BOREALIS HASP Project

Passive High Altitude Particle Capture Experiment

What is HASP?

- HASP = High Altitude Student Platform
- NASA-funded
- Operated by Louisiana State University
- Zero-pressure balloon platform
- Designed to float at ~120,000 feet for 20 hours
- One launch per year
- Room for twelve student experiments

The HASP Platform

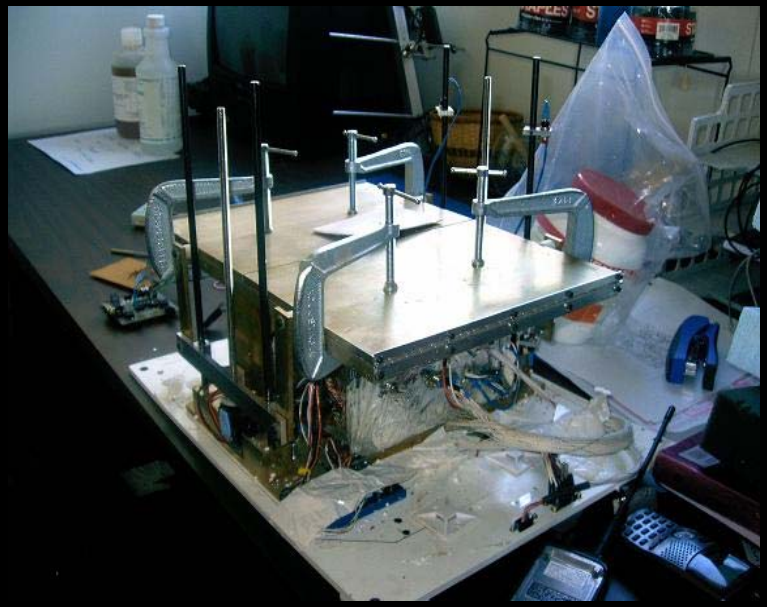
- HASP is a 2000 pound payload
- Carried by an 11 million cubic foot zero pressure balloon

Scientific Goals

- To capture and verify particles of cosmic origin
- Balloon flights captured the first cosmic dust material and are similar to the NASA ER-2 flights
- Cometary dust gives us information about the formation of our solar system 4.6 billion years ago and about the very edges of the solar system
- Possible capture of material from known Trans-Neptunian Objects

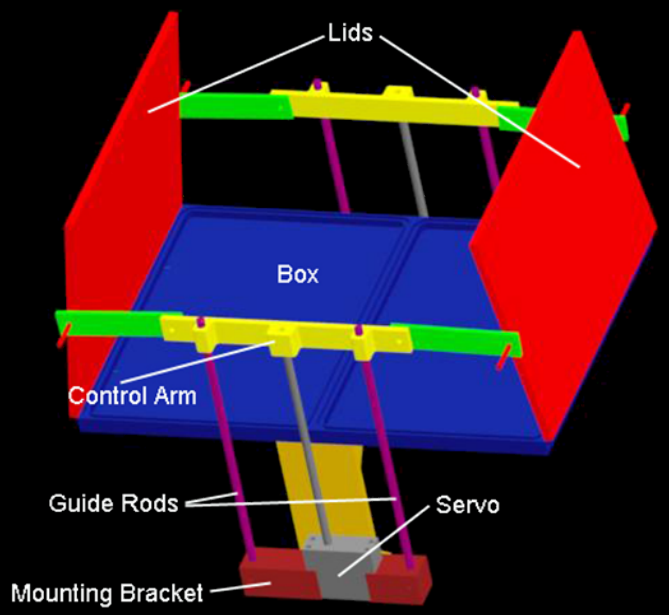
BOREALIS' Involvement

- First proposal submitted in Fall 2006.
- Our experiment: a device to capture stratospheric dust and return it for analysis.
- Special emphasis on cosmic dust (extraterrestrial origin)
- First flight: September 2007
- Second flight: September 2008
- Possibility of additional flights



Experiment Design

- Dual separate containment areas
- Operates via uplinked commands
- The box has an o-ring seal to prevent contamination
- Silicone oil coated Plexiglas plates are contained in the box
- Capture Plates and fluid are optically clear for imaging
- Prepared in a clean room facility



Student Involvement

- 11 students have participated in HASP

  Nate Martin, Jennifer Hane, Michael Lenander, Theresa Lannen, Kyle Crawford, Dylan Larson, Gordon Nelson, David Wax, Andrew Marx,

