HASP2010- UND-UNF Payload #7
University of North Florida Team
Monthly Status Report for July 2010

UNF Students Team
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Our team did the following work during July 2010:

(1) Three groups of sensors were fabricated. Group: 1 Nanocrystalline ITO gas sensors, Group: 2 Nanocomposite ZnO+ITO gas sensors and Group: 3 Nanocomposite WO_3+ITO gas sensors. Total four sets were fabricated. Each group of sensors was interfaced on the printed circuit board. One complete array consists of total 24 sensors as shown in fig.1. Out of 24 sensors, 8 sensors are from Group: 1, 8 sensors are from Group: B and 8 sensors are from Group: C

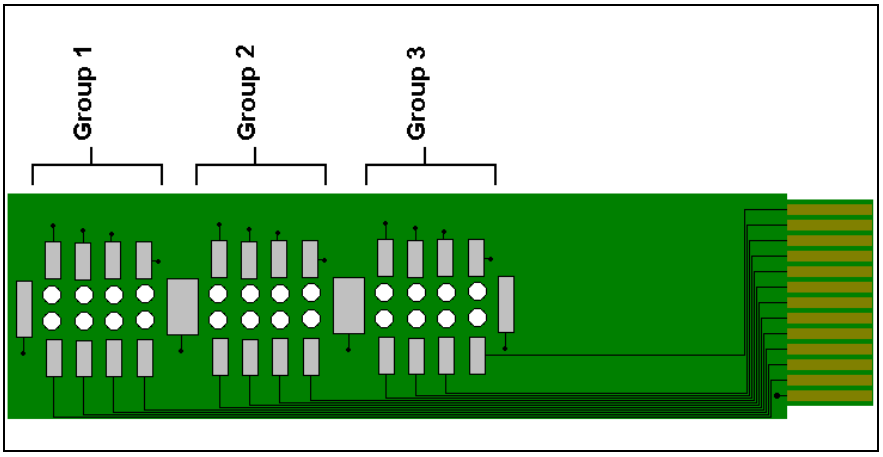


Fig.1 Schematic diagram of sensor arrays on the printed circuit board

Array was assembled in a metal box, which is shown in fig.2. A low power fan, low voltage flexible heater and temperature sensor was also assembled in a box.

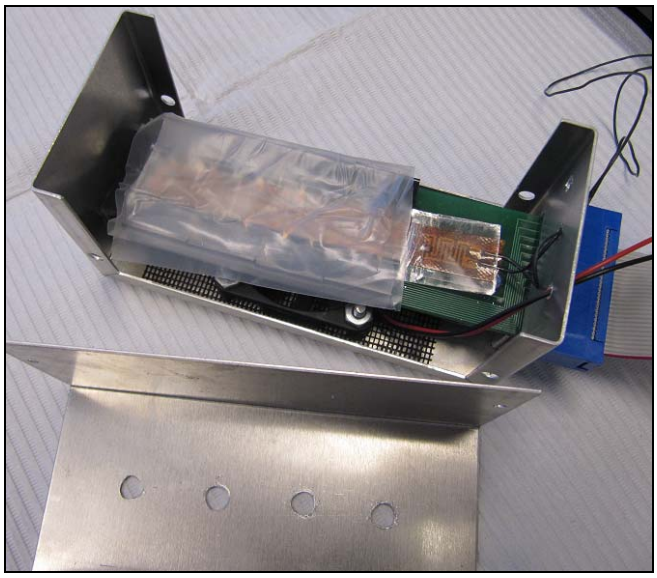


Fig.2 Sensor array PCB, fan, heater and temperature sensor in a metal box

Two sensor arrays were assembled in two boxes as shown in fig.3. One sensor box will be interfaced with the electronic circuit board made by the UND team and then integrated in the payload body. Second sensor box and two arrays are kept as the backup.

