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The Magsat Bibliography

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INTRODUCTION

Magsat was a NASA Project/Mission with primary objectives to obtain data for improved modeling of the time varying magnetic field generated within the core of the earth, and to map variations in the strength and vector characteristics of crustal magnetization. Magsat was discussed initially by U.S. Geological Survey (USGS) and NASA scientists in the late 1960's and was officially approved in 1977. The instruments and the satellite were constructed from 1977-1979, under the direction of the GSFC project office headed by G. Ousley. Principal contractor for the spacecraft was the Johns Hopkins Applied Physics Laboratory with L. D. Eckard as project manager.

Launch occurred on October 30, 1979, into a twilight, sun-synchronous orbit with 96.76^{o} inclination, 561 km apogee and 352 km perigee. The spacecraft remained in orbit for seven and a half months, until June 11, 1980.

By almost any measure this project has been a success. Launch was within budget and on time. The data acquired exceeded prelaunch quality requirements even though the instrumentation encountered some problems.

Perhaps a better measure of success for a scientific mission is the number and quality of publications. For Magsat this measure is documented in this bibliography. We have included all papers we are aware of which have to do directly with the Magsat project. This includes scientific papers, papers describing the spacecraft and its instrumentation, and papers describing the data and its processing. There are, of course, some grey areas. We have tried to limit the scientific papers to those which actually utilized either Magsat data or a product, such as a spherical harmonic main field model, which directly depended upon the Magsat data. Further, if it was a product which was used, we tried to only include papers where that product was important to the result of the paper. For example, if a paper used a Magsat field model, but could have used any field model, whether derived from Magsat data or not, that paper was not included. This eliminated many papers. We also did not in general include theoretical papers which were prompted by Magsat but did not use the Magsat data or a product therof.

The present Bibliography is complete, to the best of our knowledge to 1 March, 1987, and comprises 229 papers. These include descriptions of the program, the spacecraft and the data as well as scientific papers. We trust that it will prove a valuable resource to both the scientific community and to anyone who wishes to gain insight into the nature and results of the program.

ORGANIZATION OF THE BIBLIOGRAPHY

The Bibliography proper is in two parts. Part I lists all the papers together in order by author. Part II is subdivided into nine parts as follows:

1. Papers giving background for Magsat.
2. Papers having to do with the Magsat program.
3. Papers describing the spacecraft/instrumentation.
4. Papers describing the data and its processing.
5. Scientific papers studying, or related to studies of, the field from the earth's crust.
6. Scientific papers studying, or related to studies of fields originating external to the earth.
7. Scientific papers studying, or related to studies of, the field originating in the earths core.
8. Scientific papers related to earth induction.
9. Review papers.

Included are papers which are "submitted", "in press" and a few preprints. At present the Bibliography is not annotated. It is hoped that annotation can be added in a later edition.

PUBLICATION STATISTICS

There are a total of 229 papers listed in the Bibliography. These include papers from three "special issues": The April 1982 issue of Geophysical Research Letters, with 36 papers; Volume 36, Number 10, 1984 of Journal of Geomagnetism and Geoelectricity, with 13 papers, and the February 28, 1985 issue of Journal of Geophysical Research, with 26 papers. Thus, these three issues account for 75 of the 229 papers.

The bibliography includes 2 Doctoral and 9 Masters theses.

A breakdown by Journal or publication type is as follows (the number in parentheses is the number of papers in that journal):

Geophysical Research Letters (49)
Journal of Geophysical Research (47)

Journal of Geomagnetism and Geoelectricity (18)
APL Technical Digest (13)
Physics of the Earth and Planetary Interiors (11)
Theses (11)
Tectonophysics (9)
Earth and Planetary Science Letters (7)
Geophysical Journal of the Royal Astronomical Society (7)
Geophysics (6)
NASA Technical Memos (4)
Magnetospheric Currents: AGU Publication (4)
Journal of Geophysics (4)
Prospect and Retrospect in studies of Geomagnetic Field Disturbance: U. of Tokyo Publication (4)
Geomagnetism and Aeronomy (3)
Geology (2)
Reviews of Geophysics and Space Physics (2)
Proceedings of the Indian Academy of Sciences (2)
AGU Monograph
Advances in Space Research
Annales Geophysicae
Annals de Geophysics
BMR Journal of Australian Geology and Geophysics
Bull. Australian Society of Exploration Geophysics
Canadian Journal of Earth Science
Cold Regions Science and Technology
Computers and Geosciences
Encyclopedia of Geophysics
EOS, Transactions of the AGU
Geoexploration
Geological Journal
Geological Society of America
IEEE Transactions on Magnetics
Journal of Guidance, Control, and Dynamics
Journal of the Alaska Geological Society
Journal of the British Interplanetary Society
Philosophical Transactions of the Royal Society of London
Science Today
Preprints (2)

Table 1 Summarizes the publications by category, as used in the second part of the Bibliography, and year. Figure 1 shows a plot of the number of main field, crustal field and external field studies per year, as well as the total number of publications per year.

Some comments are in order. As might be expected, the peak years for publication are 1982 and 1985, the years of the GRL and JGR special issues. The strong continuation of published studies into 1986, which is apparently continuing into 1987, is perhaps a bit unexpected since major project funding terminated in 1983.

