SAN MARCO

88-026A-01A

DBI NEUTRAL DENSITY DATA

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1. INTRODUCTION:

The documentation for this data set was originally on paper, kept in NSSDC's Data Set Catalogs (DSCs). The paper documentation in the Data Set Catalogs have been made into digital images, and then collected into a single PDF file for each Data Set Catalog. The inventory information in these DSCs is current as of July 1, 2004. This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system. The information existing in the DSCs is now not needed for locating the data files, but we did not remove that inventory information.

The offline tape datasets have now been migrated from the original magnetic tape to Archival Information Packages (AIP's).

A prior restoration may have been done on data sets, if a requestor of this data set has questions; they should send an inquiry to the request office to see if additional information exists.

2. ERRATA/CHANGE LOG:

NOTE: Changes are made in a text box, and will show up that way when displayed on screen with a PDF reader.

When printing, special settings may be required to make the text box appear on the printed output.

Version	Date	Person	Page	Description of Change
01				
02				

3 LINKS TO RELEVANT INFORMATION IN THE ONLINE NSSDC INFORMATION SYSTEM:

http://nssdc.gsfc.nasa.gov/nmc/

[NOTE: This link will take you to the main page of the NSSDC Master Catalog. There you will be able to perform searches to find additional information]

4. CATALOG MATERIALS:

a. Associated Documents To find associated documents you will need to know the document ID number and then click here.
http://nssdcftp.gsfc.nasa.gov/miscellaneous/documents/

b. Core Catalog Materials

REQ. AGENT	ACQ. AGENT
CMW	DKB

SAN MARCO

DBI NEUTRAL DENSITY DATA

88-026A-01A STPH-00005

This data set consists of 9 multi-filed tapes. These tapes were reblocked copies of the original 9-track, 6250 bpi, binary, tapes, written in FORTRAN V Language for IBM computers, with 895 "DATA1" files and 895 "DATA2" files. The originals were returned to Prof. Carlo Arduini,Italy. Data for each pass are provided in two categories; "DATA1" gives general info on the pass; "DATA2" contains a table; first column is the time (in seconds from the initial time of the pass), second column is the value of the density. The D tapes are 3480 cartridges and C backup tapes are 9 track, 6250 bpi. Pass times are as follows:

D#	C#	DATA FILES		PASS TIMES
D-88213	C-29449	863	DATA1	04/21/88 - 07/12/88
D-88214	C-29450	32	DATA1	08/06/88 - 11/02/88*
		311	DATA2	Table
D-88215	C-29451	85	DATA2	Table
D-88216	C-29452	96	DATA2	Table
D-88217	C-29453	87	DATA2	Table
D-88218	C-29454	70	DATA2	Table
D-88219	C-29455	86	DATA2	Table
D-88220	C-29456	108	DATA2	Table
D-88221	C-29457	52	DATA2	Table
		8	Fortran, NORAD orbital elements and DATA1 & DATA2 info.	

* Pass of November 2, data in file #6

The output

In the following the format of the output data, as it will appear in the NSDC Archive file, is described, and an example is presented.

- For each pass two files DATA1, DATA2 are provided, the first of wich gives general informations on the pass.
- The second file DATA2 contains a table whose first column is the time (in seconds from the initial time of the pass) and the second is the value of the density (grams/cm^3).

The explanation of the data of the first file DATA1 is given hereafter:

- File name: contains the name of the "pass".
- Initial time: initial time of the DBI data of the pass (year, month, day, hour, minute, second).
- Final time: final time of the DBI data of the pass (year, month, day, hour, minute, second).
- Sun referred spin rate: is the spin rate as measured from pulse to pulse of the sun sensor.
- Transition sun-shadow: year, month, day, hour, minute, second, of the closest transition.
- Transition shadow-sun: (idem, when appropriate).
- Norad Element Set: (see ref. 9) is a set of 9 parameters referred to an EPOCH (YMDHMS) which are allowing the generation of the ephemerides applicable to the "pass". The program used is SPG4 (see ref. 9).
- State of the instruments: is a table which gives the status (ON or OFF) of the spacecraft instruments different from DBI. This information is relevant for DBI since the contemporary operation of one of the instrument (ASSI) is generally producing mechanical oscillation, sensed by DBI (and eliminated, by the way, by the data processing procedure).
- Attitude (θ, ψ): refers to the spin axis. θ is the colatitude and $\psi = \epsilon + 90$ where ϵ is the right ascension with respect to the Vernal Reference (see ref. 3).
- Time of the last maneuver: refers to the last magnetic maneuver for correcting the attitude. Looking at this time we know if the pass is sufficiently far from the dynamically perturbed period corresponding to the maneuver.
- High frequency filters: CF1, CF2 are the frequencies of the two filters used to clean the data from high frequency noise.
- Spin filter: is the frequency used for filtering out the useful signal (generally coincides with the spin frequency).
- Bias averaging period: the bias is computed by two successive averages, the first at spin frequency, the second at the indicated period.

