# What if you put a Phone on a Drone?

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**ABSTRACT**

Snow has significant impacts on springtime flooding, water resource management practices, and the global water-energy budget. *In situ* observations are considered some of the highest quality measurements of snow depth available and are useful constraints for climate model and reanalysis system estimates of snow water content. The application of laser altimetry (LiDAR-Light Detection and Ranging) for measuring snow depth has proven an effective method for quickly and accurately observing large areas, however this technique has traditionally been quite expensive to perform in practice due to the high cost of the necessary equipment coupled with required specialized training. In this work, we examine the capabilities of the iPhone 12 Pro LiDAR (iLiDAR) when attached to a consumer-grade DJI Phantom 4 drone (iDrone) in estimating snow depth at two study sites in southern Ontario, Canada. These sites were selected as representative locations of typical snow-covered areas including an open field with low-lying vegetation, as well as a sheltered site with a sloping surface and partial canopy cover. Initial comparisons between iDrone iLiDAR depth estimates and colocated snow ruler measurements demonstrate strong positive agreement with a mean squared error < 4 cm, and low absolute mean bias of approximately 1 cm. Our results suggest that the intersection of these two technologies defines a novel, low-cost alternative to traditional LiDAR-based snow depth measurement systems, while maintaining a high degree of accuracy. Furthermore, the improved accessibility of this method provides new opportunities for citizen science-based snow depth contributions to local weather networks and in turn, the potential for improved regional forecasting of snow melt.

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