

NASA/USIP

(University Student Instrumentation Program)

Fairbanks, Alaska Campaign

John Cao

Wednesday 25 March 2015

Solar Storm: Wednesday 18 March 2015 2:25 AM



Introduction

- Major
 - Senior B.S. Environmental Science
 - Focus in Atmospheric Sciences
- Interests
 - Being outdoors, hiking/camping, biking, basketball
 - Music, photography, reading
- Future goals
 - Work in the government sector
 - Focus on permitting and regulations to further understand sustainability issues and how the private industry interacts with the government
 - Return to get MBA in Sustainability



Spring Break 2015

- In Fairbanks, Alaska from March 13th-22nd
- Worked long hours, from 10:00AM-4:00AM
- Studied the dynamics of the Aurora and its interactions with the atmosphere



NASA Objective

- Study Auroral Ionosphere and Stratospheric Ozone Layer
- Atmospheric Sciences
 - Obtain a better understanding of the sources of variance in electrical conductivity and present status of the Arctic ozone hole
 - Study the changes in atmospheric composition and timescales in which they occur



NASA/UH USIP Purpose

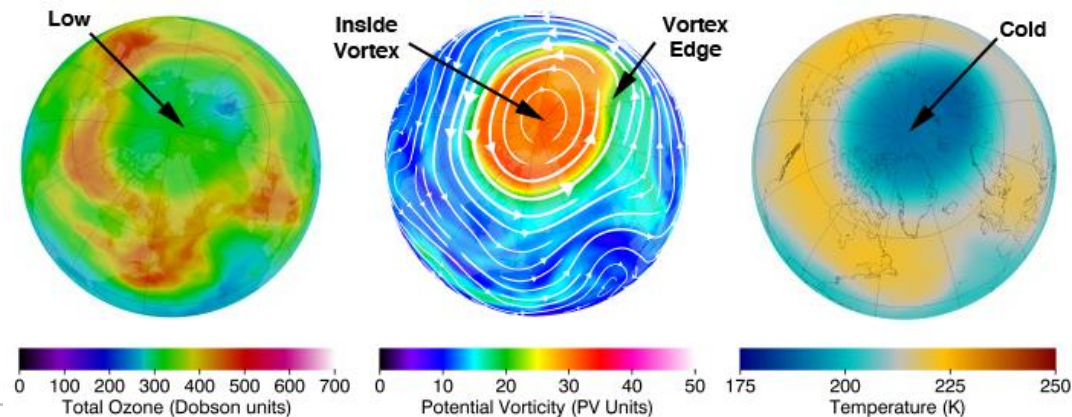


NASA/UH USIP Purpose

- Engage students in the process of developing low cost & lightweight technology
- Balloon-borne Payloads
 - Gaseous Compounds
 - Astrobiology/Extremophile Organisms
 - Auroral Spectroscopy and Imaging
 - DC Electric Field
 - VLF and Magnetic Field Wave Receiver
 - Total Electron Content

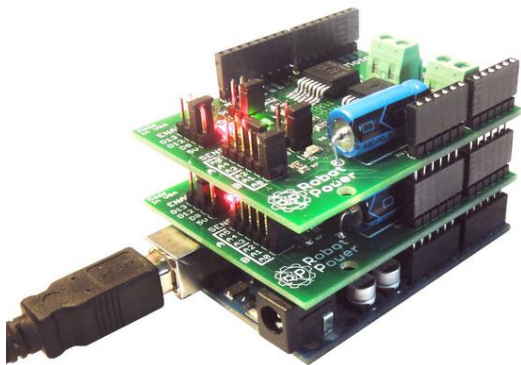
How this is important?

