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Latest instrument and algorithm developments from the GeoCarb mission

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Since its selection as a NASA Earth Venture mission in late 2016, the Geostationary Carbon Cycle Observatory (GeoCarb) has been in steady development. Launch is planned for 2024, and the instrument will be hosted on a commercial platform in geostationary orbit. Featuring a geostationary view over the western hemisphere, GeoCarb will be able to provide atmospheric total-column trace gas amounts to help answer scientific questions related to the carbon cycle of North and South America such as the quantification of regional- and urban-scale carbon dioxide emissions.

GeoCarb's instrument design features a two-arm grating-type spectrometer with four separate bands at wavelengths 0.765 µm, 1.606 µm, 2.065 µm and 2.323 µm in order to measure atmospheric absorption features of oxygen (O2), carbon dioxide (CO2), methane (CH4) and carbon monoxide (CO). With the spacecraft position being fixed relative to Earth and the instrument's scan mirror assembly, GeoCarb will be able to selectively point at locations visible from its position over the American continents. As a result, very different sampling strategies can be employed, compared to polar orbiting instruments which are generally limited to revisit periods of days and weeks. For routine operations, the North and South American land masses will be scanned at least once per day – depending on the final choice of scanning strategy, large portions of the American continents could be measured twice per day. Thanks to the flexible scanning capability, there is also the possibility for special campaigns which can feature many repeated measurements over targets of special interest throughout a single day.

In this presentation, we summarize the most recent development status of the GeoCarb instrument and the various retrieval algorithms that will be used for data product generation. We will share updates on the impact of sub-slit scene inhomogeneity on retrieval results, and how a slit homogenizer can mitigate those effects. Further, we report on our analyses regarding the correction of the so-called keystone optical aberration. Finally, we provide a detailed overview of GeoCarb's capabilities for the retrieval of solar-induced chlorophyll fluorescence.