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Citation Classics

Ness N F, Scearce C S & Seek J B. Initial results of the IMP-1 magnetic field experiment. *J. Geophys. Res.* **69**:3531-69, 1964.

The authors present the first comprehensive survey and discovery by the IMP-1 satellite of the magnetosphere. The physical characteristics and locations of these boundaries, formed by the interaction of the magnetized solar wind plasma with the geomagnetic field, are studied. [The *SCI*® indicates that this paper was cited 270 times in the period 1964-1977.]

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"Identification of this paper as a 'citation classic' is a very pleasant way to be reminded of successful research conducted some years ago. My colleagues and I are suitably flattered by this long term result, although that does not compare with the excitement of discovery which permeated many of the results of this early experiment in space magnetometry. Our research was done just as the space age began, but prior to any accurate or comprehensive studies of the interplanetary magnetic field or the interaction of the solar wind with the geomagnetic field. The contemporary spirit of exploration of space was heightened by the competition with the USSR. The technological challenges of all spacecraft investigations were great because of the new environment and criteria by which such experiments were conducted.

"The IMP-1 spacecraft was the first of 10 such customized science laboratories to be launched into space during a particularly vigorous phase of exploration in space (1963-1973). One of them. Anchored IMP (AKA Explorer 35) was placed in lunar orbit and provided definitive comparison data for several ALSEP experiments This series of spacecraft represents one of the better investments the NASA and the nation have made with respect to scientific return.

"A particularly critical but not unique aspect of space experiments had been the slow processing, analysis and interpretation of data obtained. I was well versed in the use of high speed digital computers at a time when such facilities and related experiences were in short supply. Challenged by the scientific and technical tasks of exploring our unknown terrestrial environment in space and the properties of magnetized plasmas associated with the earth and sun, I also accepted an assignment to provide initial processing of data for all other 8 experiments on the Interplanetary Monitoring Platform No. 1 (AKA Explorer 18). Thus, with other colleagues, we developed the IMP Information Processing System, and so the results of not only our experiment but all the others on the spacecraft benefited from its development and prompt distribution of data.

"IMP-1 was launched during a period of minimum solar activity, so that conditions in interplanetary space were relatively stationary. As a result, we were able to detect readily the regular ordering of the direction of the magnetic field in interplanetary space ('sectors') and to identify the field as being of solar origin, having been carried outward by the expanding solar corona ('solar wind'). Our first measurements of the detached bow shock wave, standing off from the distorted geomagnetic field, the magnetosphere, made a collisionless shock wave in astrophysical plasmas available for direct study. However, the most striking result of our studies was the discovery of an extended geomagnetic tail, directed away from the sun, much in the fashion of a cometary ion tail and due to the same cause, i.e., the solar wind flow. The tail is now known to be extremely important in the dynamics of the magnetosphere But we still have much to learn before the dynamics of the magnetosphere are understood."