- Thresholds: irregularities in the bias are recognized by means of the parameters B_1, B_2 exceeding the indicated thresholds.

- High frequency noise amplitude jumps of more than the indicated percentage are separing data fields of different noise characteristics.

- Spikes are recognized as sudden voltage jumps of more than the indicated value.

- Sensitive area: is the reference cross section of the spacecraft.

- Time step: is the time interval between successive density data points.

- Markers:
  * is the character which marks the fields where density data are lacking (because of spikes, etc.);
  ** used for marking the high frequency noise transitions identified by the threshold indicated above;
  *** used for marking the points where the bias is irregular according to the B_1, B_2 thresholds indicated above.

- Noise frequency and amplitude (> 5%):
  a table is given with the results of the harmonic analysis of the first 4 useful frames (≈ 32 sec of data).
  If the "high frequency" levels are lower than 5% of the main signal (at spin frequency), the table is omitted and there is in place the statement: "noise absent". If the "high frequency" noise levels are larger than the main signal, the table is omitted and there is in place the statement: "bad pass, be careful" (which does not necessarily imply the rejection of the data). The table, when present, has columns with the frequencies in Hz and amplitudes (in Volt) of the high frequency noise found in the first 4 frames.

- Table with data quality indicator: this table reports a set of indicators for every field of data (determined by the high frequency noise transitions). The fields are indicated by their extremes in terms of "frames" (each frame is 8.192 sec) or equivalently in seconds from the initial time of the pass.
  The indicators are:
  Gain: the gain setting of the DBI;
  Ampm: mean value of the main signal in Volts;
  CF1M: max amplitude isolated by the CF1 filter (Volts);
  CF1m: average amplitude isolated by the CF1 filter (Volts);
  CF2M: max amplitude isolated by the CF2 filter (Volts);
  CF2m: average amplitude isolated by the CF2 filter (Volts);
  CF1M%, CF1m%, CF2M%, CF2m%: as above, but as percent of the main signal.
  BIAS: Reg = regular bias pattern,
  Hol = irregular bias pattern.
  When BIAS = Hol the value of the corresponding B_1, B_2 are also indicated.

- Wrong data interval: data intervals, defined by initial and final time in seconds from the pass biginning, where the

quality of the data has been judged poor.

- Procedures: the list of the computer procedures used for the data analysis.

FILE: DATA1 TA0586R1 VM/SP PROGETTO SAN MARCO - CRA

File name = TA0586R1-M0

		Lat	Lon	Lt	Height
Initial time	88: 5: 4:15:42:15.399	0.164	11.71	16.485	290.34
Final time	88: 5: 4:15:50:41.202	-1.545	43.73	18.760	257.55

Sun referred spin rate = 36.088 deg/sec

Transition shadow => sun at time = 88: 5: 4:14:54:45

Norad elements set :

Epoch	Mean Motion derivatives	B*
88: 5: 3:15:43:29	0.000674130 -0.13038D-04	0.33766D-03

Inc	Raan	Ecc	AP	AM	P rev/day
2.996	300.2709	0.02443480	198.7531	160.4580	15.466607620

State of instruments :

Frame	1 - 64	64 - 65
Time	0. - 516.	516. - 532.
ASSI	ON	OFF
Frame	1 - 64	64 - 65
Time	0. - 516.	516. - 532.
EFI	ON	OFF
Frame	1 - 64	64 - 65
Time	0. - 516.	516. - 532.
IVI	ON	OFF
Frame	1 - 65	
Time	0. - 532.	
WATI	OFF	
Frame	1 - 65	
Time	0. - 532.	
STAR	OFF	

Attitude :

