

IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)  
On Track - Undergraduate Space Education (3)

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## STUDENT SPACE MISSIONS – REPORT ON OUR 2022 UNDERGRADUATE AURORAL OBSERVING CAMPAIGN

### **Abstract**

The Undergraduate Student Instrumentation Project (USIP) was a NASA program created to engage undergraduate students in rigorous scientific research for the purposes of innovation and developing the next generation of professionals in space research. It is now run by the University of Houston using local resources. This student-led project, based on the 5E instructional model, is executed by the students from initial ideation of research objectives to the design, testing, and deployment of scientific payloads. The 5E Instructional model places the student at the center of knowledge building, while instructors facilitate interaction with content and guide the inquiry process. Since 2013, this project has been not only an effective vehicle for delivering STEM education but is also effective in increasing classroom engagement and interest in space. Space research is inherently interdisciplinary and crosscuts Geoscience, Engineering, and Technology. The project is designed to integrate engineering, technology, physics, material science, and earth and atmospheric sciences as an important opportunity for the students to gain access to cross-disciplinary experiential research. In addition to classroom engagement, the students build their own payloads and ground instruments. This project increases students' command of essential skills such as teamwork, collaboration, problem solving, technology, communication, innovation, and leadership. For the faculty, the project was an extended exercise in professional development, learning how to implement project level inquiry-based education on this scale. For the students, this formative experience continues to encourage the development of a much broader range of technical skills than is typically offered within an undergraduate degree. Furthermore, the extensive time and energy that students commit to this project promotes a strong sense of personal and professional responsibility and emphasizes the necessity of coherent teamwork. Not only do students make valuable connections with each other during this process, but also to the broader space science community. They often work with professionals from outside of the USIP structure, and regularly attend and present at conferences and student competitions throughout the project. This paper will present the results of the 2022 Alaska observing campaign. Student projects included subjects ranging from atmospheric trace gas chemistry, ground penetrating radar for measure permafrost thickness and thermal infrared imaging of frozen waterbodies coupled with multiwavelength lidar study of surface topography and chemistry, auroral electron precipitation, quantitative multi-wavelength airglow studies, search for stratospheric microplastics, and monitoring auroral radio emissions, and stratospheric conductivity. This program is a for-credit course of two to three years duration.