Boundary layer climate is a macroscopic meteorological ensemble which is a cumulative effect of micro meteorological ensembles. The heat transfer across soil-air interface and loss or gain of heat at various soil strata beneath sub-soil surface contributes to the microscopic ensembles. Boundary layer climates form a part of Space Physics. The region in which it is influencing is an important creamy location, where most of the biological activities of human beings, animals and plants take place.

Meteorological data required for the analysis for the work have been collected from two locations. One at the Department of Agronomy, Agricultural College and
Research Institute, Killikulum of Tuticorin District located along Coastal region and the other along the Western Ghats region at Horticultural Research Station, Pechiparai of Kanyakumari District. Both the locations belong to Tamil Nadu State.

The meteorological data which include soil temperatures at 0.05, 0.1, 0.15, 0.2 and 0.3 m soil depths, air temperature, rainfall, relative humidity, wind speed, sunshine, evaporation, etc., were collected. The period for which the data have been collected was 20 years at Killikulum since 1993 and eight years of soil temperature data since 2006 and the other meteorological data except rainfall for six years since 2007 and the rainfall data for 20 years since 1993 for Pechiparai.

Weather is a continuous, multidimensional, dynamic and chaotic process and thus weather forecasting, a formidable challenge. Atmospheric Boundary Layer (ABL) is that part of the lower atmosphere in which we live and interface, that moderates biosphere-atmosphere exchange processes.

Boundary layer climates enlightens about the meteorological study of the environment in the profiles of soil-air interface. A good number of remote packages added in the communication satellites in order to statistically monitor the dynamic change of variable in the boundary layer climates. The sanctity of the environment is under threat in the recent decades following the variability of meteorological parameters. So, it is necessary to assess such impact in the environment both in short and long term. In addition, extreme climates leading to drought, flood, soaring sun, etc., followed by revisit of calamities has caused an irrecoverable stress in environment. Hence an effort was taken to study the environment impact assessment of rainfall and soil temperature.
Soil temperature leaves systematic and regular impressions in soil compared to the atmosphere. Annual variations of soil temperature behave like a sinusoidal variation involving seasonal and monsoonal variations. The characteristics of annual variations of soil temperature such as range, rate of change of temperature per week, soil heat flux, soil heat budget, etc., were studied for both the locations.

Rainfall studies make relevance in Boundary layer climates owing to the fact that accumulation or depletion of soil moisture content in soil influences annual variation of soil temperature. Soil temperature and rainfall were inverse parameters in Soil Physics that influences the environment. In the classification of rainfall analysis especially CRD (Crop Rainy Days) and Rain spell characteristics brings usefulness to the environment. Identification and assessment of environmental impact signals alert to the society and to prepare the measure to understand disaster management. Monsoon variability, IMD criteria of rainfall classification, Drought Statistics, CRD analysis were included in the Environment Impact Assessment (EIA).

Classification of climate in soil temperature and rainfall studies is given as follows.

<table>
<thead>
<tr>
<th>SEASON</th>
<th>DURATION</th>
</tr>
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<tbody>
<tr>
<td>Winter (CWP)</td>
<td>– January, February</td>
</tr>
<tr>
<td>Pre-monsoon or Summer (HWP)</td>
<td>– March, April, May</td>
</tr>
<tr>
<td>South West Monsoon (SWM)</td>
<td>– June, July, August, September</td>
</tr>
<tr>
<td>North East Monsoon (NEM)</td>
<td>– October, November, December</td>
</tr>
</tbody>
</table>
Where CWP (Cold Weather Period) and HWP (Hot Weather Period) are contrast seasons and SWM and NEM are monsoon seasons.

Predictions involve periodical and non periodical weather parameters and so Back Propagation Algorithm (BPA) was used as an applied tool for spatial monitoring. The predicted values were compared with the observed and evaluated with error analysis. For error analysis and model validation, statistical tools were used. Predicted data were attempted to indentify Environmental Impact.

Soil temperature data can be used to make predictions about how the ecosystem is affected by warming or cooling the global temperatures. Comparing soil, air and water temperatures over many years helps to understand the changes in global climates and many processes related to it.

Rainfall and soil temperature are the inverse parameters that influences the environment in a great manner. The behaviour of the meteorological parameters is needed to be analysed through years to understand the nature of the environment.

For convenience the thesis is broadly divided into seven chapters.

In chapter I, **Introduction** provides the general introduction to boundary layer in soil- air interface, soil temperature, rainfall, etc.

Chapter II, **Review of Literature** gives a brief review of various studies made on soil temperature, air temperature, rainfall, trend analysis, prediction using BPA, thermal mapping and thermal wave characteristics such as range, rate of change temperature per week, soil heat flux, soil heat budget, monsoon variability, validation methods, etc.
Chapter III, **Data and Methodology** deals with the data analysed and methodology adopted for the present analysis. Details of the experimental sites, data collection and classification of weather are mentioned in this chapter. Thermal mapping of soil temperature, air temperature and the thermal wave characteristics are given. The procedure has been used to predict the meteorological parameters using BPA of ANN and its network are briefly explained. The statistical parameters used to validate the model are also explained. The time series analysis has been used to detect the trend setting. The method involved is the method of least squares. In the trend setting analysis the secular trend has been identified.

Chapters IV-VI comprises of the Results and discussion of the present study.

In Chapter IV, **Thermal mapping and thermal wave characteristics of annual soil temperature** were studied and results were discussed in detail. Accumulation and depletion of soil heat across soil strata have been analysed using the matrix of rate of change of temperature per week. The soil heat flux gives an idea about the exchange of heat across the soil-air interface and it can further be used to assess the status of global warming.

**Predictions of Boundary layer climates using BPA** of ANN was done and the results were given in Chapter V. Soil temperature at different depths and the other meteorological parameters were predicted using BPA and attempted to identify the trend setting. Giving all the meteorological parameters as inputs, the output rainfall was predicted. The predicted values are validated by means of statistical tools. The statistical validation of predictions gives insignificant error in comparison with the observed.
Chapter VI deals with the **Environmental Impact based on meteorological parameters**. Correlation between rainfall and soil temperature reveals inverse relationship between them. Trend analysis of rainfall and soil temperature exhibits an existence of environmental impact. To assess the impact Monsoon variability, IMD criteria of rainfall classification, Drought statistics and CRD analysis were studied and discussed in detail.

Chapter VII contains **Summary, Conclusion and Future scope**.

Finally, the list of Journals and Books are given in the Reference section of the thesis.