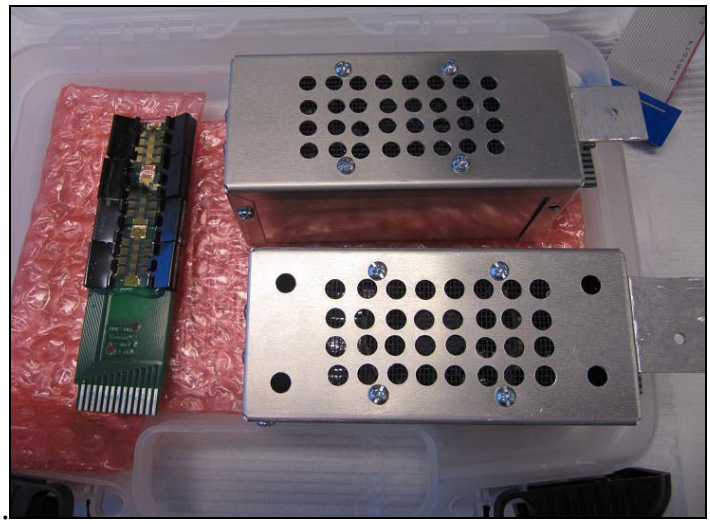


Fig.3 Ozone sensor array and boxes

(2) All sensor arrays were tested and calibrated with ozone gas. Fig.4, 5 and 6 are the calibration plots for each group of sensor of Array #A. We are going to update all the calibration plots by making several times calibrations and making average of the plots.

