M.S. Defense Title:

Using Kites for Meteorological Measurement of the Marine Boundary Layer

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Abstract:

Kite-based platforms to measure atmospheric properties have been used for centuries. With rapid development of new miniaturized technology for drones, kite measurement can also get a makeover. We use our strategic location on the island of Oahu in Hawaii to make meteorological measurements of the steady incoming trade wind flow off the windward coast. Incoming marine air is measured from the coastline before it is modified by the island, giving information on upwind flow properties for use in studying the marine boundary layer. We observe high resolution vertical profiles of the atmospheric temperature and humidity structure with instruments tethered to a kite string. Temporal and vertical variation can also be observed by flying multiple instruments simultaneously at different heights within the marine boundary layer. Through this process we have learned that kite measurement is not as easy as it looks, and that there are many factors to consider for accurate measurement from kites. However, kites are advantageous due to their cost-effectiveness and capability for long-duration, continuous in-situ observation. Using a kite platform, we observe small-scale, strongly anticorrelated perturbations of temperature and humidity at constant altitudes greater than 300 m above sea level. These anticorrelated variations are hypothesized to be important for convective initiation, following Nugent and Smith (2014).