

Arkansas BalloonSAT: Solar Eclipse Chasing & STEM Outreach

Ross Carroll¹, Tillman Kennon¹, Ben Rougeau¹, Ed Roberts²

¹Arkansas State University, Department of Chemistry & Physics, Jonesboro, Arkansas USA

²Pottsville High School, Pottsville, Arkansas USA

Abstract

High altitude bursting balloons allow a relatively low-cost option for stratospheric sciences and STEM outreach. Arkansas BalloonSAT is a team of researchers and teachers using stratospheric ballooning missions to give Undergraduate and K12 students opportunities for reaching the edge of space. These missions typically entail payloads designed and/or built by students for atmospheric sensing and imaging projects. In recent years we have focused on imaging the Moon's shadow from the stratosphere during a total solar eclipse. We report our work on eclipse chasing in 2017 and our preparations for the April 2024 Total Solar Eclipse that will fall upon Mexico, USA, and Canada.

Arkansas BalloonSAT

Founded in 2006 by Dr. Tillman Kennon and Ed Roberts, Arkansas BalloonSAT is a research and educational outreach program primarily funded by the Arkansas Space Grant Consortium to bolster STEM education and near-space sciences in the Upper Mississippi Delta. Our typical flight entails using a 1.6 kg latex bursting balloon attached to a payload train with a typical mass of 4.5 kg made from separate tracking and sensing payloads. Flights are tracked by onboard radio and satellite modems. Scientific payloads vary by mission to accommodate atmospheric sensing and imaging projects for undergraduate and K12 participants.

Beyond the typical 4 to 5 missions per year, Arkansas BalloonSAT participates in local and state-wide STEM outreach events such as the Arkansas Science Festival. This involves demonstrations of our launch setup, payload designs, flight videos, and the occasional full balloon launch. For K12 and Undergraduate students in the region, these events and missions give a low-barrier to a novel experience that can further drive engagement in STEM.

Eclipse Chasing in the Stratosphere

In 2016, Arkansas BalloonSAT joined the NASA Eclipse Ballooning Project ran by Montana State University with a goal of live-streaming video of the Moon's umbra from an altitude above 18 km. We were the sole Missouri site team with a launch from Fulton High School. We will review our successes and failures in the 2017 Total Solar Eclipse mission then examine our work in preparing for another eclipse chase in April 2024. This upcoming solar eclipse will fall upon most of the population of Arkansas and our past experiences have shown the absolute power in driving STEM engagement via stratospheric ballooning and eclipse chasing.

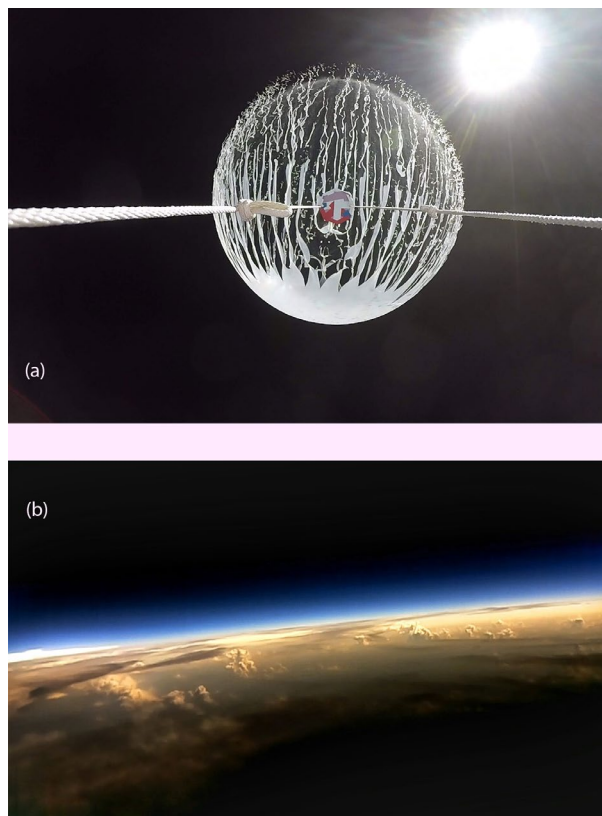


Figure: (a) 2.0 kg latex balloon at burst. (b) composite image from the 2017 Total Solar Eclipse taken at an altitude of approximately 21 km above Fulton, MO