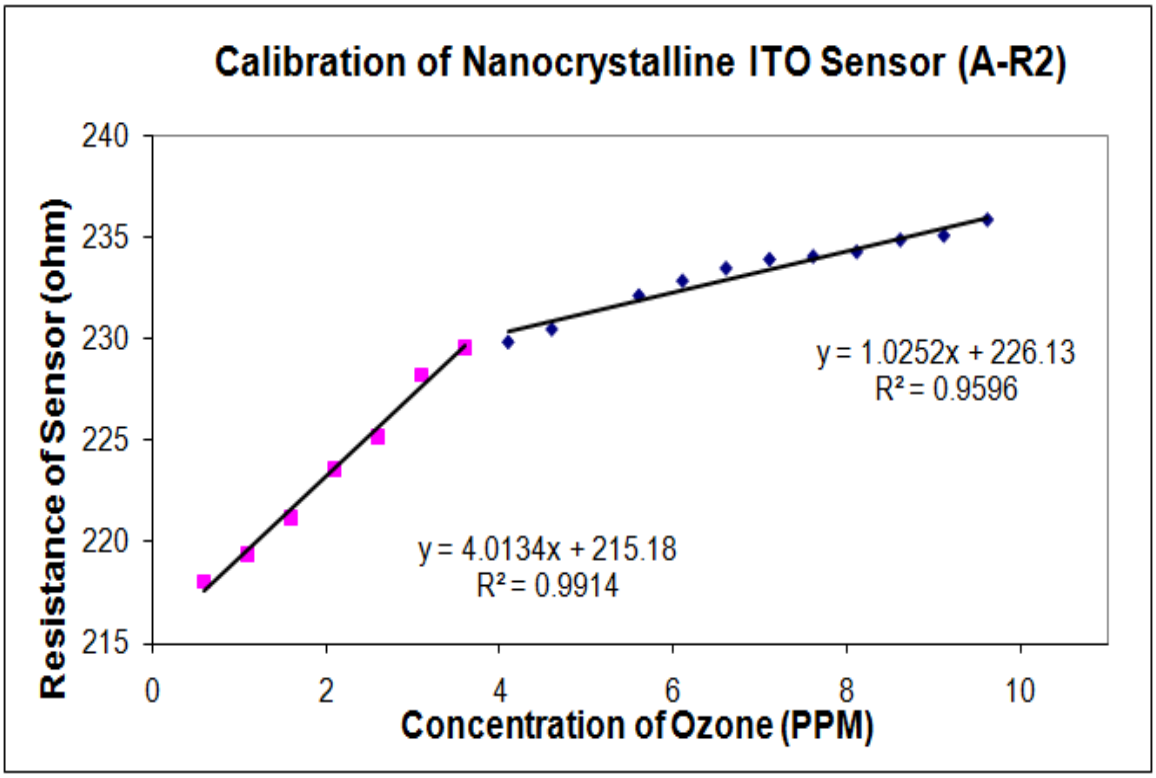


Fig.4 Calibration of nanocrystalline ITO gas sensor

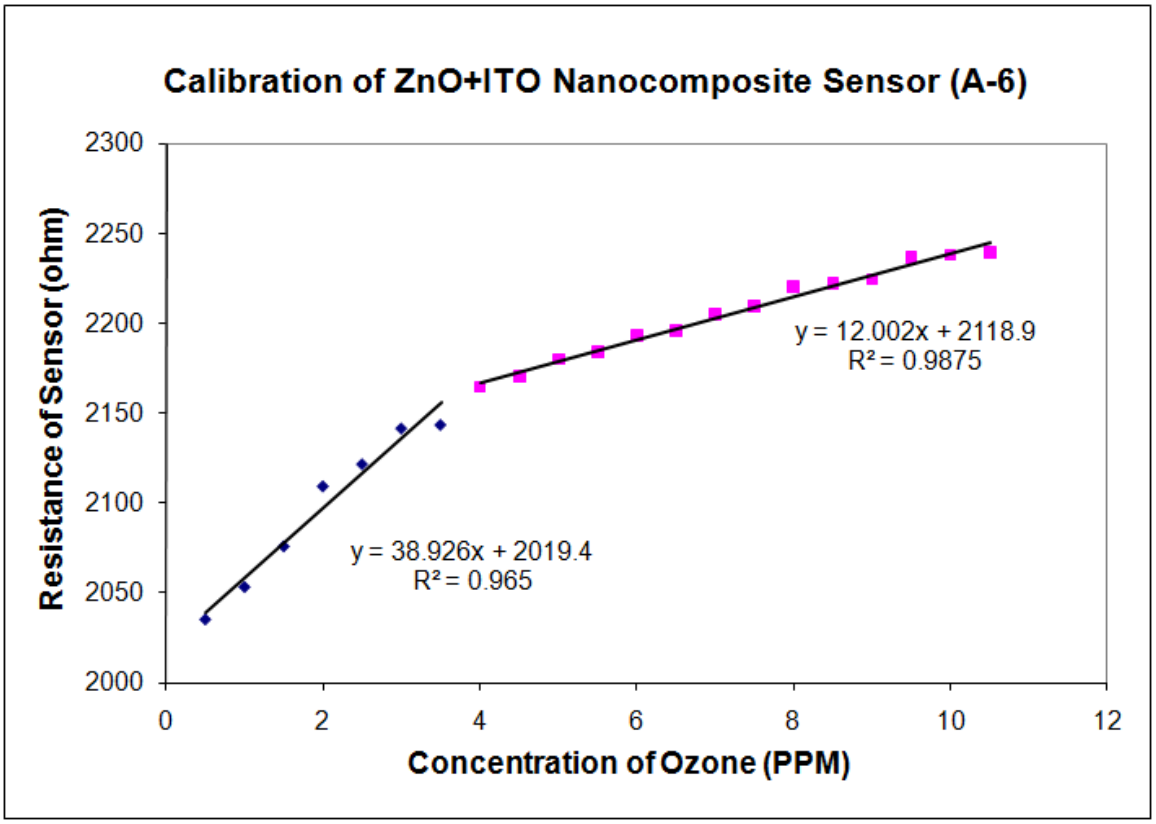


Fig.5 Calibration of nanocrystalline nanocomposite ZnO+ ITO gas sensor

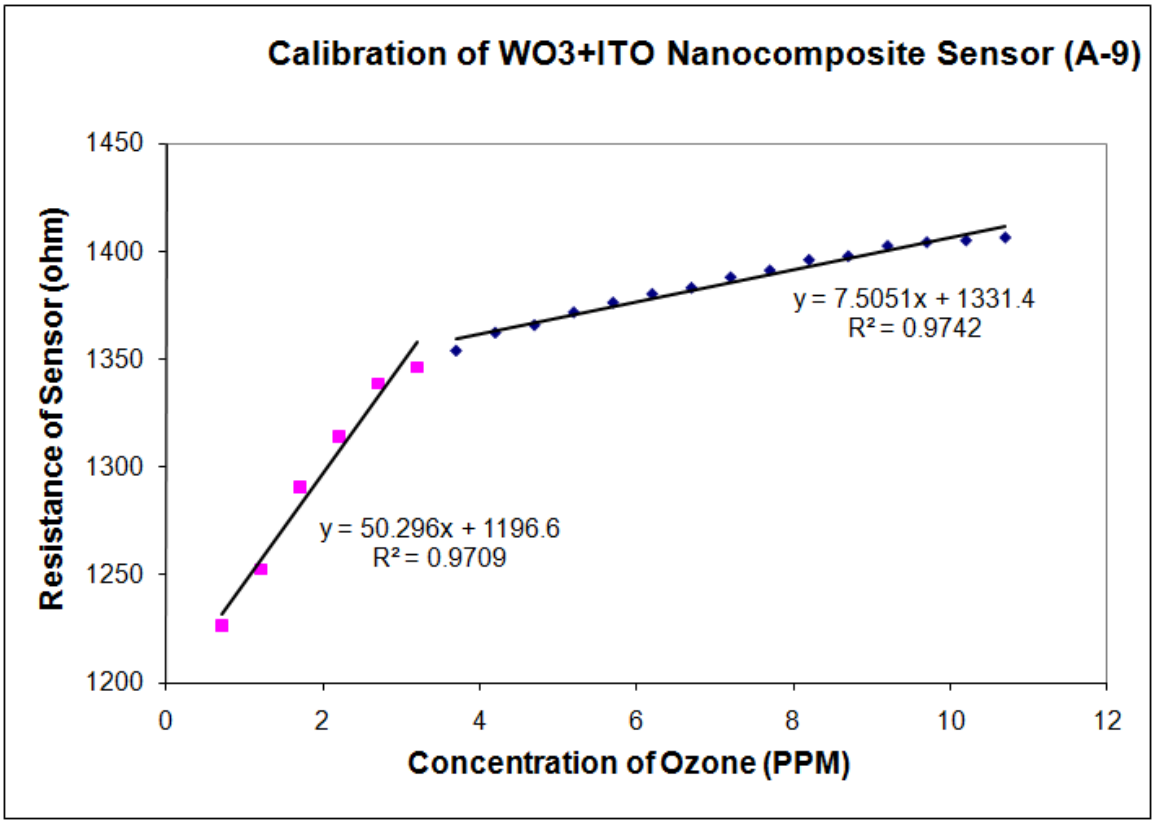


Fig.6 Calibration of nanocrystalline nanocomposite WO_3+ ITO gas sensor