Theta = 177.945; Psi = 102.201

Pass before first maneuvre

High frequency filters => CF1 = 3.410 Hz, CF2 = 1.300 Hz

Spin filter = 36.088 deg/sec

Bias averaged over 40 seconds

Thresholds :

for Bias Holes B1= 0.0800 B2= 0.0005

for CF1m and CF2m transitions = 50.0 %

for Spikes elimination = 5.0 Volt

Sensitive area = 0.7915 mq (see note on pag. 26)

Time step = 1.024 sec

FILE: DATA1 TA0586R1 VM/SP PROGETTO SAN MARCO - CRA

* = density data lack
** = noise transition
*** = bias irregular (hole)

Noise frequencies and amplitudes (> 5.%)
Analysis over first 4 useful frames

Hz	Volt (%)
3.41797	0.22522
6.01196	0.13035

Frame	1 - 9	9 - 12	12 - 37	37 - 63
Time	0. - 66.	66. - 90.	90. - 295.	295. - 508.
Gain	1.003	1.003	1.003	0.247
Ampm	0.50141D+00	0.52962D+00	0.62599D+00	0.31763D+01
CF1M	0.47380D+00	0.47380D+00	0.47380D+00	0.35732D+00
CF1m	0.85247D-01	0.85247D-01	0.85247D-01	0.19886D+00
CF2M	0.45159D-01	0.25894D+00	0.58061D+00	0.16435D+00
CF2m	0.10724D-01	0.24827D-01	0.12755D-01	0.42014D-01
CF1M%	0.94494D+00	0.89460D+00	0.75688D+00	0.11250D+00
CF1m%	0.17001D+00	0.16096D+00	0.13618D+00	0.62608D-01
CF2M%	0.90064D-01	0.48892D+00	0.92750D+00	0.51743D-01
CF2m%	0.21388D-01	0.46877D-01	0.20376D-01	0.13227D-01
Bias	Reg	Reg	Reg	Reg

Wrong Data intervals :

65. 98.	285. 303.

Procedures : DOUBFITT,BIAS,LEVBIAS,FITPARA,NEWAMP,DBIP,LEVSPI

FILE: DATA2 TA0586R1 A1 VM/SP PROGETTO SAN MARCO - CRA

File name = TA0586R1-M0

DT sec	density gr/cm**3
0.0000	0.4148D-13
1.0200	0.4168D-13
2.0480	0.4188D-13
3.0680	0.4210D-13
4.0960	0.4230D-13
5.1150	0.4246D-13
6.1430	0.4262D-13
7.1630	0.4272D-13
8.1910	0.4282D-13
9.2110	0.4288D-13
10.2390	0.4292D-13
11.2580	0.4300D-13
12.2860	0.4310D-13
13.3060	0.4318D-13
14.3340	0.4328D-13
15.3540	0.4336D-13
16.3820	0.4344D-13
17.4100	0.4352D-13
18.4290	0.4360D-13
19.4580	0.4372D-13
20.4770	0.4386D-13
21.5050	0.4394D-13
22.5250	0.4406D-13
23.5530	0.4422D-13
24.5730	0.4440D-13
25.6010	0.4458D-13
26.6200	0.4474D-13
27.6480	0.4486D-13
28.6680	0.4494D-13
29.6960	0.4504D-13
30.7160	0.4512D-13
31.7440	0.4518D-13
32.7630	0.4522D-13
33.7910	0.4524D-13
34.8110	0.4524D-13
35.8390	0.4528D-13
36.8590	0.4528D-13
37.8870	0.4532D-13
38.9060	0.4538D-13
39.9340	0.4544D-13
40.9540	0.4548D-13
41.9820	0.4554D-13
43.0020	0.4560D-13
44.0300	0.4568D-13
45.0580	0.4574D-13
46.0770	0.4578D-13
47.1060	0.4584D-13
48.1250	0.4592D-13
49.1530	0.4600D-13

