The Spatial Sampling Approach used by the Orbiting Carbon Observatory (OCO)

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The Orbiting Carbon Observatory (OCO) will be launched in September 2008 to make global space-based measurements of atmospheric carbon dioxide (CO_2) with the accuracy and resolution needed to identify CO_2 sources and sinks and quantify their variability over the seasonal cycle. OCO will join the Earth Observing System (EOS) Afternoon Constellation (A-Train), which flies in sun-synchronous polar orbit that provides global coverage with a 16-day global repeat cycle. The observatory carries a single instrument that incorporates three high-resolution grating spectrometers, designed to measure the absorption of near-infrared sunlight by $CO_2$and molecular oxygen (O_2). These measurements will be combined to yield spatially-resolved estimates of the column-averaged CO_2 dry air mole fraction, X_{CO2}, over the sunlit hemisphere. OCO will fly 12 minutes ahead of the EOS Aqua platform with a 1:18 PM equator crossing time, such that it shares the same ground track. For routine science operations, the spacecraft bus will point the instrument either at the local nadir or at the sun glint spot while continuously collecting 12 to 24 bore-sighted CO_2 and O_2 soundings per second. The nominal plan is to switch between Nadir and Glint observations on alternating 16-day global repeat cycles, to map the entire Earth in both modes about once each month. Because these measurements are made in reflected sunlight, their sensitivity will vary with latitude and surface reflectivity. Individual soundings are expected to resolve X_{CO2} variations as small as 1 ppm over bright surfaces at low latitudes, but multiple samples will have to be combined to yield this measurement sensitivity at higher latitudes or over very dark surfaces. Clouds will also preclude measurements of the total column CO_2 over some regions. This presentation will describe the OCO sampling approach and expected spatial variations in the information content of the data.