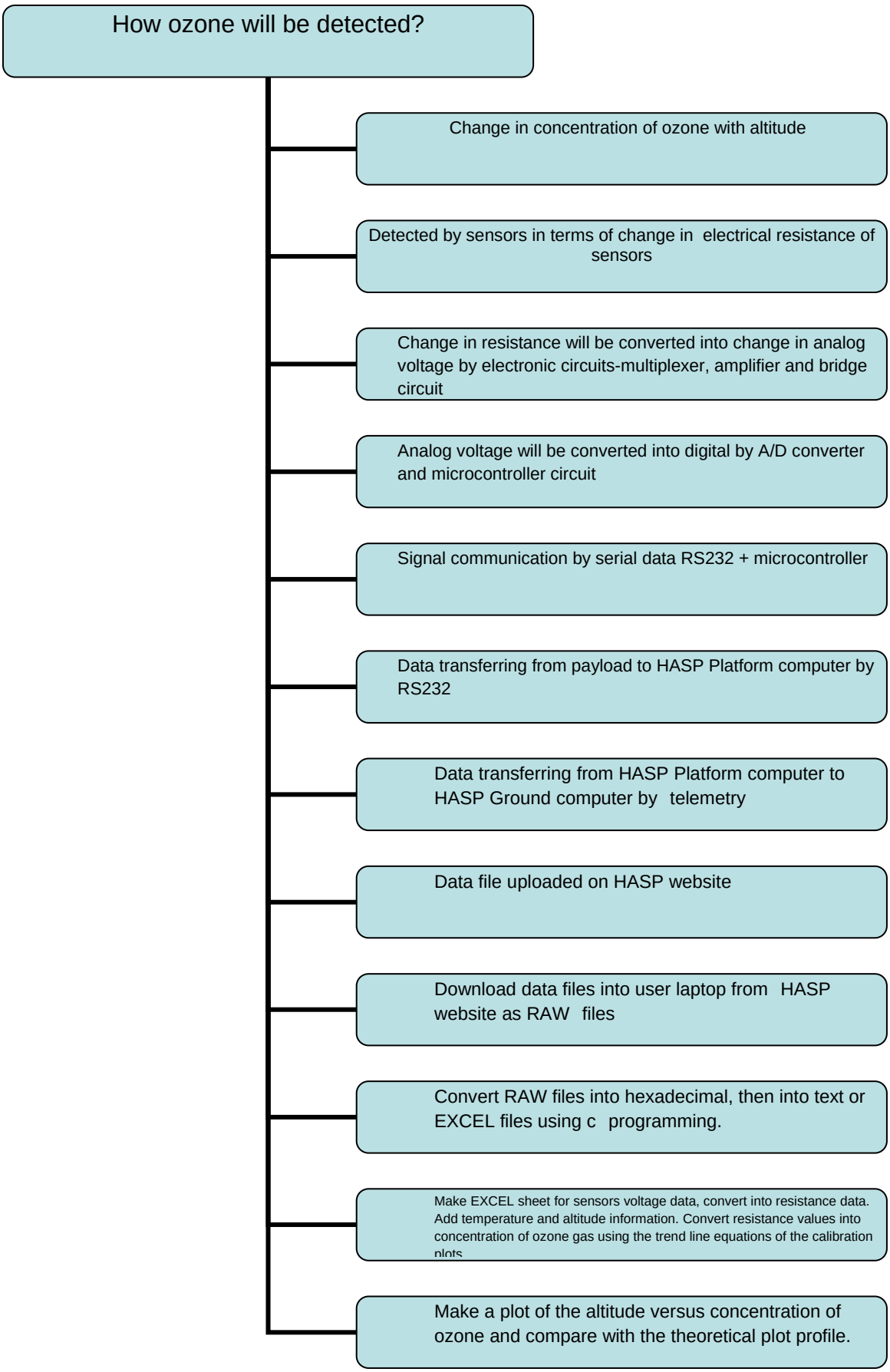
The trend line equations of the plots are listed in the Table-1. These equations will be applied to the measured data during the flight for the determination of ozone profile. These equations will be updated after making several additional calibration plots.

