CGMS – XXIX –INDIA WP- 04
Prepared by India
Agenda Item: II/4

Quantitative Precipitation Estimates from the Infra-red data of INSAT-1D for various Meteorological Sub-divisions of India

SUMMARY

This paper summarizes results of a limited study conducted over Indian sub- continent for the period 1997-2000 with a view to improve the Quantitative Precipitation Estimates (QPEs) being derived operationally with INSAT data using Arkin's technique. Based on a detailed study, best possible combination of temperature threshold and rain –rate constants have been found for various sub-divisions. By using these revised parameters improved quality of QPEs have been derived.

Action proposed : None

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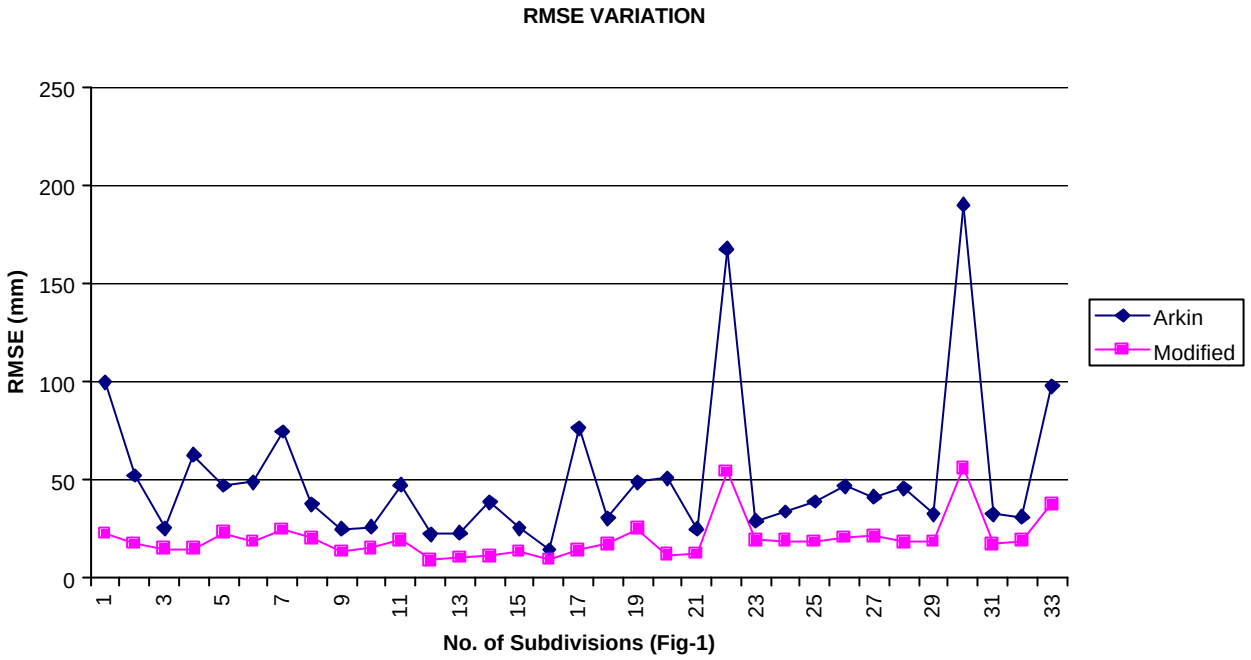
India Meteorological Department have been using Arkin's Technique (Arkin, 1979) operationally for the computation of Quantitative Precipitation Estimates (QPE) on daily , weekly and Monthly basis. The following empirical technique is used operationally:

$$QPE = K \times Fc \times Nc$$

Where, Fc is the fractional clouding, K is a constant (in mm/day) related to rain rate, and Nc is the number of days. The threshold temperature chosen by Arkin was 235 K while a value of 71.2 mm/day was used for the constant K. Studies by Kelkar et al (1998) show that convective precipitation as assessed by this techniques are fairly good over the oceanic regions of the subcontinent. The results over the land areas and orographic regions have not been very encouraging. There are several limitations and sources of error in this type of rainfall derivation due to different temporal and spatial scales of two measuring systems.

India has large landscape of various kinds of physical terrain, orography etc. Therefore, it is expected that the rain rate coefficient and threshold temperature values over different parts of India will be different. Hence, attempts have been made in Sat. Met. Division, IMD to compute QPE with some modifications in this technique by making variations in the temperature threshold and the rain rate coefficient. Different combinations of temperature threshold and the rain rate coefficients have been used for computation of QPE over 33 meteorological sub-divisions of India for the monsoon seasons of 1997-2000. A weekly comparison of QPE has been made with actual sub-division wise rainfall for the above period. Based on the study of actual rainfall versus QPE, weekly sub-division wise assessment has been made for the suitability of temperature threshold and rain rate coefficient combination. A statistical analysis of sub-division wise suitability of temperature threshold and rain rate coefficient has provided a reasonable basis for routine QPE computation in various meteorological sub-divisions of India. Further fine tuning of this study is under progress. The RMSE errors in comparison to Arkin's technique are shown in Fig.1. The results clearly show improvements. These results will be useful for derivation of improved quantitative precipitation estimates.


RMSE VARIATION
250
200
150
100
50
0
RMSE (mm)
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
No. of Subdivisions (Fig-1)
Arkin
Modified