Preface

The metals present in the surface sediments have high demand on a global perspective, and the main reservoir of these elements is believed to be the ocean floor. A lot of studies on metals are going on throughout the world for its quantification and exploitation. Even though, some preliminary attempts have been made in selected areas for the quantitative study of metals in the western continental shelf of India, no comprehensive work has been reported so far. The importance of this study also lies on the fact that there has not been a proper evaluation of the impact of the Great Tsunami of 2004 on the coastal areas of the south India. In view of this, an attempt has been made to address the seasonal distribution, behavior and mechanisms which control the deposition of metals in the sediments of the western continental shelf and Cochin Estuary, an annex to this coastal marine region.

Surface sediment samples were collected seasonally from two subenvironmental systems of southwest coast of India, (continental shelf of Kerala and Cochin estuarine system), to estimate the seasonal distribution and geochemical behavior of non-transition, transition, rare-earth elements, Th and U. Bottom water samples were also taken from each station, and analysed for temperature, salinity and dissolved oxygen, hence the response of redox sensitive elements to oxygen minimum zone can be addressed. In addition, other sedimentary parameters such as sand, silt, clay fractions, CaCO₃ and organic carbon content were also estimated to evaluate the control factors on level of metals present in the sediment. The study used different environmental data analysis techniques to evaluate the distribution and behavior of elements during different seasons. This includes environmental parameters such as elemental normalisation, enrichment factor, element excess, cerium and europium anomalies and authigenic uranium.

The thesis is divided into six chapters. The first chapter gives an introduction to the coastal environment, emerging issues, oceanographic investigations carried out along the west coast of India, the shortfall the need for the present study and objectives. The limitations of previous works and the aim and scope of the present study is also mentioned in this chapter.
The second chapter provides the materials, description of the study region, methodology adopted for sample collection and analyses of water and sediment samples. Also, mentioned are the precision and accuracy of metal analyses, environmental techniques such as elemental normalization, enrichment factor, elemental excess, Ce and Eu anomalies and authigenic uranium.

The third chapter elaborates the seasonal changes in the hydrographic parameters and sediment characteristics along the shelf of Kerala and Cochin estuarine system. This includes bottom hydrography, textural property, energy conditions, organic and carbonate contents.

The forth chapter explains the results on seasonal distribution of non-transition elements such as, Be, Al, Ga, Rb, Sr, Cs, Ba and Pb along the study region. The relationship between the overlying water environment, sediment texture and elemental concentrations are explained using techniques such as element excess, enrichment factors of the elements and normalization.

Fifth chapter explains the seasonal variation of the 15 transition elements such as from Sc to Zn (except Ti), Y to Mo, Hf and Ta along the study region. This chapter also discusses elemental correlation with hydrographical and sedimentological parameters, element excess, enrichment of elements and normalisation. Comparison of coastal sediments with the marine and estuarine system is given in this chapter.

Sixth chapter deals with the seasonal distribution of rare-earth elements, Th and U in the sediments from the shelf of Kerala and Cochin Estuary. The relationship between organic carbon, CaCO₃, dissolved oxygen, temperature, salinity and elements are explained in detail. It also elaborates on the shale normalization; element excess, enrichment factors, Ce and Eu anomalies and authigenic uranium. The statistical techniques such as correlation and multiple regressions used in this study are also given at the end of each chapter.

The summary is given at the end of the thesis, which sum-ups the distribution and geochemical behavior of metals along the two sub-environments. This study contributes significantly to the database of non-transition, transition and rare-earth elements on the west coast India.