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INFRARED CORRELATION RADIOMETER FOR TROPOSPHERIC CARBON MONOXIDE MEASUREMENTS FROM GEO

Abstract

We will present the development and performance assessment of a 2.3 μm infrared correlation radiometer (IRCR) prototype subsystem for a future spaceborne instrument designed specifically to measure carbon monoxide (CO) from geostationary orbit. The Geostationary Coastal and Air Pollution Events (GEO-CAPE) mission, one of the United States Earth Science and Applications Decadal Survey missions, specifies infrared correlation radiometry to measure CO in two spectral regions. The abundance of CO in Earth's troposphere directly affects the concentration of hydroxyl, which regulates the lifetimes of many tropospheric pollutants. In addition, CO is a precursor to ozone formation; is used as a tracer to study the transport of global and regional pollutants; and is used as an indicator of both natural and anthropogenic air pollution sources and sinks. CO measurements at 2.3 μm are uniformly sensitive throughout the troposphere, and 4.7 μm measurements are most sensitive to the free troposphere. In combination, the measurements yield information about this Criteria Pollutant near Earth's surface. NASA's infrared gas correlation radiometer Measurement of Air Pollution from Satellites (MAPS) provided the first measured tropospheric CO from space, and the Terra/MOPITT IRCR has produced over a decade of CO measurements from space. GEO-CAPE will use this robust IRCR measurement technique at GEO, nearly 50 times farther away than the Terra/MOPITT orbit, to determine hourly changes in CO across a continental domain. Our effort focuses on improving 2.3 μm CO measurement capability. We have structured this NASA Instrument Incubator Program funded development project around a prototype subsystem and an IRCR instrument performance simulator to enable rapid evaluation of future spaceborne instrument designs once the GEO-CAPE mission is defined. The architecture of the performance model, the design of the prototype hardware, and the future spaceborne instrument performance assessment approach will be presented.