Optical Autocovariance Wind Lidar (OAWL) Evolution

**2008-2012: OAWL IP-07**
- Breadboard system, Single look
- 355 nm board, 4x channels
- Ground validation with NOAA MOPA
- Coherent detection system
- Autonomous flight tests on NASA WB-57

**2014-2017: HAWC-OAWL IIP**
- Two-look/two-wavelength airborne system built for DC-8 integration
- Added depolarization channels for aerosol studies
- High altitudes have fewer aerosols & clouds, so UV wavelengths are used to measure winds using lidar returns from just molecules (e.g. ESA's Aeolus mission)

**ATHENA-OAWL**: Proposed Space-based Demonstration DWL mission that builds on:
- Proven CALIPSO lidar technologies: Laser (532 nm), Telescopes, optics, processing
- Demonstrated wind measurements from ground & airborne platforms
- ISS enabling technologies: Mass, Cooling system, TDRSS downlink

**High altitudes**: Fewer aerosols & clouds, so UV wavelengths are used to measure winds using lidar returns from just molecules (e.g. ESA’s Aeolus mission)

**Data GAP**: Upper level wind profiles over the oceans and Southern Hemisphere.

**Aerosol-DWL’s provide good returns in lower troposphere and where aerosol layers or thin clouds are present**

**Airborne & ground DWLs are ideal for boundary layer dynamics studies that can be smeared by space-based orbit speeds (~7.2 km/s)**

**2015-2017: ATHENA-OAWL Venture-Tech: GrOAWL**
- Airborne demonstrator System WB-57
- 2 looks: 2 lasers & 2 telescopes to demonstrate the 2-look geometry for space for wind speed & direction profiles
- Real time wind speed processing

**2014-2017: HAWC-OAWL IIP**
- Two-look/two-wavelength airborne system built for DC-8 integration
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**Solution: Space-based Doppler Wind Lidar (DWL)**

**OAWL Based Solutions**

OAWL path to *full* atmospheric wind profiles:
- Two wavelengths and two “nested” receivers measure winds from both aerosols AND molecules
  - @ 532 nm – more precision using the *aerosol returns*
  - @ 355 nm – more coverage using the *molecular returns*

Applicable for airborne and Space-based configurations - but ideal for space