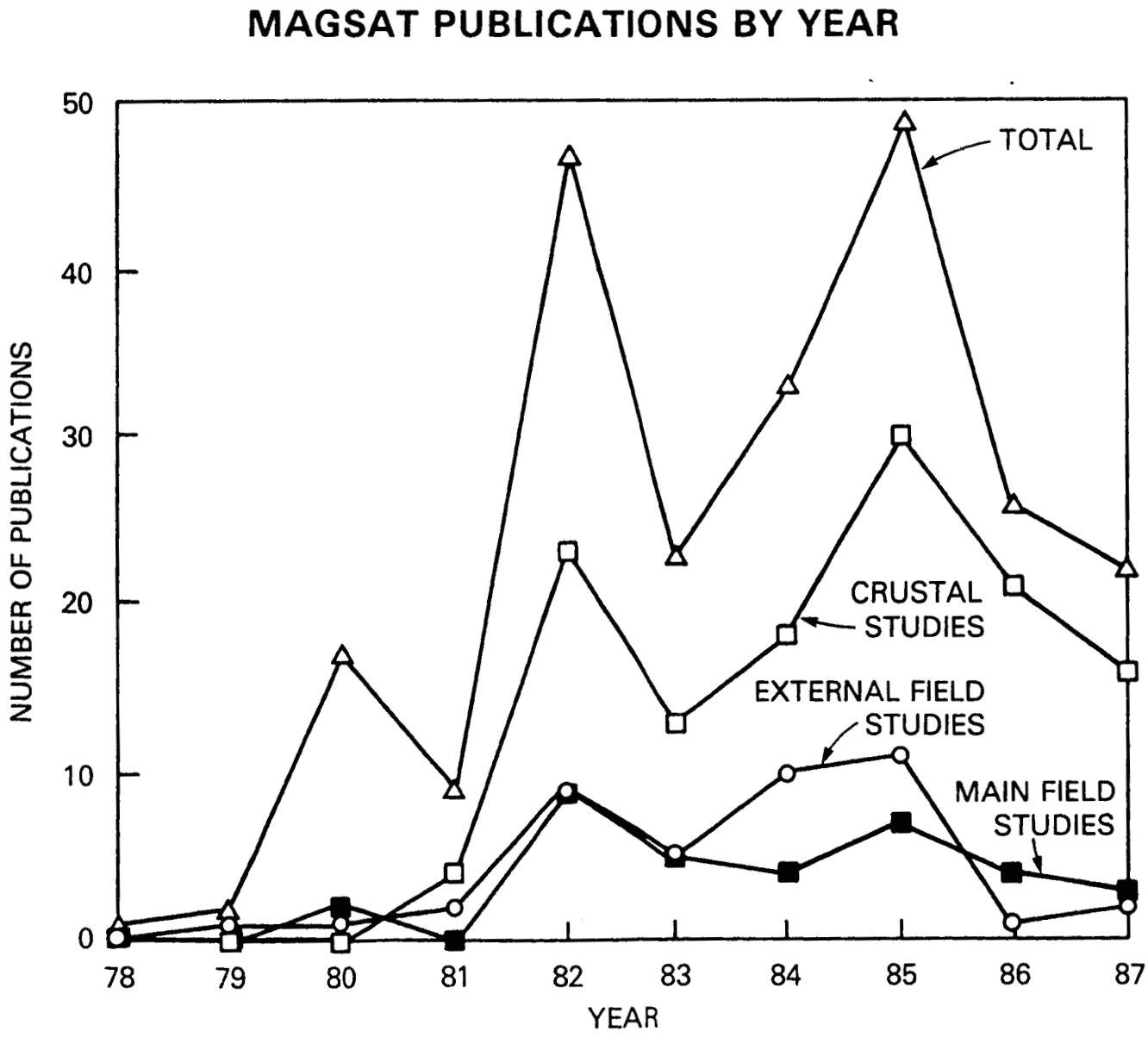
The number of main field studies may seem low, but this is to be expected. There is only one main field at 1980 and once it is accurately determined further calculation simply serves to give small refinements. The possibilities of significant modeling papers is thus small. Two things are very encouraging. First, many of the papers have to do with the development of new techniques for models which both give more accuracy and which better reflect the physics of the inner earth. The second is that significant studies of the inner earth, the core, core-mantle boundary and mantle have been steadily forthcoming. It seems that Magsat not only provided a good data base for some of these studies but also injected new enthusiasm into the community.

Study of crustal fields from satellite data is a relatively new discipline in geophysics. It has gotten off to a somewhat slow start and there has been a measure of skepticism regarding the meaning and usefulness of the data. As pointed out by Langel in the introduction of the JGR special issue, there was a great deal of effort spent in just trying to gain confidence in the data and verify that we were indeed measuring crustal fields that could be interpreted meaningfully. Some of this skepticism remains. But as the data have become better understood the initial questions regarding the data are beginning to be answered. And it is more and more clear that significant advances in understanding of the crust have been made and will continue to be made by the study of this data. The continuing rate of publication attests strongly to this fact.

TABLE 1:

SUMMARY OF PUBLICATIONS FROM THE MAGSAT PROGRAM

YEAR-->	78	79	80	81	82	83	84	85	86	87	Total
CLASSIFICATION											
Bkgrnd/programatic	0	1	2	0	0	0	0	0	0	0	3
Instrumentation	1	0	11	1	0	0	0	0	0	0	13
Data description	0	0	0	1	2	0	0	0	0	0	3
Review	0	0	1	1	3	0	1	1	0	1	8
Crustal studies	0	0	0	4	23	13	18	30	21	16	125
Main field	0	0	2	0	9	5	4	7	4	3	34
External field	0	1	1	2	9	5	10	11	1	2	42
Earth induction	0	0	0	0	1	0	0	0	0	0	1
Total	1	2	17	9	47	23	33	49	26	22	229



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16. Abstract

Publications related to the Magsat project number 228, as of March 1987. Of these, 34 deal with analysis of the Earth's main magnetic field, 125 with analysis of the Earth's crustal field, and 42 with analysis of the magnetic field originating external to the Earth. The remainder document the magsat program, satellite, instruments or data or are review papers. The Bibliography is divided into two parts. The first lists all papers by first author; the second is subdivided by topic.

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