

Coherent rainfall zones: Case study for Karnataka

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Abstract. Generally average rainfall over meteorological subdivisions is used for assessment of the variability of monsoon rainfall. It is shown here that variations of seasonal rainfall over the meteorological subdivisions of interior Karnataka are not coherent. A methodology for delineating coherent rainfall zones is developed in this paper and applied to derive such zones for the State of Karnataka.

Keywords. Monsoon variability; coherent rainfall zones.

1. Introduction

The major problem in monsoon meteorology is understanding the nature of the variability of the monsoon rainfall on different spatial and temporal scales. Over the monsoonal regions there is a large interannual variability of rainfall from droughts to years with a good monsoon. The severity of droughts can be assessed either in terms of the deficit of the rainfall in a season/year or in terms of the impact on critical resources such as agriculture. Generally droughts are defined in terms of the deficit of rainfall because it is not easy to assess quantitatively the impact on specific resources. Large anomalies in seasonal or annual rainfall generally occur simultaneously over regions which are hundreds of kilometers in extent because the monsoon is a planetary scale phenomenon. Hence the average rainfall over regions of this spatial scale viz the meteorological subdivisions (figure 1), is used by the India Meteorological Department for assessment of the monsoon performance in a specific year or a season.

It is clear that such an assessment is meaningful only if the variations of the rainfall for the period of interest are coherent over each of the meteorological subdivisions. Otherwise, even when the subdivisional average rainfall is normal, parts of the subdivision may experience drought while the rainfall may be normal or in excess over the rest. Our analysis of the time series of monthly rainfall over the State of Karnataka (figure 1) has revealed that two of the three meteorological subdivisions of the State are not coherent with respect to the variation of annual and seasonal rainfall. This implies that the subdivisional average does not reflect the experience of the subregions within these subdivisions and the availability of critical resources such as agricultural produce and water may not be related to the quantity of the subdivisional rainfall. For a meaningful assessment of the variability of rainfall it is necessary to use zones over which rainfall variations are coherent over the time scale of interest. Such coherent rainfall zones have to be identified for defining the occurrence of droughts, estimating their impact and for planning remedial measures. Clearly, coherent zones should form the basic unit for deriving the detailed statistics of rainfall variation during the