

THE MAN-MADE SATELLITE; AN INSTRUMENT OF OPPORTUNITY.

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ABSTRACT

With the advent of space-based remote sensing techniques, the data requirements for Environmental, Meteorological and Hydrological applications are being met through the combined use of the surface based and space based systems. This paper is a case study based on operational experience with surface observation from space using the satellite, space based sensor, as an instrument. The analysis was done at the National Meteorological Center (NMC) on products that employ an overhead perspective that is maps; aerial photographs including many that are based on radiation not visible to the human eye. In particular the paper displays several Meteosat/NOAA products and images in the last fifteen years intended for operational meteorology and climate studies from the wide and diverse satellite services at the Zambia Meteorological Department. In Meteorological terms, a product means a parameter which is extracted and processed from the image data and which can be used in everyday applications. The man-made satellite as an instrument is one of the most comprehensive observation instruments. Its product has multi-disciplinary science applications for science and society. It is an instrument of opportunity.

1. INTRODUCTION

A picture is worth a thousand words. Each picture therefore can truthfully be said to distill the meaning of thousands of words. With the advent of space-based remote sensing techniques, the data requirements for Environmental, Meteorological and Hydrological applications are being met through the combined use of the surface based and space based systems. This paper is a case study based on operational experience with Zambian analysis of products that employ an overhead perspective that is maps; aerial photographs including many that are based on radiation not visible to the human eye. The emphasis is on the man made satellite as an instrument. In particular the paper displays several Meteosat/NOAA products and images intended for operational meteorology and climate studies from the wide and diverse satellite services at the Zambia Meteorological Department. The main advantage of the satellite as an instrument of surface observation from space is that the product has a multi-disciplinary science application for both science and society. The products cover a wide range of atmospheric, oceanographic and land cover geophysical parameters.

In Meteorological terms, a product means a parameter which is extracted and processed from the image data and which can be used in everyday applications. Some typical examples of these products are wind and land cover data, water body location, atmospheric trace gas monitoring, meteorological parameters, text and graphical products. The man-made satellite as an instrument is one of the new most comprehensive observation instrument of the Earth from space.

2. OBJECTIVES

The main objective of this paper was to do a case study based on operational experience with surface observation from space. In particular the paper displays several Meteosat/NOAA operational products and images in the last fifteen years from the Zambia National Meteorological Center.

3. DATA AND METHODOLOGY

The study involved collection of all the available and accessible Meteosat/NOAA remote sensed products in the last fifteen years of the satellite technology at the National Meteorological Center. Part of the knowledge on new developments with surface observation from space was acquired from literature materials and International satellite conferences attended by the lead author.

4. RESULTS

In current and previous satellite programmes, Zambia National Meteorological Center (NMC) has been able to access the following services using the satellite (space based sensors) as an instrument:

High Resolution Images (HRI)
Meteorological Products Extraction Facility (MPEF)
Indian Ocean Data Coverage (IODC)
Data collection and Retransmission (DCP)
Meteorological Data Display (MDD)
Satellite Application Facility (SAF)
Numerical weather Prediction (NWP)
Regional services in surveying, mapping and remote sensing (RSSMRS)
Geo-information services (GIS)
Satellite Distribution (SADIS)

Among the processed products from these services are the following:

- Meteorological parameters- temperature, wind, precipitation, relative humidity and sea-surface temperature.
- Land cover data and surface analysis- Normalized Difference Vegetation Index (NDVI), Cold Cloud duration (CCD), Surface albedo.
- Water body location- rivers, lakes, flooded areas, severe storms, clouds and oceans.
- Atmospheric trace gas monitoring- Air pollution (Dust, Smoke), and aerosol indicators.
- Text and graphical formats- Aviation forecast charts, numerical forecast models, images, map views, weather analysis and displays.

- General geoinformation technology products in the assessing and management of - Agriculture and forestry, Soil, geology, water resources, Biodiversity, Rural and urban, Coastal and marine resources, Disasters, Climate change and variability.
- World area forecast system (WAFS) products- significant weather charts.

5. CONCLUSION

The satellite is a fully fledged meteorological, hydrological and environmental instrument covering all aspects from image processing to weather analysis, now casting, forecasting and the automatic production of high quality weather graphics for end users- the scientist and society. It is an instrument designed to operate in the complex data processing environment of modern meteorological services. It represents a flexible and user-friendly approach to the whole concept of earth observation from space to a larger user community. The man-made satellite is an instrument of opportunity.

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Footnote: *The opinion and views presented in this paper do **not in** any way reflect the official representation of the Zambia Meteorological Department. They are solely by the individual authors.*