



## **The Duke University Helicopter Observation Platform (HOP) for environmental and Earth science studies**

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Duke University purchased a new Bell 206B3 ("JetRanger") helicopter to perform various atmospheric in situ and remotely-sensed environmental observations (referred to as the Helicopter Observation Platform – HOP). As compared to other aircraft, the helicopter has the unequalled flexibility and maneuverability to fly slowly and close to the ground. Furthermore, it can land and refuel at station, which allows performing long-term observations during field campaigns. It can also operate from a ship at sea. This presents significant advantages especially for the observations of aerosols, fluxes of heat, water and other gases important for various environmental and Earth science studies. The Duke HOP is currently equipped with high-frequency sensors that can measure the 3D components of the wind, temperature, moisture and CO<sub>2</sub>. It is also equipped with an inlet to sample undisturbed air outside of the zone of influence of the main rotor wake and it is designed to support many other remote and in-situ sensors. A computational fluid dynamics (CFD) software was used to simulate the aerodynamical envelope of the HOP in flight at various airspeeds. Together with in-situ observations of turbulence in front of the helicopter nose where all the sensors are attached, the CFD results are used to demonstrate that the HOP can make high-quality observations of the above-mentioned environmental characteristics unaffected by the main-rotor wake at airspeeds as low as 15 m/s and as high as 60 m/s. This emphasizes the strong potential of this platform for environmental observations, especially of aerosols, which are sampled very inefficiently with other aircraft platforms. Flights conducted over the Duke Forest in North Carolina where atmospheric variables were collected simultaneously with a tethered sonde, a lidar, and on towers demonstrate the HOP capability and potential.