Data Set Catalog #121
Search Coil Magnetometer 'A'
64-054A-01A 29 taper

54-054A-01A

This data set consists of 29, 556 BPI, BCD, 7-track tapes made on the IBM/7094. Each revolution of the satellite is recorded on a separate file, but there is not data for every orbit.

| D# | C# | Orbits | Files | Start | Stop |
|---|---|---|---|---|---|
| D-05639 | C-04752 | 8,9 | 2 | 09/23/64 | 09/29/64 |
| D-05640 | C-04753 | | | | |
| D-05641 | C-04754 | 20-28 | 9 | 10/25/64 | 11/16/64 |
| D-05642 | C-04755 | 30-38 | 9 | 11/21/64 | 12/14/64 |
| D-05643 | C-04756 | 40-42 | 3 | 12/18/64 | 12/26/64 |
| D-05644 | C-04757 | 70-78 | 9 | 03/08/65 | 03/21/65 |
| D-05645 | C-04758 | 80-89 | 10 | 04/03/65 | 04/30/65 |
| D-05646 | C-04759 | 90-99 | 10 | 05/01/65 | 05/26/65 |
| D-05647 | C-04760 | 100-106 | 7 | 05/27/65 | 06/2[illegible]/65 |
| D-05648 | C-04761 | 141-149 | 9 | 09/13/65 | 10/07/65 |
| D-05649 | C-04762 | 150-158 | 9 | 10/07/65 | 10/31/65 |
| D-05650 | C-04763 | 160-168 | 9 | 11/03/65 | 11/27/65 |
| D-05651 | C-04764 | 170-173 | 4 | 11/29/65 | 12/09/65 |
| D-05652 | C-04765 | 208-210 | 3 | 03/11/66 | 03/15/66 |
| D-05653 | C-04766 | 210-212 | 3 | 03/16/66 | 03/24/66 |
| D-05654 | C-04767 | 220-228 | 9 | 04/12/66 | 05/06/66 |
| D-05655 | C-04768 | 230-236 | 7 | 05/08/66 | 05/27/66 |
| D-05656 | C-04769 | 274-279 | 6 | 09/03/66 | 09/19/66 |
| D-05657 | C-04770 | 280-288 | 9 | 09/19/66 | 10/13/66 |
| D-05658 | C-04771 | 290-298 | 9 | 10/15/66 | 11/08/66 |

| D# | C# | Orbits | Files | Start | Stop |
|---|---|---|---|---|---|
| D-05659 | C-04772 | 300-308 | 9 | 11/11/66 | 12/04/66 |
| D-05660 | C-04773 | 310-311 | 2 | 12/08/66 | 12/11/66 |
| D-05661 | C-04774 | 342-349 | 8 | 03/13/67 | 03/24/67 |
| D-05662 | C-04775 | 350-359 | 10 | 03/24/67 | 04/20/67 |
| D-05663 | C-04776 | 360-369 | 10 | 04/20/67 | 05/17/67 |
| D-05664 | C-04777 | 370-377 | 8 | 05/17/67 | 06/05/67 |
| D-05665 | C-04778 | 411-419 | 8 | 09/03/67 | 09/27/67 |
| D-05666 | C-04779 | 420-428 | 9 | 09/27/67 | 10/21/67 |
| D-05667 | C-04780 | 430-438 | 9 | 10/24/67 | 11/17/67 |

Note: Tape number D-05640 arrived at the Data Center as a blank tape

The experiment number listed on the header file does not

coincide with the experiment number assigned to this data set by NSSDC.

OGO-3
D5608-5708

THE $B_4$ - θ PLOTS FOR THE OGO-1
SEARCH COIL MAGNETOMETER

The spin stabilization of the OGO-1 spacecraft makes it possible for the search coil magnetometer to measure the amplitude and direction of the dc magnetic field in the spin plane of the spacecraft. The methods used to make these measurements are described in the Appendix.

The measurements obtained are plotted in the following three forms:

FORM ONE

A. Vertical scales

1. Amplitude

1" = 10, 100, 1000 γ depending upon instrument gain.