  Jayson Nissen and Clark Kogan

- 5 Students have traveled to 4 locations

  Columbia Scientific Balloon Facility - Palestine, TX

  Columbia Scientific Balloon Facility – Fort Sumner, NM

  Johnson Space Center

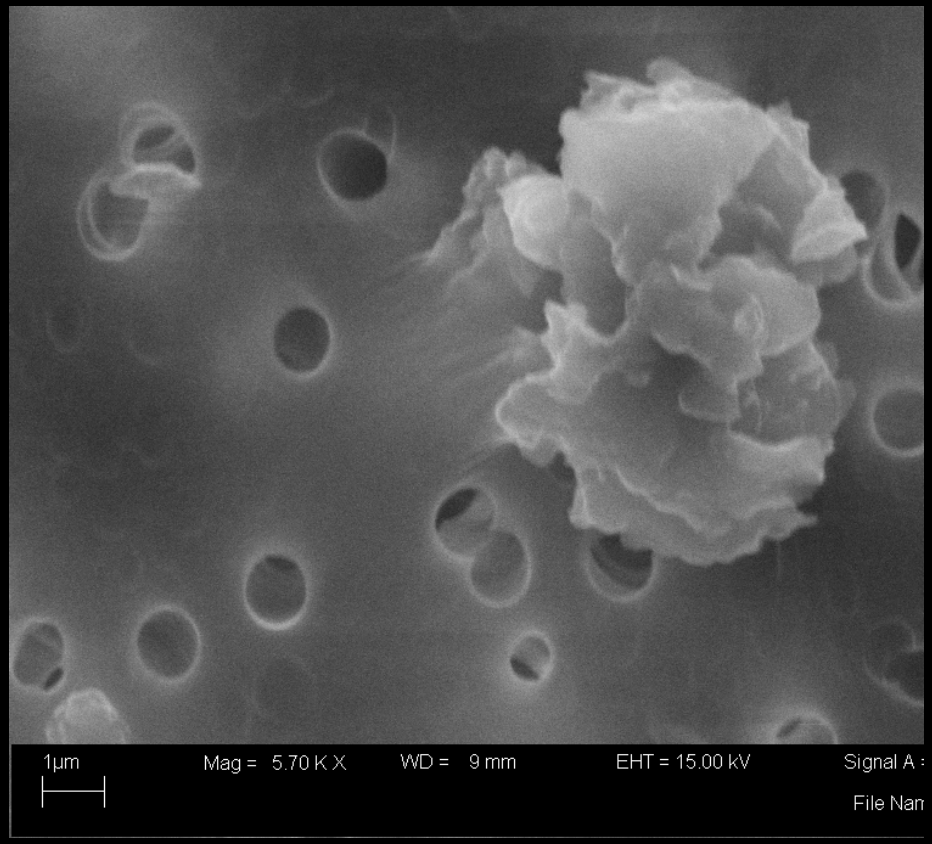
  NASA - AMES

Travel to JSC

- Several BOREALIS members traveled to the Cosmic Dust Lab at Johnson Space Center
- We learned about the particle capture and analysis process
- Many of the second flight's improvements were based on knowledge gained here

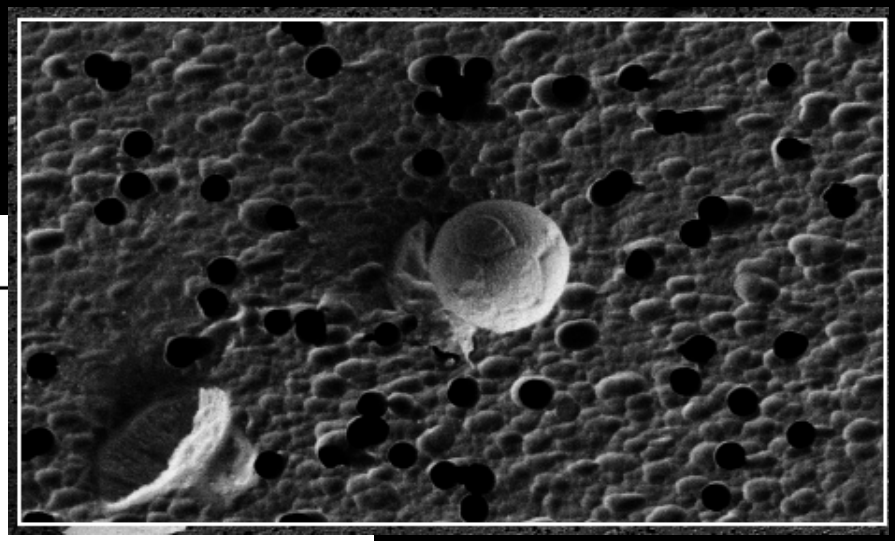
Analysis

- Particles are first removed from the oil
- Particles are imaged and analyzed with an FEM microscope in the ICAL facility at MSU
- Particles are categorized based on composition and morphology

