Data Set Catalog # 122
OGO-3 Search Coil Magnetometer
66-049A-12A 41 tapes

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OGO-3 SEARCH COIL MAGNETOMETER

This data set consists of 41, 556BPI, BCD, 7-track tapes made on the IBM/7094. For each revolution there is a separate file, but there is not data for every orbit.

D#	C#	Orbits	Files	Start	Stop
D-05668	C-05016	2	1	6/9/66	6/11/66
D-05669	C-05017	11-20	10	6/27/66	7/17/66
D-05670	C-05018	21-30	10	7/17/66	8/6/66
D-05671	C-05019	31-40	10	8/6/66	8/27/66
D-05672	C-05020	41-50	10	8/27/66	9/15/66
D-05673	C-05021	51-60	10	9/16/66	10/6/66
D-05674	C-05022	61-70	10	10/6/66	10/26/66
D-05675	C-05023	71-80	10	10/27/66	11/16/66
D-05676	C-05024	81-90	10	11/16/66	12/6/66
D-05677	C-05025	91-100	10	12/6/66	12/26/66
D-05678	C-05026	101-110	10	12/26/66	1/15/67
D-05679	C-05027	111-120	10	1/15/67	2/4/67
D-05680	C-05028	131-140	10	2/27/67	3/17/67
D-05681	C-05029	121-130	10	2/5/67	2/24/67
D-05682	C-05030	141-150	10	3/17/67	4/6/67
D-05683	C-05031	151-159	9	4/6/67	4/24/67
D-05684	C-05032	160-161	2	4/24/67	4/27/67
D-05685	C-05033	161-170	10	4/26/67	5/17/67
D-05686	C-05034	171-180	10	5/17/67	6/6/67
D-05687	C-05035	181-190	10	6/6/67	6/26/67
D-05688	C-05036	191-200	10	6/26/67	7/16/67
D-05689	C-05037	116	1	1/25/67	1/27/67
D-05690					
D-05691	C-05038	221-230	10	8/26/67	9/15/67
D-05692	C-05039	231-240	10	9/16/67	10/5/67
D-05693	C-05040	241-249	9	10/6/67	10/23/67
D-05694	C-05041	250-258	9	10/23/67	11/11/67
D-05695	C-05042	260-268	9	11/15/67	12/1/67
D-05696	C-05043	270-279	5	12/3/67	12/23/67
D-05697	C-05044	271-275	5	12/5/67	12/15/67
D-05698	C-05045	280-284	5	12/23/67	1/2/68
D-05699	C-05046	286-290	5	1/5/68	1/14/68
D-06000	C-05047	291-295	5	1/14/68	1/24/68
D-06001	C-05048	296-300	5	1/25/68	2/4/68
D-06002	C-05049	301-305	5	2/4/68	2/14/68
D-06003	C-05050	306-310	5	2/14/68	2/24/68
D-06004	C-05051	311-315	5	2/24/68	3/5/68
D-06005	C-05052	316-317	2	3/6/68	3/9/68
D-06006	C-05053	318-326	9	3/9/68	3/29/68
D-06007	C-05054	328-332	5	3/29/68	4/8/68
D-06008	C-05055	338-341	4	4/18/68	4/27/68

Note: D-05690 has too many tape errors omit to be duped of listed.

The experiment number on the header records of these tapes does not agree with experiment number assigned to the data set by the NSSDC.

D-05685 has no header records on the 10th file.

D-05698 has a day 367 which I have assumed is meant to be day 2.

OGO-3
D5668-5706

THE $B_\perp$ - 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 $B_\perp$ - 0 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 ω) 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