Preface

Monsoon is a unique weather phenomenon of the Indian subcontinent and is among several geographically distributed observations of global monsoon taking place in the Indian subcontinent. It is one of the oldest weather observations, an economically important weather pattern. Yet it is only partially understood and notoriously difficult to predict. Several theories have been proposed explaining the origin, the process, the strength, the variability, the distribution and the general vagaries of the monsoon of the Indian subcontinent, but understanding of the phenomenon and its predictability are still evolving. Indian monsoon is the primary delivery mechanism for fresh water in the Indian subcontinent. As such it impacts the environment (and associated flora, fauna and ecosystems), agriculture, society, hydro-power production and geography of the subcontinent.

In the last five decades, eight major monsoon observational experiments have been carried out. There are four pre-1980 monsoon experiments, namely, International Indian Ocean Expedition (IIOE) carried out during 1960–1965, Indian Summer Monsoon Experiment (ISMEX, year 1973), Indo-Soviet monsoon experiment of 1977 (MONSOON-77), and the monsoon experiment MONEX-79 has been carried out in 1979. The post-1980 experiments are Monsoon Trough Boundary Layer Experiment in 1990 (MONTBLEX), Land Surface Processes Experiment (LASPEX) during 1997–98, the Bay of Bengal Monsoon Experiment (BOBMEX) in 1999, and the Arabian Sea Monsoon Experiment (ARMEX) during 2002–2005. Further, an international experiment, ‘Joint Air–Sea Monsoon Interaction Experiment’ (JASMINE) has been carried out in 1999 over the tropical Indian Ocean. A major international monsoon research programme named MAHASRI (Monsoon Asian Hydro-Atmosphere Scientific Research and Prediction Initiative) has been carried by some Asian countries during 2008–2010. Another programme, the Asian Monsoon Year (AMY) 2007-2012 has aimed to study the Asian monsoon system on different spatial and timescales.

The monsoon systems have been studied by many scientists and find that the monsoon systems depend on various parameters all around the globe. Indian
Meteorological Department has tried to forecast the monsoon for India since 1884. In fact, there are some models to predict monsoon taking into account various parameters. 16 parameter, 10 parameter and 8 parameter models are considered for predicting the monsoon at present. This also underlines the fact that each parameter has its own weightage. In this context, the present thesis is dedicated to the detailed study of Findlater jet (which is one of the important parameter that influences summer monsoon) and its association with Indian summer monsoon or south west monsoon. Jet stream is a current of fast moving air found in the upper levels of the atmosphere. The two jet streams which are at the tropopause level and influence monsoon are subtropical westerly jet stream and easterly jet stream. During the late sixties and early seventies, J. Findlater, a British meteorologist has observed very strong winds (Low level jet) in the form of a narrow current of air off the coast of east Africa. Using monthly mean winds Findlater (1971) has shown that the Low level jet splits into two branches over the Arabian Sea, the northern branch intersecting the west coast of India near 17º N, while the southerly branch passes eastward just south of India and this Low level jet is termed as Findlater jet or Somali jet which is named after the scientist J. Findlater. It is this Findlater jet associated with south west monsoon. As mentioned above the monsoon prediction models be it 8 parameter model or 10 parameter model the Findlater jet is not directly included. However, there are number of scientific articles highlighting the importance and relation of Findlater jet or Somali jet.

The present thesis is a unique study on Findlater jet or Somali jet and emphasizes the role of Findlater jet. The aim and objective of the present thesis is to study in detail the importance of Findlater jet and its relation with south west monsoon and other related Air-Sea parameters. The data and methodology is given in chapter 2. The main thesis work consists of two parts. The first part deals with Findlater jet climatology, structure and interannual variability and is given in chapter 3. Indian Ocean is a tremendous storage house of thermodynamic energy which drives the monsoonal circulations, which are a result of differential heating between land and sea. So, the heat fluxes, wind and Sea Surface Temperature besides the total radiation balance drives the intense south west monsoon. So, the ocean parameter especially the radiation parameters and heat fluxes gives a clue to the temporal and spatial variation in monsoonal circulation as well as the
intraseasonal and interannual variations of monsoon. Therefore, the second part deals with the intraseasonal variability of Findlater jet and its association with various Air-Sea parameters like Rainfall, Sea Surface Temperature, Outgoing Longwave Radiation, Latent Heat Flux and Sensible Heat Flux individually and are given in chapter 4. Conclusions of the study and future work are given in chapter 5. One of the significant outcomes of the present doctoral thesis is that the Findlater jet plays an important role in the intraseasonal and interannual variability of Asian monsoon activity. It is desirable that monsoon indices should be developed giving proper weightage to Findlater jet besides other associated factors.