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The Spaceborne Atmospheric Boundary Layer Experiment (SABLE): A cost-effective mission on Iridium-NEXT

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Cloud top entrainment is one of the most challenging processes to understand and accurately represent in climate models. Critical for setting the physical and radiative properties of boundary layer clouds, entrainment is a fundamentally small-scale process that has not been adequately estimated using satellite observations. The Spaceborne Atmospheric Boundary Layer Experiment (SABLE) is a proposed NASA Ventures mission to provide the observations needed to constrain cloud top entrainment rates on a regional and monthly timescale using a boundary layer mass budget approach. SABLE is a process-oriented satellite mission to seek high science returns at a relatively low cost through government-commercial partnership. It aims to advance the stereoscopic observing technique using two tandem satellites from the Iridium-NEXT constellation to measure a wide-swath (1000 km) of cloud top heights and winds to an accuracy 5-10 times better than current imaging techniques. SABLE will also profile the thermodynamic stratification inside the boundary layer using state-of-the-art GPS radio occultation (RO), and retrieve cloud thickness using a novel multi-angle oxygen A-band technique. These measurements will be used collectively to better understand the key factors controlling the geographical and temporal variability of cloud top entrainment rate. In this presentation, we will present the scientific basis of the SABLE mission, describe its observing techniques, and highlight SABLE climate/weather applications.