- Measure atmospheric vertical profile of O₃, NO, CO during an Auroral event
 - Sources of variance in electrical conductivity
- Polar vortex
 - Most powerful during the winter/early spring
 - Chemistry of polar vortex induces severe ozone depletion
- Arctic Ozone Hole
 - Chlorofluorocarbon (CFC) primary causes of ozone depletion
 - Nitric acid in Polar Stratospheric Clouds (PSC) reacts with CFCs to dramatically enhance depletion

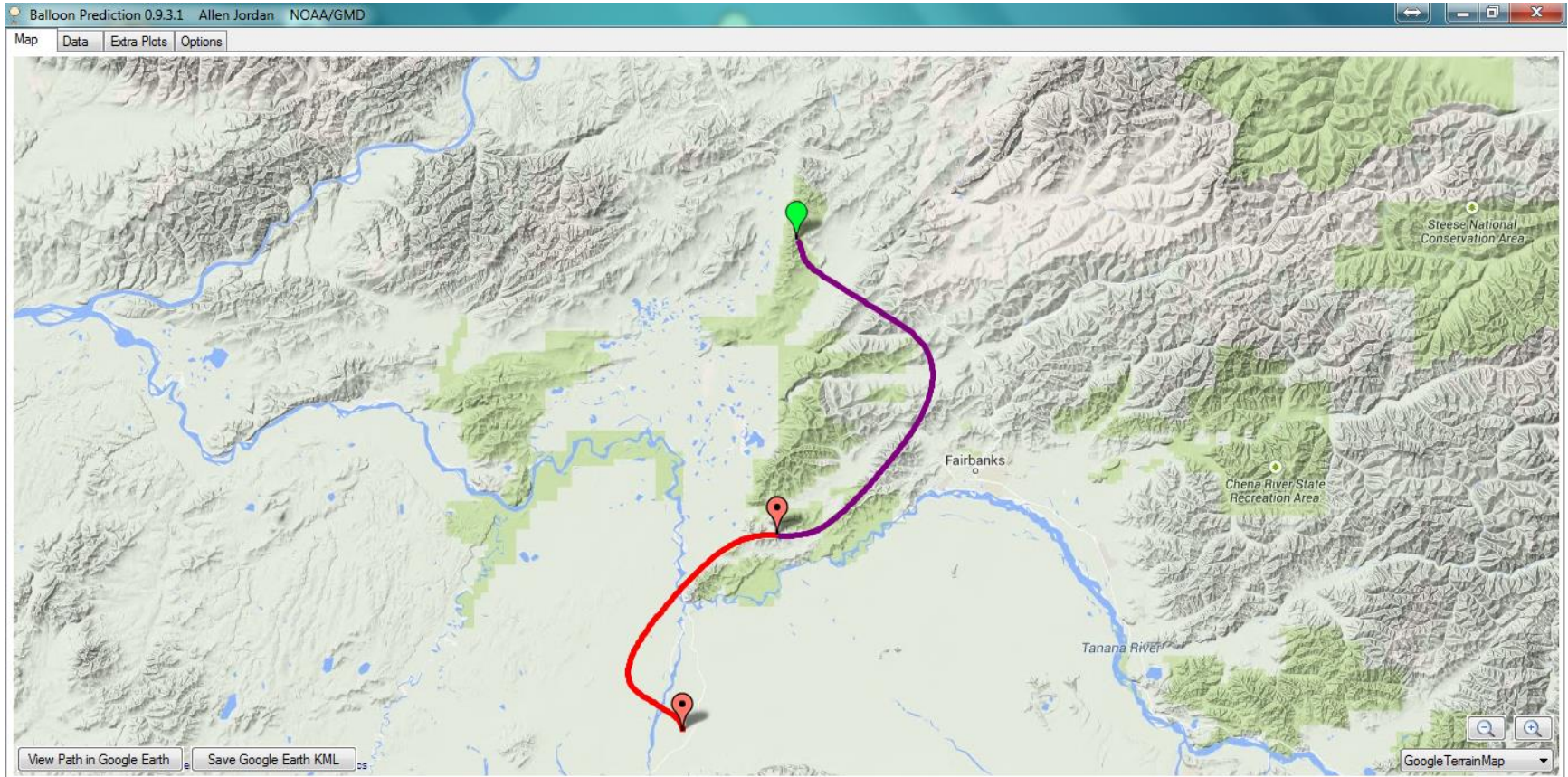


Instrumentation

- Electrochemical solid state gas sensors
 - Measures concentration of the gas
 - Oxidizes gas at an electrode and measuring the resulting current
 - Seeks to improve existing chemical cell methods
- Arduino /Microcontroller
 - ADC – Analog to digital converter
 - RS232/GPS – communication and tracking
 - SD – On board memory

