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Loon long duration balloons have pioneered a new era of internet communication that provides more connectivity for people in areas without robust ground communication infrastructure. Equipped with a Global Navigation Satellite System (GNSS) receiver onboard and enabled by their continuous movement throughout the stratosphere, these balloons have the potential to assist in research efforts including tracking and predicting meteorological phenomena such as the North American Monsoon.

This study evaluates typical Loon balloon trajectories in the tropical to subtropical region. There is potential for these balloons to pass through and sample areas of interest making radio occultation (RO) measurements if they are configured to track GNSS satellites below the horizon. RO retrievals of the refractive index of the atmosphere contain information on temperature and moisture. We use ray-tracing simulations from the GNSS satellites to the receiver to predict the position of RO profiles given a balloon trajectory. This study provides the first step in investigating the capabilities of these balloons as well as adverse effects that the maneuvers made by the balloons may have on obtaining RO profiles, and their ability to contribute to improving forecasts of precipitation in the monsoon.

In order to obtain optimal results, a typical balloon path would need to have little to no altitude adjustment and be allowed to freely float. Looking at past Loon flight trajectories, the steadiness of these balloons was determined to provide a maximum duration of free float of about 22 hours. The ability of the Loon balloons to make RO observations can also have potential future applications such as measuring equatorial waves in the tropics, and monitoring conditions associated with convection and precipitation. Its potential application to atmospheric rivers is an area of particular interest to the Center of Western Weather and Water Extremes

(CW3E) in their research and operations partnership for better understanding flooding and water resource management in the Western US.

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