Magnetic Field Measurements by the Satellite Systems: A Review

Jyh-Woei Lin

ABSTRACT

Recently, in real-time the Disturbance storm time (Dst) indices observing by Geostationary Operational Environmental Satellite (GOES) was performable using so-called Goes-Magnetometer. Dst index is a geomagnetic index, which is the L1 data with the lead time, to detect geomagnetic storms with the lead time. Geomagnetic storms affected human activity and caused economic losses. Therefore, Dst index is a very important index. The past recorded contributions of corresponding Satellites were introduced. Now, in real-time Dst indices observing by Geostationary Operational Environmental Satellite (GOES-16) (Goes-Magnetometer) was performed. However, the Dst index was not the issue in this study.

Keywords: Disturbance storm time (Dst) indices; Geostationary Operational Environmental Satellite (GOES); Goes-Magnetometer; Geomagnetic Storms; GOES-16.

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I. INTRODUCTION

In 1966, the first magnetic field measurement instruments were installed in geosynchronous orbit on the ATS-1 (Application Technology Satellite) (Table I), and operational measurements began with the SMS (Synchronous Meteorological Satellite) in May 1974 (Table II). Following two SMS satellites, the first Geostationary Operational Environmental Satellite (GOES) was launched in October 1975, which continued with two satellites called GOES-8 and GOES-9. These two satellites, instead of two SMS satellites, are used for space weather operations, e.g., recording magnetic field data. The GOES system's data are collected and processed by the National Oceanic and Atmospheric Administration (NOAA) Space Environment Center and are archived and distributed through the National Geophysical Data Center of NOAA. A continuous record spanning several decades is one of the advantages of these measurements over those made in other orbits over more limited time spans. In terms of describing the magnetometer instrument, the geosynchronous space environment, and the operational and scientific uses of the GOES magnetometer data, the magnetometers on the three-axis stabilized GOES I-M (1994–2013) (called GOES 8-12 after launch) series of satellites are three-axis fluxgate magnetometers manufactured by the Schonstedt Instrument Company, and they were integrated into the spacecraft by Space Systems [1]–[6]. In real-time Disturbance storm time (Dst) indices observing by Geostationary Operational Environmental Satellite (GOES-16) (Goes-Magnetometer) was performed (Fig. 1). Finally, the measurement of Dst index is not the issues in this study

II. CORRESPONDING HOWPAGES

The information of the Application Technology Satellite (ATS) System as follows:

<https://eosps.nasa.gov/missions/applications-technology-satellite>.

The information of the Synchronous Meteorological Satellite (SMS) System as follows:

<https://eosps.nasa.gov/missions/synchronous-meterological-satellite>.

The information of the Geostationary Operational Environmental Satellite (GOES) System as follows:

<https://www.nasa.gov/content/goes>.

The information of The GOES I-M System (1994–2013) as follows:

<https://eosps.nasa.gov/missions/geostationary-operational-environmental-satellites-i-m>.

In real-time Dst indices observing by Geostationary Operational Environmental Satellite (GOES-16) (Goes-Magnetometer) is as follows:

<https://www.swpc.noaa.gov/products/goes-magnetometer>.

III. CONCLUSIONS

Following SMS system, ATS-1 was used as first magnetic field instrument in 1966. The first Geostationary Operational Environmental Satellite (GOES) was used to record magnetic field data in October 1975. These two satellites called GOES-8 and GOES-9, instead of two SMS satellites, were used to record magnetic field data. Now, in real-time Dst indices observing by Geostationary Operational Environmental Satellite (GOES-16) (Goes-Magnetometer) was performed.

TABLE I: THE APPLICATION TECHNOLOGY SATELLITE (ATS) SYSTEM

Mission	Launch Date (UTC)	Duration	Major investigations	Mission highlights
ATS-1	December 7, 1966	18 years	Spin stabilization, investigated the geostationary environment, space communications	First full-Earth cloud cover images
ATS-2	April 6, 1967	6 months	None	Launch vehicle failure caused spacecraft to reach undesirable orbit. Limited data was obtained
ATS-3	November 5, 1967	At least 20 years	Spin stabilization, communications tests	First color images from space. ATS-3 was also used as a communications satellite, providing links to Antarctica and the Pacific Basin
ATS-4	August 10, 1968	launch failure, mission did not occur	None	Intended for geostationary orbit. Launch vehicle failure left it in a useless LEO orbit. Little data was obtained.
ATS-5	August 12, 1969	3 year design life	Communications tests, intended (failed) testing of an ion engine	Spacecraft entered an unintended spin and encountered excessive acceleration. This caused damage to the ion engine.
ATS-6	May 30, 1974	5 years	Tested several communications technologies, satellite assisted search and rescue, and broadcast television.	First satellite to broadcast educational content.

TABLE II: THE SYNCHRONOUS METEOROLOGICAL SATELLITE (SMS) SYSTEM

Designation	Launch Date (UTC)	Rocket
SMS-1	May 17, 1974	Delta 2914
SMS-2	February 6, 1975	Delta 2914

Fig. 1. In real-time Dst indices observing by Geostationary Operational Environmental Satellite (GOES-16).

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