



High-Energy Doppler Lidar for Offshore Wind Mapping

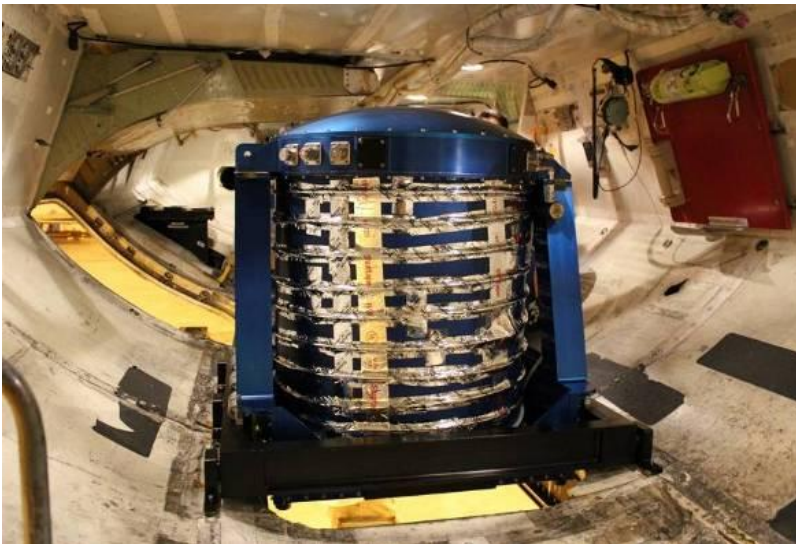
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Features of Doppler Wind Lidar

- Works by aerosols in atmosphere reflecting light from a pulsed laser beam.
- Allows wind measurements from a long distance—offshore wind can be probed from an onshore location.
- Laser beam wavelength (2- μm) creates no hazard for the human eye.
- NASA lidar technology is unique in laser pulse energy and capability for long-range wind measurements.
- Engineered into compact enclosure with unattended operation.
- Rugged enough to be flown on research aircraft into hurricanes.
- Poised for technology transfer for commercial development.



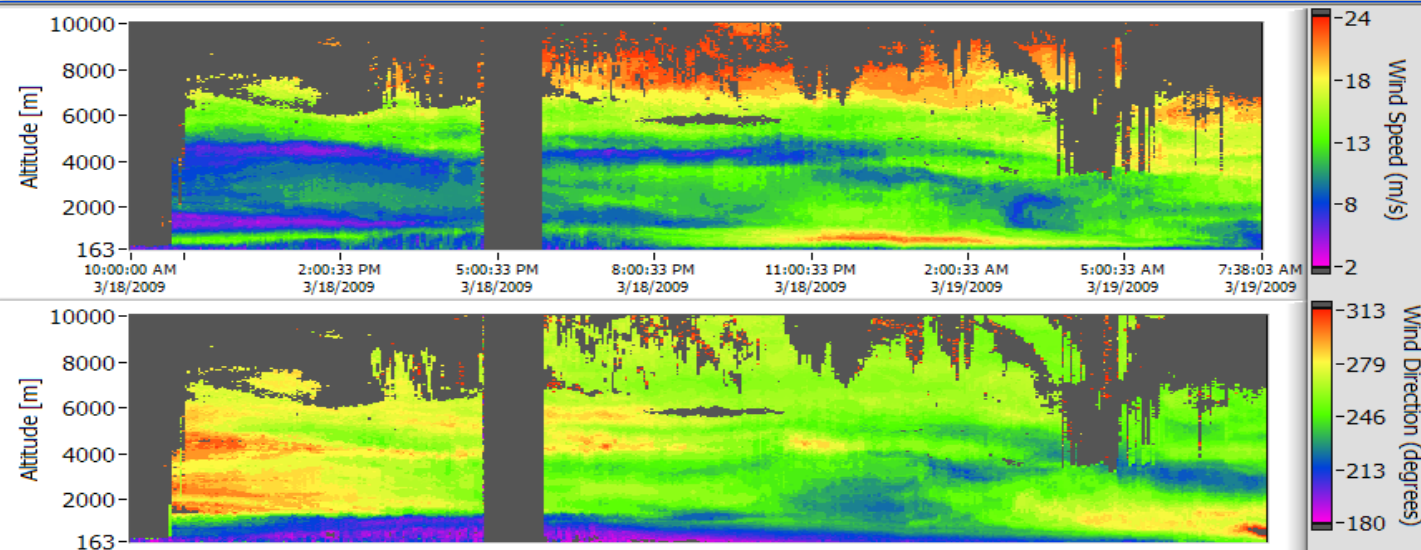
lidar installed in cargo bay of DC8 aircraft