50.1730	0.4612D-13	
51.2010	0.4620D-13	
52.2210	0.4630D-13	
53.2490	0.4638D-13	
54.2680	0.4654D-13	
55.2960	0.4670D-13	
56.3160	0.4684D-13	
57.5950	0.4702D-13	
58.3640	0.4722D-13	
59.3920	0.4750D-13	
60.4110	0.4776D-13	
61.4390	0.4802D-13	
62.4590	0.4812D-13	
63.4870	0.4806D-13	
64.5070	0.4802D-13	
65.5350	0.4800D-13	**
66.5540	0.4796D-13	**
67.5820	0.4778D-13	**
68.6020	0.4748D-13	**
69.6300	0.4708D-13	**
70.6500	0.4664D-13	**
71.6780	0.4640D-13	**
72.7060	0.4658D-13	**
73.7250	0.4694D-13	
74.7540	0.4730D-13	
75.7730	0.4764D-13	
76.8010	0.4800D-13	
77.8210	0.4800D-13	
78.8490	0.4812D-13	
79.8690	0.4834D-13	
80.8970	0.4856D-13	
81.9160	0.4850D-13	
82.9440	0.4816D-13	
83.9640	0.4766D-13	
84.9920	0.4710D-13	
86.0120	0.4654D-13	
87.0400	0.4644D-13	
88.0590	0.4680D-13	
89.0870	0.4722D-13	
90.1070	0.4762D-13	**
91.1350	0.4794D-13	**
92.1550	0.4830D-13	**
93.1830	0.4880D-13	**
94.2020	0.4942D-13	**
95.2300	0.5008D-13	**
96.2500	0.5066D-13	**
97.2780	0.5084D-13	**
98.2980	0.5090D-13	
99.3260	0.5086D-13	
100.3540	0.5086D-13	
101.3730	0.5094D-13	
102.4020	0.5104D-13	
103.4210	0.5108D-13	
104.4490	0.5114D-13	
105.4690	0.5118D-13	

ORBITAL PROPAGATOR FOR S. MARCO V SATELLITE

The tape N¢ 9 contains the program PROPAG FORTRAN that reads from file DATA1 &1 the data initial time and the epoch of the NORAD data (orbital elements), by the subroutine NOI (Norad Orbital Integrator) gives all information on position and velocity of the satellite versus time (Initial time + time read from DATA2 &1 file)

All the routines are written in FORTRAN V Language for IBM computers.

The procedure starts by the command:

< PROPAG Filename >

where <Filename> is the name of the data file.

Es.:

< PROPAG TA0586R1 >

in this case we have in output the file HEIGHTS TA0586R1 that contains the height and local time for any density datum.

```
1 //ZMCOWFDM JOB (K1005,N990,99),'C.M. WONG',TIME=(2,5),MSGCLASS=X,       JOB09608
  //   NOTIFY=ZMCOW,CLASS=A     MEMBER=FATDUMP
  //*JOBPARM LINES=99
  //*
  //*    + + + + + + + + + + + + + + F A T D U M P + + + + + + + + + + + + + +
  //*    +                                                                   +
  //*    +   THIS JOB DUMPS CMWS01 (REBLOCKED DUPE OF DD-88213) BY PRINT     +
  //*    +   COMMAND BELOW!                                                  +
  //*    +                                                                   +
  //*    + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
  //*
2 //TAPEDUMP  EXEC  PGM=FATAR
3 //SYSPRINT  DD    SYSOUT=*
4 //TAPESUMM  DD    SYSOUT=*
5 //SYSUDUMP  DD    SYSOUT=*
  /* ANALYZE TAPE
6 //TAPEIN    DD UNIT=T3480,DISP=OLD,VOL=(PRIVATE,SER=CMWS01),
  //        LABEL=(,BLP,,IN)
7 //SYSIN     DD    *
```

