profiles of CO2 and many other atmospheric gases by measuring how the atmosphere absorbs sunlight at different wavelengths as the Sun rises and sets relative to the spacecraft.



CO2 concentration at 100 km altitude (~62 mi) measured by ACE (blue circles) and predicted by a model of the chemistry and physics of the global upper atmosphere (green crosses). The purple line shows the linear trend of the ACE data. Credit: U.S. Naval Research Laboratory

CO2 occurs naturally throughout Earth's atmosphere and is the primary

radiative cooling agent in the energy balance of the mesosphere (~50-90 km altitude) and thermosphere (>90 km). The same properties of CO2 that cause it to trap heat in the troposphere (