

TCSP LIP conductivity data

The gerdien type dual conductivity probe was mounted at the front of the left pod so that it samples clean air. Bias voltages of 0, 6, 12, 18, and 24 volts are applied to the outer electrode at 30 second intervals. The probe measures the conductivity (S) at the aircraft altitude. By offsetting the bias voltages, most of the time, the positive and negative conductivities are measured simultaneously. The 10 second sampled data has been averaged at a 1 sec interval to correspond to the navigation data sample rate.

Positive/negative bias voltage corresponds to positive/negative conductivity. The outer electrode is recessed approximately 1 inch on both sides of the cylindrical housing. While this helps with not pushing ions of the sign that you want to measure out of the air stream, it does not completely eliminate it. There is still a small number of ions that are pushed out of the air stream in this 1 inch section, therefore the conductivity values at increasing bias voltages have been adjusted (about 7% at the highest bias voltages). Data over thunderstorms is NOT valid. This is caused by the probe outer case potential being elevated by aircraft self charge and thus pushing ions out of the air stream that enters the probe. This effect will be corrected for at a later date. Note that conductivity values are a function of geomagnetic latitude, pressure, temperature, and altitude. The data will be normalized at a later date to the temperature and pressure at 20 km and the geomagnetic latitude. File naming conventions are of the following format:

TCSP_LIP_cond_YYYY.DDD_YMMDD_hhmm.txt

where YYYY.DDD=year and julian Day, YMMDD=year, month, day, hh=hour, and mm=minute.

The positive and negative conductivities are referenced to the same 0 level, and the data have been corrected for the bias voltages mentioned above. For example, julian day 169 on 06/18/2005 at start time 1345Z is given by

TCSP_LIP_cond_2005.169_050618_1345.txt

The columns in the ASCII data file are (probe 2 is in the last half of the file)

1. probe number
2. time (hr) - with respect to current day (can be greater than 24)
3. cond (S)
4. cond_std (S)
5. altitude (km)
6. alt_std (km)
7. bias voltage (V)
8. latitude (deg)
9. lat_std (deg)
10. longitude (deg)
11. lon_std (deg)
12. pressure (mb)
13. press_std
14. T (deg K) - outside air temperature

15. T_std (deg K)
16. Q (V/m) - aircraft self charge
17. Q_std (V/m)
18. Ez (V/m) - vertical electric field in the aircraft reference frame
19. Ez_std (V/m)

The IDL format string that was used to write the data for N=8000 data points was

```
format='(8000(i1,1x,f7.4,2(1x,e12.5),2(1x,f9.4),1x,f6.2,4(1x,f10.5),2(1x,f8.3),2(1x,f8.3),4(1x,f9.2),/))'
```

An IDL sample read program has been provided (plot_TCSP_archive_data.pro). To use it, you will need to appropriately change the directories for each day and then:

```
idl
.r plot_TCSP_archive_data
plot_TCSP_archive_data,0 (0 - plot to screen, 1 - output plots to postscript file named
test.ps)
.cont - to get next day
```

The data plots are plotted both on a log and a non log scale. Positive (black) and negative (red) conductivity and altitude (blue) are plotted versus time. The altitude scale is on the right side of the plot. Conductivity altitude profiles are also shown. Probe 1 is on the top of the plot. Probe 2 is on the bottom of the plot. Although both probe 1 and probe 2 are shown, the calibration for probe 1 is currently trusted more than probe 2.

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