D - 88213

C - 29449

```
FAST ANALYSIS OF TAPE AND RECOVERY -- FATAR   VER 4.3.5   -- INNOVATION DATA PROCESSING  AUTHORIZED   3/26/93   PAGE   1

FATS070 CONTROL CARD TABLE SIZE IS   4096 BYTES

FATAR CONTROL CARDS

   1--   ANALYZE LABELS=NO,RETRY=5
   2--   PRINT LF=ALL,B=ALL,L=2000

FATS071 TAPE BUFFER SIZE IS 65535 BYTES

                                    CHARACTERISTICS OF THE TAPE TO BE ANALYZED
                                              UNIT  SERIAL  DEN  TRTCH
                                               5BB  CMWS01  38000

                                                FATAR DETAIL REPORT

 BLOCK  LNGTH/  MESSAGE/                1...5...10...15...20...25...30...35...40...45...50...55...60...65...70...75...80
 NUMBER DISPL  BLOCK TYPE                        (COLUMN GRID IS VALID ONLY FOR CHARACTER FORMATTED DATA)

* * * * * * *  START FILE       1

      1  5976  PRINT REQUESTED          --------------------+--------------+--------------+-------------+
       +00080                                  File name =  PS0384R1-M0
       +00160                                                Lat   |   Lon  |   Lt   | Height  Initial time  88: 4:21:
       +00240                           9:31:59.100  -0.810 |  30.27 | 11.551 | 266.58  Final time    88: 4:21: 9:35: 4
       +00320                          .445  -0.164 |  42.01 | 12.385 | 259.20
       +00400                                                          Sun referred spin rate = 36.371 deg/sec
       +00480
       +00560                                        Transition shadow => sun at time =  88: 4:21: 9: 5:29
       +00640
       +00720                              Norad elements set  :
       +00800                                                                                          Epoch
       +00880                             |  Mean Motion derivatives |     B*                  88: 4:20: 8:48:33 | 0.0
       +00960                          00704730  0.00000D+00 |  0.38971D-03            Inc   |  Raan    |     Ecc    |
       +01040                             AP     |    AM    | P rev/day        2.996  |  46.4957 | 0.02499400 | 346.153
       +01120                          8 |  13.2142 |15.448521780      --------------------+--------------+------------
       +01200                          --+-------------+                        State of instruments :
       +01280                                          --------------------+--------------+--------------+-------------
       +01360                          +        Frame    1  -  38  |   38  -  43  |   43  -  48  |
       +01440                           Time     0. - 303. |  303. - 344. |  344. - 393. |                      ASSI
       +01520                               OFF    |       ON     |      OFF     |                  ---------------
       +01600                          ----+--------------+--------------+-------------+        Frame    1  -  48  |
       +01680                                                                          Time     0. - 393. |
       +01760                                                                  EFI         OFF    |
       +01840                                                        --------------------+--------------+------------
       +01920                          --+-------------+        Frame    1  -  48  |

* * * * * * *  END OF FILE      1  -- FILE CONTAINED       1 BLOCKS

* * * * * * *  START FILE       2

      1  6120  PRINT REQUESTED          --------------------+--------------+--------------+-------------+
       +00080                                  File name =  PS0385R1-M0
       +00160                                                Lat   |   Lon  |   Lt   | Height  Initial time  88: 4:21:
       +00240                          11:12:18.181   0.738 |  34.51 | 13.506 | 261.08  Final time    88: 4:21:11:14:43
       +00320                          .593   1.223 |  43.71 | 14.159 | 268.43
       +00400                                                          Sun referred spin rate = 36.382 deg/sec
       +00480
```

FATAR TAPE SUMMARY FOR TAPE VOLUME -CMWS01- AT DENSITY 38000 BPI 3/26/93

PHYS FILE	DATASET NAME (LAST 17 CHARS)	FILE SERIAL	FIL# VOL#	CRDATE	EXPDATE	REC-FM	LRECL BLKSZ	CREATING JOB&STEP	SEC	BLOCKS READ	BYTES READ	PERM TEMP	---BLOCKSIZES---- MIN	AVG	MAX	EST. FEET
1	ZMCOWFDM.R0004825									1	5976	0	5976	5976	5976	0
2	ZMCOWFDM.R0004825									1	6120	0	6120	6120	6120	0
3	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
4	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
5	ZMCOWFDM.R0004825									1	6264	0	6264	6264	6264	0
6	ZMCOWFDM.R0004825									1	6264	0	6264	6264	6264	0
7	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
8	ZMCOWFDM.R0004825									1	5976	0	5976	5976	5976	0
9	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
10	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
11	ZMCOWFDM.R0004825									1	5976	0	5976	5976	5976	0
12	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
13	ZMCOWFDM.R0004825									1	6264	0	6264	6264	6264	0
14	ZMCOWFDM.R0004825									1	6552	0	6552	6552	6552	0
15	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
16	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
17	ZMCOWFDM.R0004825									1	6264	0	6264	6264	6264	0
18	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
19	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
20	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
21	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
22	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
23	ZMCOWFDM.R0004825									1	6264	0	6264	6264	6264	0
24	ZMCOWFDM.R0004825									1	6480	0	6480	6480	6480	0
25	ZMCOWFDM.R0004825									1	6048	0	6048	6048	6048	0
26	ZMCOWFDM.R0004825									1	6048	0	6048	6048	6048	0
27	ZMCOWFDM.R0004825									1	6048	0	6048	6048	6048	0