PREFACE

Nature has bestowed Kerala with abundant rainfall. The average annual rainfall of the State is about 300 cm. Despite its small size, Kerala supports about 4% of the population of India and has the highest population density among the Indian states. Kerala has large temporal and spatial variations in rainfall. It will be of great socio-economic importance if we learn to use the rainfall bounty to our greatest advantage and learn to cope with the rainfall variations.

This study focuses on the aspects of south-west monsoon rainfall over Kerala and its variability both on the spatial and temporal scales. The thesis contains eight chapters. In the first chapter a very detailed literature review pertaining to the topic of research is presented. The chapter also includes the physiography of the state and general climatology with special emphasis on the rainfall climatology. Chapter-2 gives a detailed description of the data sets and the method of analysis used in the study. A detailed description of the MM5 model is also given in this chapter.

Chapter- 3-is the study on the Intra Seasonal Variability of south-west monsoon rainfall. This is an important topic studied in the thesis. Intra Seasonal Oscillations of rainfall (ISO) for south Kerala, north Kerala and whole India is studied using the Wavelet Analysis and the statistical significance of the periods at levels 90%, 95% and 99% were determined. The results on the south Kerala rainfall series have been published in *Proc. of Indian Academy of Sciences-Earth and Planetary Sciences* (Vol. 113, No. 2, June 2004).

The interannual variability of Kerala summer monsoon rainfall and that of south and north Kerala rainfall is discussed in chapter-4. It is seen that Kerala’s monsoon rainfall has large interannual variability like Indian Summer Monsoon Rainfall (ISMR). However, Kerala rainfall has no epochal variation unlike ISMR. South Kerala rainfall has a strong decreasing trend that is particularly
prominent in the hill areas of central Kerala around Peermade where there is a
decreasing trend close to 25% in 100 years.

The relationship between antecedent global circulation parameters with
monsoon rainfall of Kerala is studied in chapter-5 and an attempt has been made
to develop a statistical model for long-range forecast of monsoon rainfall for the
state. Four factors have been identified that have strong and significant linear
correlation with Kerala summer monsoon rainfall. The multiple correlation
coefficient of these factors with KSMR is 0.72 for the period 1977-2003 and the
estimated rainfall using this equation has a standard error of estimate of 22.9cm
which is about 64% of the standard deviation of KSMR.

In chapter-6 we have studied the diurnal variation of south-west monsoon
rainfall using data of 33 stations mostly in central and north Kerala. It is found
that the first (diurnal) and second harmonics (semi-diurnal) of 24-hour rainfall
are found to be prominent. Combination of these harmonics give afternoon
maxima to some stations, morning maxima for another group of stations and a
flat rainfall diurnal curve for the remaining stations.

In chapter-7 we have used Mesoscale Model MM5 to simulate the
convective monsoon rainfall to understand the controls on the rainfall. Two
factors control the rainfall of Kerala. One is a dynamic control by the Low
Level Jet stream. The other is the orographic control. Using a mesoscale model
which has the orography of central Kerala hills (Anamalai and Cardamom hills)
we have simulated the convective rainfall around these hills for three days with
Low Level Jet axis just south of Kerala and three days with Low Level Jet axis
just north of Kerala. These simulations bring out the controls by LLJ and the
orography.

In the last chapter (Chapter-8), the major findings of this thesis are
summarized. The scope for future studies is also discussed.