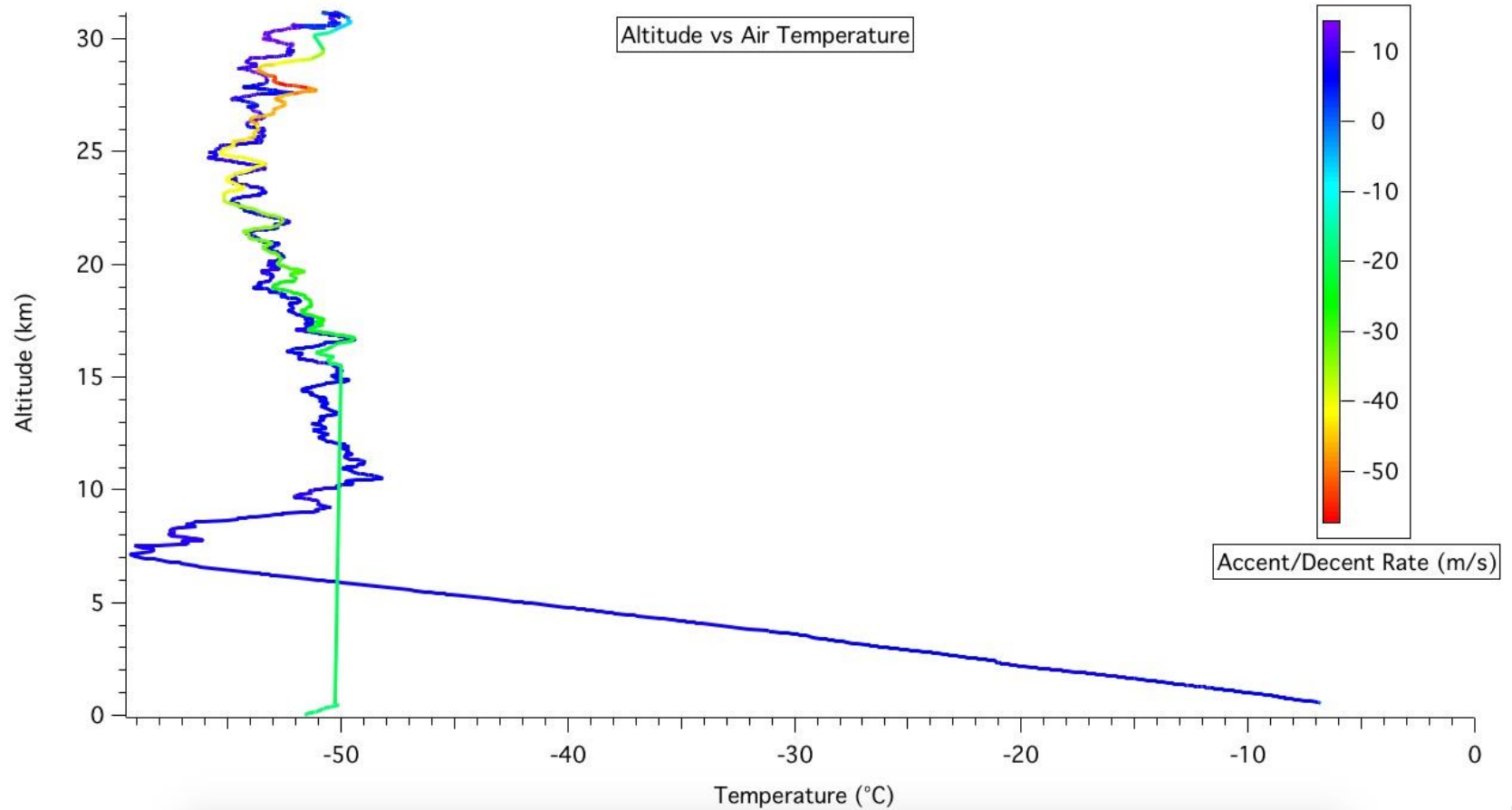


Flight Trajectory

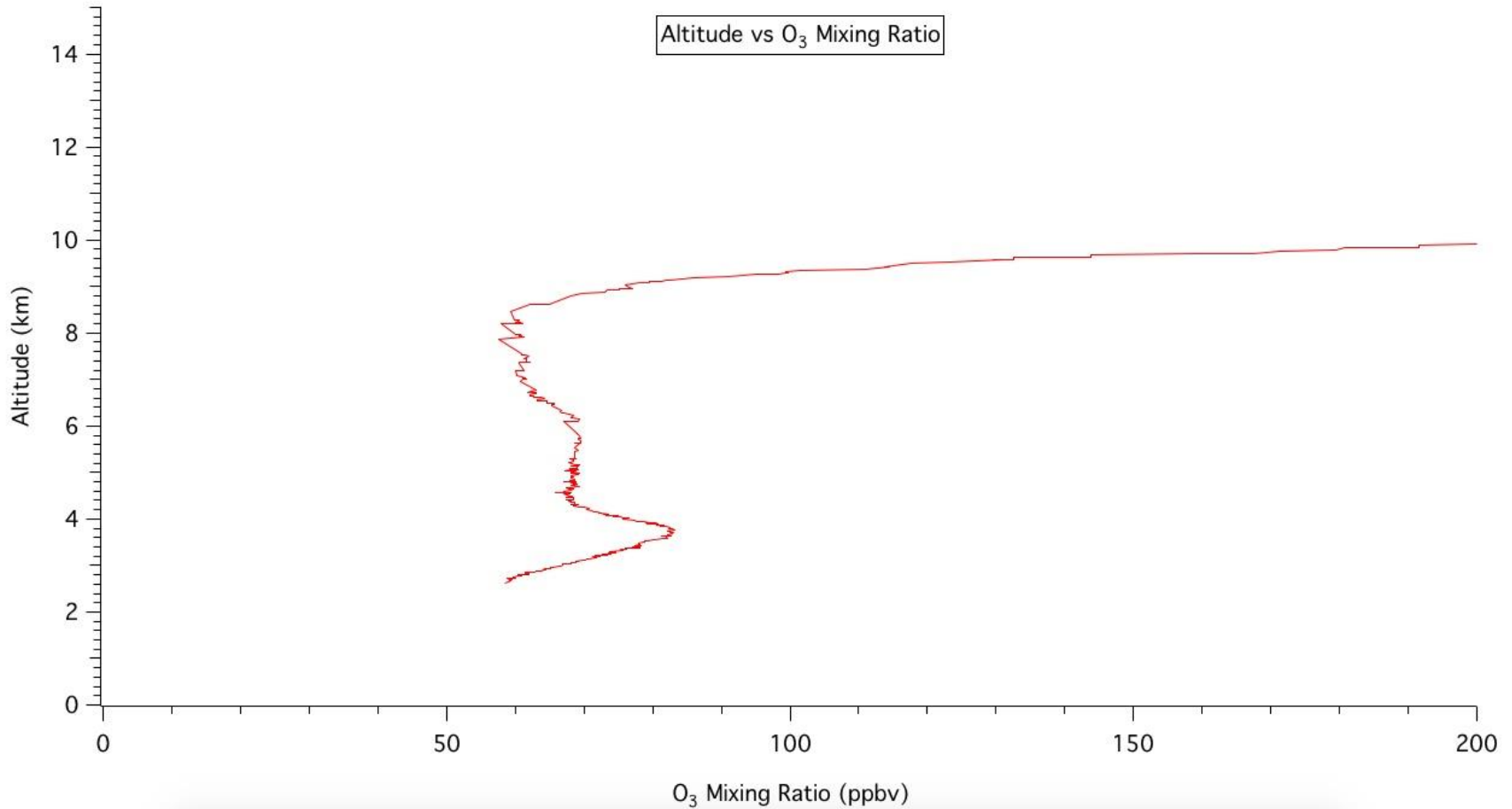


Prediction for 2015/03/20 05z ; NCEP GFS Model Base Dataset: 2015/03/19 12z + 17 hours out ; max sounding alt: 30986.1 m

