

Foreword

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The initiation of this new journal comes at a time when the field of terrestrial observation is entering a new phase. A historical perspective suggests the following. Observations from space have been under development since the beginning of the space era in the 1950's. The potential value to observe the earth from space was seen as enormous in those early years of the Space Age. The value of the space vantage point was seen to be its synoptic view; being higher means one can see more and more quickly. This was perceived as an advantage both in that the broader view of the earth was new and should shed new insight on conditions and also because the broader view should make the acquisition of data for any given area less expensive. Though satellites are expensive, the volume of data they can gather is so much larger than that of aircraft or surface observers that the per-unit cost would be much lower.

Measurements of the solid, liquid, and gaseous earth (the land, the oceans, and the atmosphere) were each thought to be of enormous importance scientifically but even more so for practical, everyday uses. The value of observations of the atmosphere and the oceans were readily apparent to scientists and to practitioners, alike, and even to the "person in the street." Operational weather data gathering quickly followed research systems, and the responsibility for operational data gathering of the atmosphere and the ocean was focused in the hands of NOAA, a governmental agency. Many value-added commercial firms came into being to bridge the gap between raw data and the practical public uses. In short, while still growing and polishing the technology, the matter of using satellite

observations for weather and climatic uses quickly became commonplace.

On the other hand, even though its potential impact was seen at the outset as even greater, use of satellites to gather information about the land surface has come about more slowly. The earth's land surface is much more complex, detailed, and quite dynamic. There really are two types of systems that needed to be conceived, for the following reason. Fundamentally, remote sensing is based on the assumption that the energy field emanating from any subject matter contains information about what the subject matter is and its condition. Then, how to make measurements from which to extract this information becomes the key question. Since the energy field is finite and is thus controlled by the Law of Conservation of Energy, there are three basic variables involved, spatial resolution, spectral resolution, and signal-to-noise ratio. If one measures the energy field in very fine spatial elements (pixels), and one also wishes to do so with great spectral detail (many spectral bands), then there may be little energy left in each pixel and each band to overcome the inevitable noise that will be present in the measurement system; thus, controlling the level of detail of the measurement. One must decide upon what balance to strike between these three. Emphasis on spatial resolution leads to image oriented systems, image processing methods, and human interpretation. Emphasis on spectral detail leads to (less or non-image oriented) computer processing methods, methods which are perhaps less intuitive, and thus must be more highly developed to be acceptable by the future practitioner community. Preliminary example systems of both of these two types are now in being.

Progress on developing a practical level of technology was very rapid in the 1960s, but it has been less so in the last two or three decades. The primary limitation has to do with the availability of data to the user. At this time, certainly for satellite data, the user must use whatever data that has already been gathered. Users, be they researchers or operational, are not in control of when data is collected. Given the circumstances of cloud cover, orbital mechanics, and the limited number of satellites on orbit, data for any given point on earth is available only infre-

quently. Indeed, it is unlikely that data will be collected for any given use at the most appropriate time.

Further, in many cases, there is a significant delay between when data are collected and when it becomes available to the user. It is this factor that is being reduced or eliminated at this time. "Real time" data is becoming available in an increasing number of circumstances as a result of a growing number of ground stations distributed geographically and focused on various aspects of Earth observations. The Purdue Terrestrial Observatory (PTO), a series of antennas and receivers that has recently gone into operation, is one example, and is one motivating factor for the initiation of this journal. It will receive data directly from satellites over the Midwest of the U.S, and make it available immediately via a wide band connection to the World Wide Web.

These types of data gathering should significantly impact both researchers and operational users of terrestrial data by enabling them to much better connect what is observed in the space data with what is apparent from ground observations or conditions and to do so before the ground scene has changed significantly. In addition to adding to the user's insight, it could make possible many applications of such data that really require real time analysis, applications which have been largely excluded to this time.