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Short Communication

Applications of Satellite Derived Information of Rainfall and Flood Extent

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DESCRIPTION

Continuous and consistent data on rainfall is very critical for numerous weather and climate applications like flood forecasting, genesis of cyclones and other storm systems and monitoring long-term water supplies. However, the most challenging task of meteorology is in estimating precipitation since it occurs sporadically but with distinct variations with respect to time and geographic region. Surface observations alone are inadequate for observing precipitation globally. Satellite-based sensors, on the other hand, can observe the entire Earth. When these observations are validated and calibrated with comprehensive and precise ground measurements, satellite based observations offer more realistic, accurate and continuous measurement of global precipitation data sets, especially over the oceans and in remote regions [1,2].

The temporal and spatial variability of the rainfall is very high over the Indian region. The southwest (SW) monsoon in India is 80% source of rainfall which is used for drinking water and irrigation. The temporal variations in the SW monsoon, has a large impact on agricultural productivity, control of water resources and country's economy. The variability in rainfall will lead to heavy floods in one part of the country whereas the other part suffers from drought at the same time. Out of all natural disasters, floods are more dynamic, widespread and frequent disasters and cause heavy loss to human lives and property every year [3]. According to the latest statistics, the number of flood affected people has been rising rapidly due to extreme weather conditions, increasing urbanization and inadequate disaster response.

It is very important to identify the flood extent and estimate the loss to provide relief, rescue and remuneration to the affected people. Conventionally group of people make ground surveys of the affected areas and identify the losses. But many of the times, the flood affected areas are inaccessible making the ground surveys difficult [4]. Floods can be detected in near-real time using satellites since they provide synoptic coverage with high periodicity and unique spectral features. Flood early warning systems are the most useful methods to reduce flood damages.

However, to achieve reliable early warning systems, accurate rainfall estimates are required. But it is very difficult to measure rainfall when ground-based measurement networks like rain gauges or weather radar are either scanty or non-existent.

It is very much essential to derive rainfall and flood extent from the satellite based sensors since they provide synoptic, cost effective, reliable and scientific information including at global scale. This thesis work discusses the advantage of satellite derived rainfall and techniques for deriving spatial flood extent from satellites and their applicability for flood alerts, flood response and flood mitigation in India. Rainfall is a highly spatially variable and is measured conventionally by point based fixed rain gauge stations. Rain gauges provide a relatively direct measurement of rainfall at a specific point but their availability in near real time and at a sufficient spatial resolution is limited. Moreover, rain gauge measurements have wind induced errors and a point measurement represents sufficient coverage [5].

CONCLUSION

Data from individual rain gauges and rain gauge networks have been used for more than a hundred years to analyze rainfall-runoff relationships and more recently, to derive hydrologic models. Conventional rain gauge networks over the land and buoys over the ocean provide accurate measurement of precipitation at specific locations and considered as the standard reference data. But, uneven distribution of rain gauges over unpopulated regions such as deserts, orographic regions, etc. limit the use of this data at global scale.

Dense networks are possible in very small areas for specific reasons (e.g., flood warning), but are prohibitively expensive and logistically challenging for dense coverage of larger areas. Global rain gage coverage at the spatial and temporal resolution necessary for global hydrologic studies and modeling is thus not currently considered feasible.

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