Preliminary Data

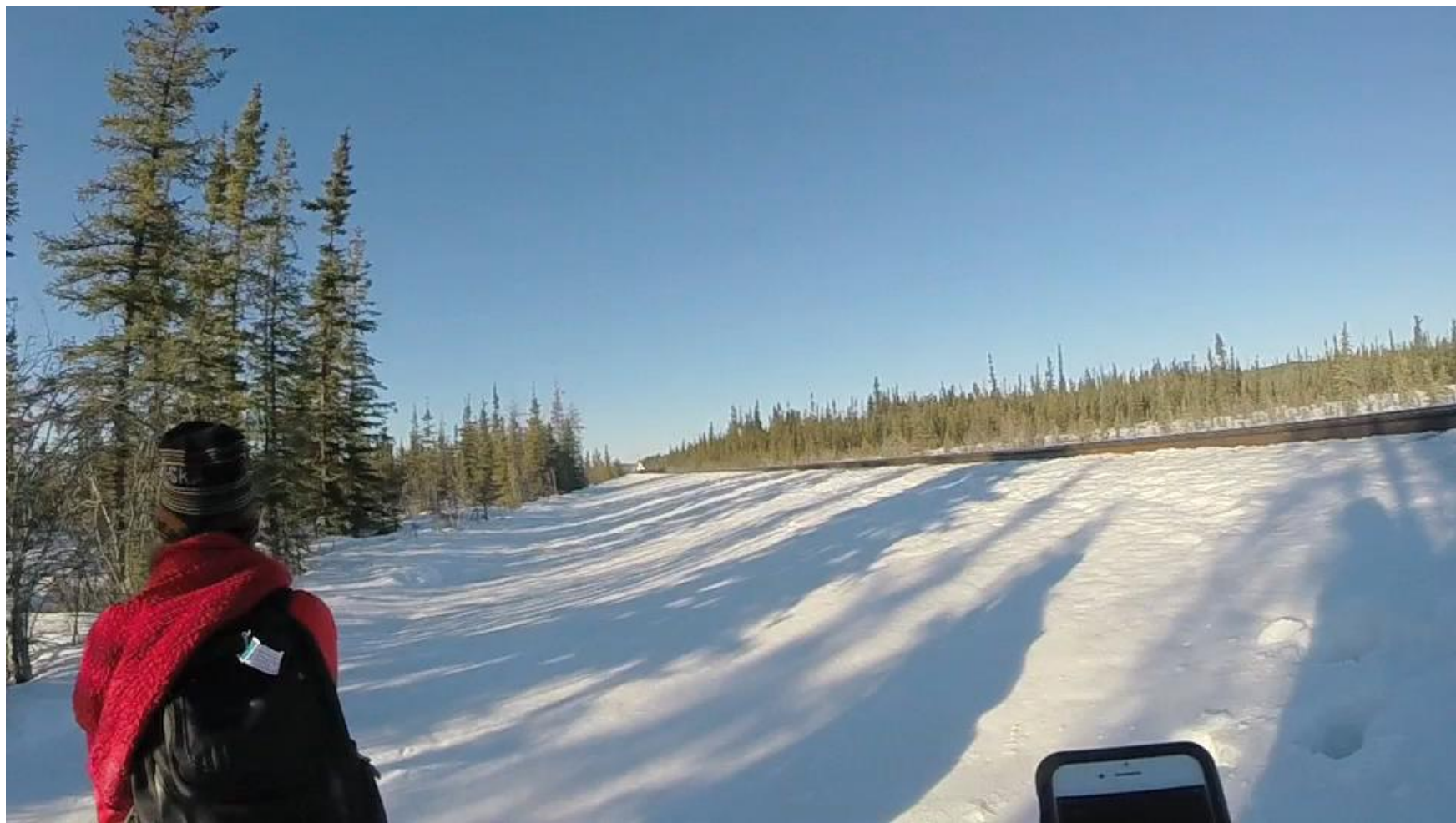


Preliminary Data



Undergraduate Opportunities

- How did I get into this?
- Programs through UH
 - PURS – Provost’s Undergraduate Research Scholarship
 - Semester long research for Juniors and Seniors
 - \$1,000 scholarship
 - SURF – Summer Undergraduate Research Fellowship
 - Full-time 10-week summer research program
 - \$3,500 stipend
 - SARP -Student Airborne Research Program
 - Full-time 8-week program
 - \$5,000 stipend + \$1000 allowance



Conclusion

It never hurts to ask, you never know what you're going to get