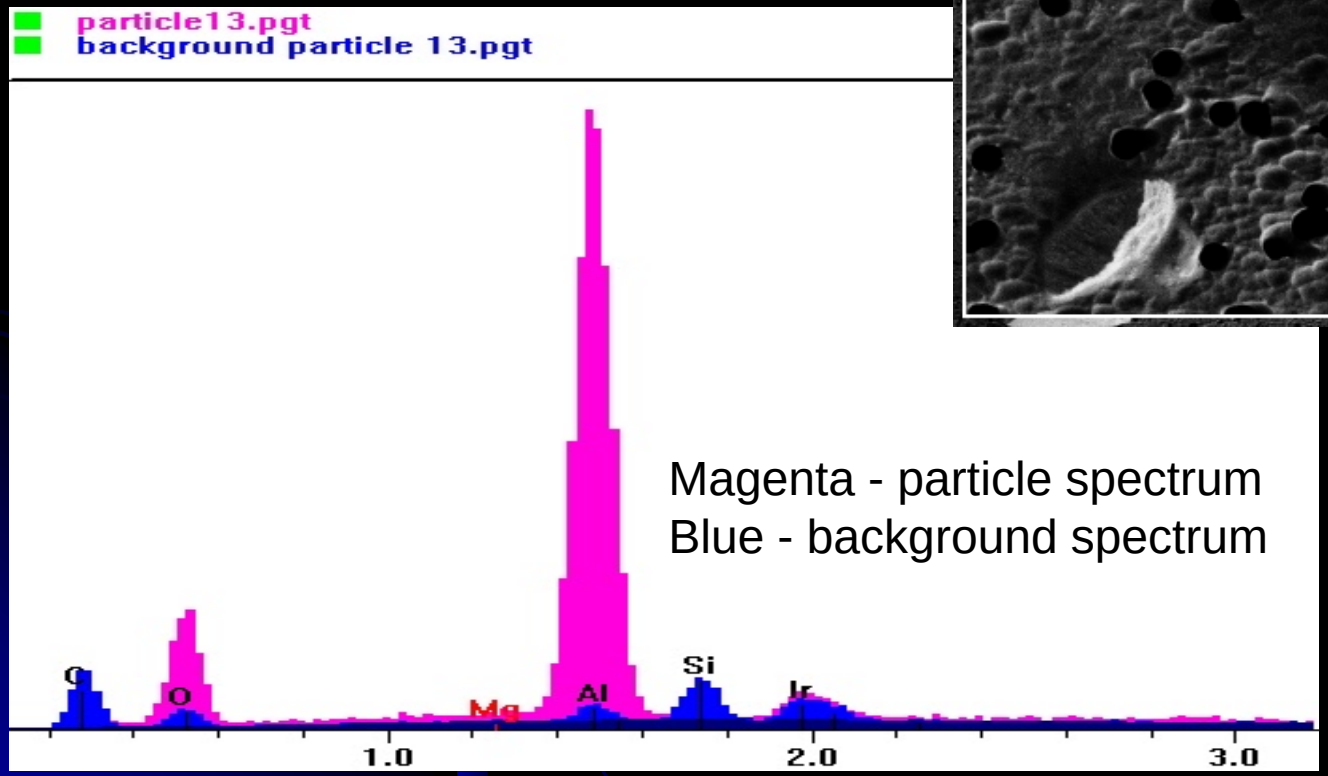


4 X 6 µm granular particle

Particle Characterization
Chemical Analysis



5-micron sphere



Magenta - particle spectrum
Blue - background spectrum

Aluminum oxide particle - solid rocket exhaust

Goals for Ongoing Work

- Complete the analysis of samples from the first flight
- Develop more reliable criteria by which to identify dust of extraterrestrial origin
- Retrieve and analyze samples from the second flight
- Prepare for a third flight with an upgraded design

Acknowledgements

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- Montana State University

  The ICAL facility staff, Dave Mogk, Phil Himmer

- Louisiana State University

  Greg Guzik, Michael Stewart