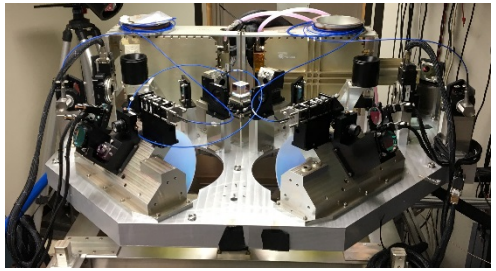
HSRL for Aerosols, Winds, and Clouds using the Optical Autocovariance Wind Lidar (HAWC-OAWL)

PI: Sara Tucker, Ball Aerospace and Technologies Corp.

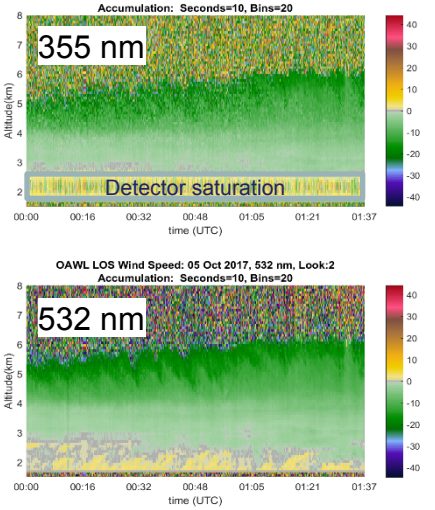
Objective

- Advance the instrument technology toward a spaceborne lidar configuration to enable simultaneous Earth science measurements of winds and aerosol properties required for the study of aerosol-wind-cloud interactions
  - Measure line-of-sight (LOS) winds with 1-3 m/s (aerosol and altitude dependent) precision at two wavelengths: 355 nm and 532 nm from ground and high altitude aircraft platform
  - Measure profiles of aerosol backscatter, aerosol extinction, and aerosol depolarization at these wavelengths
- Demonstrate a 2-look configuration (separated in azimuth by 90^0) for airborne wind and aerosol data acquisition

Right, Athermal 0.9 m field widened quadrature OPD Mach-Zehnder Interferometer



Above, packaging of dual-wavelength, two telescope/two laser system for the NASA DC-8



Simultaneous dual-wavelength winds from the HAWC-OAWL System

Accomplishments

- Designed, built, and demonstrated an FPGA-based signal-chain/data acquisition and real-time winds processing board using space equivalent parts demonstrating the required signal/data throughput for a space-based wind lidar mission
- Added 355 nm and depolarization channels (detectors and data-acquisition boards) to the 532 nm Green-OAWL (GrOAWL) system providing potential simultaneous measurements of winds and aerosol properties required for the study of aerosol-wind-cloud interactions
- Fully reconfigured the GrOAWL WB-57-based 2-look, two-window instrument for integration on DC-8 with both looks through a single window.
  - The HAWC-OAWL system is ready for demonstration on the NASA DC-8
- Designed and built an athermal OAWL interferometer (AIFO) improving the thermal stability for future space-based OAWL implementation

Co-Is/Partners: Yongxiang Hu, NASA LaRC; CIRES; Carl Weimer, Ball Aerospace

TRL_{in} = 3 TRL_{out} = 4