Table: 1 Trend line equations for three groups of sensors

Sensor Group	**Name of Array# A**	**Sensor #**	**Ozone Concentration Ranges**	**Trend Line Equations**
I	ITO	1,2,3,4, 13,14,15,16	0.5 to3.6 ppm	Y=4.01134 X + 215.18
			3.6 to 10 ppm	Y= 1.0252 X + 226.13
2	ZnO+ITO	5,6,7,8,17,18,19,20	0.5 to3.6 ppm	Y=38.926 X +2019.4
			3.6 to 10 ppm	Y= 12.002 X +2118.9
3	WO3+ITO	9,10,11,12, 21,22,23,24	0.5 to3.5 ppm	Y=50.296 X +11196.6
			3.5 to 10 ppm	Y= 7.505 X +1331.4

Where, Y= Resistance of sensor (Ohms), X= Concentration of ozone (ppm)

(3) The flow chart for "How ozone will be detected by the payload" is given below:


How ozone will be detected?
Change in concentration of ozone with altitude
Detected by sensors in terms of change in electrical resistance of sensors
Change in resistance will be converted into change in analog voltage by electronic circuits-multiplexer, amplifier and bridge circuit
Analog voltage will be converted into digital by A/D converter and microcontroller circuit
Signal communication by serial data RS232 + microcontroller
Data transferring from payload to HASP Platform computer by RS232
Data transferring from HASP Platform computer to HASP Ground computer by telemetry
Data file uploaded on HASP website
Download data files into user laptop from HASP website as RAW files
Convert RAW files into hexadecimal, then into text or EXCEL files using c programming.
Make EXCEL sheet for sensors voltage data, convert into resistance data. Add temperature and altitude information. Convert resistance values into concentration of ozone gas using the trend line equations of the calibration plots
Make a plot of the altitude versus concentration of ozone and compare with the theoretical plot profile.

(4) Payload body work is completed. Thermal blanket is also ready.
(5) We are in frequent touch with Jonathan Snarr (UND) for programming and electronic circuit work.
(6) Flight Operation plan is under preparation and will be submitted by August 1, 2010. In case, we missed to submit on Aug.1, then, we will submit it on August2, 2010 morning.

(7) Nathan Walker (UNF), Dr. Patel (UNF), and Jonathan Snarr (UND) will be travelling to Palestine, Texas on Sunday, August 1, 2010. Fernando (UND) may join with us at Texas.