2. Phase

1" = 100°

B. Horizontal scale

1.2" = 1 hour, yielding a plot 1'x6'.

FORM TWO

A. Vertical scales (same as Form One).

B. Horizontal scale

0.3" = 1 hour, yielding a plot 1'x2.5'.

FORM THREE

A. Vertical and horizontal scales are ¼ of Form One. For the second and third plots the data are averaged in groups of four then plotted at ¼ the time scale. We have not supplied copies of this

plot for all the orbits since the second plot, with its larger vertical scales, is more useful for data analysis.

## APPENDIX

## THE MEASUREMENT OF $B_\perp - \theta$ ON THE OGO-1 SPACECRAFT

Let $B_x$ and $B_y$ be two perpendicular components of the field in a plane perpendicular to the spin axis. Then, in the "rotated frame" (Z-axis parallel to the spin axis, X and Y axes in spin plane rotating with a frequency $\omega$) the following signals will be observed:

$$X_R = B_x' \cos\omega t + B_y' \sin\omega t$$
$$Y_R = B_y' \cos\omega t - B_x' \sin\omega t$$
$$Z_R = 0$$

where $B_x' = kB_x$ and $B_y' = kB_y$. k is the product of the angular velocity of the satellite and an instrument calibration constant. If we now rotate to the coil system using the inverse of the matrix for the rotation from the coil system to the rotated frame:

$$\begin{pmatrix} X_c \\ Y_c \\ Z_c \end{pmatrix} \begin{pmatrix} a_{11} & a_{21} & a_{31} \\ a_{12} & a_{22} & a_{32} \\ a_{13} & a_{23} & a_{33} \end{pmatrix} \begin{pmatrix} X_R \\ Y_R \\ 0 \end{pmatrix}$$

We obtain the following signals on the coils due to the spacecraft spin in a dc field:

$$X_c = a_{11}X_R + a_{21}Y_R$$
$$Y_c = a_{12}X_R + a_{22}Y_R$$
$$Z_c = a_{13}X_R + a_{23}Y_R$$

The Fourier Series Analysis of these signals gives:

(1) $2\alpha_x = a_{11}B_x' + a_{21}B_y'$ $\quad 2\beta_x = a_{11}B_y' - a_{21}B_x'$

$2\alpha_y = a_{12}B_x' + a_{22}B_y'$ $\quad 2\beta_y = a_{12}B_y' - a_{22}B_x'$

$2\alpha_z = a_{13}B_x' + a_{23}B_y'$ $\quad 2\beta_z = a_{13}B_y' - a_{23}B_x'$

These can be rewritten in terms of the peak-to-peak amplitudes and phases in the coil system as follows:

(2) $2\alpha_x = X\cos\theta_x$ $\quad 2\beta_x = X\sin\theta_x$

$2\alpha_y = Y\cos\theta_y$ $\quad 2\beta_y = Y\sin\theta_y$

$2\alpha_z = Z\cos\theta_z$ $\quad 2\beta_z = Z\sin\theta_z$

X - Y - Z are p-p amplitudes measured in the coil system

$\theta_x$ - $\theta_y$ - $\theta_z$ are the respective phases

Solving for $B_y$ in equations (1) gives:

$$a_{21}2\alpha_x + a_{11}2\beta_x = (a_{21}^2 + a_{11}^2)B_y'$$

$$a_{22}2\alpha_y + a_{12}2\beta_y = (a_{22}^2 + a_{12}^2)B_y'$$

$$a_{23}2\alpha_z + a_{13}2\beta_z = (a_{23}^2 + a_{13}^2)B_y'$$

which, when summed and equations (2) are substituted gives:

$$B_y = K(a_{11}X\sin\theta_x + a_{12}Y\sin\theta_y + a_{13}Z\sin\theta_z + a_{21}X\cos\theta_x + a_{22}Y\cos\theta_y + a_{23}Z\cos\theta_z)$$

where $K = 1/2k$.

$B_x$ is found in the same way.

The procedure used to determine these components of the magnetic field involves two processing steps. First