scientists using the lidar for 2010 hurricane study



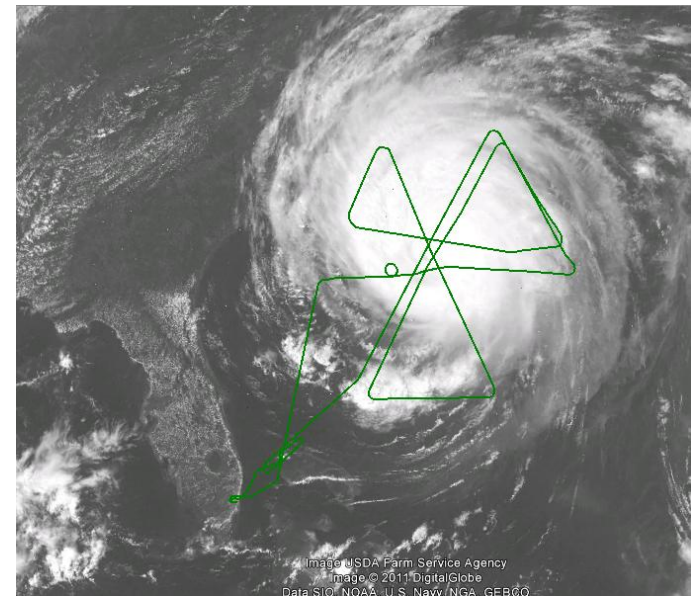
Example Wind Measurement



- ground-based example.
- vertically looking for wind measurements to high altitudes.



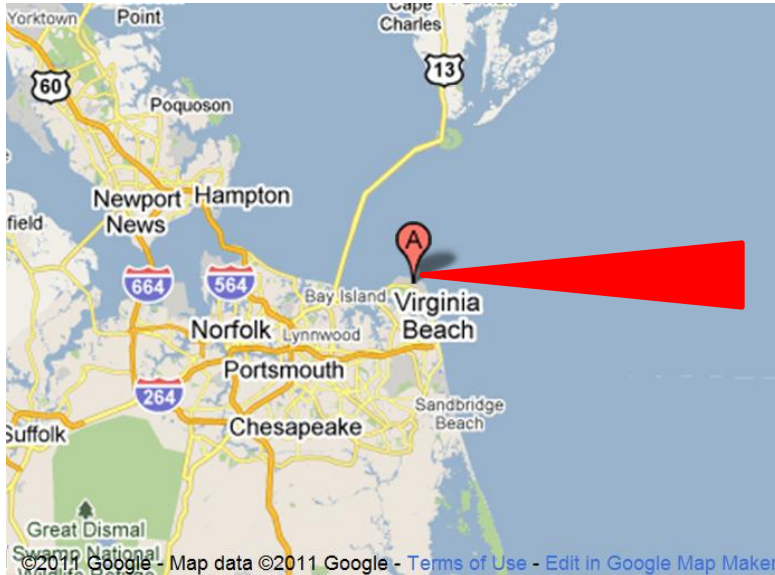
- lidar was used on 2010 hurricane hunting flights, including Hurricane Earl shown here.
- wind measurements are made from flight altitude to ocean surface.





Upcoming Field Study

- proof of concept field study being funded by NASA Earth Science Technology Office.
- taking place September-October 2011.



- lidar will be positioned at oceanfront site, likely Fort Story with thanks owed to US Navy.
- beam will be scanned over potential turbine locations.
- comparison can be made to weather station on Chesapeake Light Tower.



- lidar will be installed in mobile trailer.
- measurement goals include:
 - line-of-sight winds over possible turbine sites.
 - aerosol backscatter in marine boundary layer.
 - range capability in various weather conditions.
 - database for follow-on meteorological studies.



Possible Follow-On Work

Wind Lidar

- combine lidar measurements with meteorological analysis.
- develop scan patterns and algorithms to measure not only wind, but shear and turbulence across turbine swept area.
- more field testing.
- build a copy of lidar dedicated for wind power applications.

Other NASA Langley Expertise Available

- aerodynamics and aeroelasticity
- structures and materials
- non-destructive evaluation
- infrasonic noise measurement