# CHAPTER 7

# CONCLUSIONS AND RECOMMENDATION FOR FUTURE RESEARCH

## 7.1 CONCLUSIONS

Following are the conclusions drawn from the research work done.

1) A new brightness temperature difference based method of flood detection and monitoring, incorporating vertical polarization, has been developed, with an accuracy level of 70 percent.

2) A modified brightness temperature ratio based method of flood detection and monitoring, with the introduction of a threshold value, has been developed. The accuracy level achieved in this modified method is about 70 percent, for areas having high soil moisture. This is in contrast to the accuracy of the order of 40 percent only in case of existing methods, where there was no concept of threshold value.

3) Novel use of polarization index in flood detection and monitoring leads to an accuracy level of about 80 percent. Earlier use of this index was only in soil moisture measurement.

4) Use of C-band SAR backscattering coefficient in flood detection and monitoring gives an unprecedented accuracy of 90-100 percent.

5) Flood boundary delineation is also made with the same backscattering coefficient with an accuracy of 90-100 percent.

6) Prediction of flood using polarization index is experimented for the first time, with about 80 percent accuracy. Thus it proves to be a highly potential tool for flood prediction.

7) Precipitation data of microwave satellite is used for the first time in the unique terrain of the Brahmaputra valley and the Assam-Meghalaya border for prediction of flash flood.

8) A novel technique of cloudburst prediction using microwave remote sensing has been developed, with an accuracy level of about 70 percent.

9) An Artificial Neural Network based system has been developed for estimation of soil moisture, for the regions having large open water bodies, with an accuracy of 80 percent. The conventional remote sensing based methods of soil moisture estimation using existing techniques give an accuracy of about 40 percent only in such regions, like North east India.

10) Passive remotely sensed microwave data are suitable only in case of regional study. For studies of phenomenon like flood in smaller areas, active microwave data is to be used.

## 7.2 KEY CONTRIBUTIONS FROM THIS RESEARCH

The key contributions from the research work are development of a number of new potential methods as enlisted below-

1) Flood detection and monitoring using passive microwave brightness temperature difference.

2) Flood detection and monitoring using passive microwave polarization index.

3) Flood detection and monitoring using active microwave backscattering coefficient.

4) Flood boundary determination using active microwave backscattering coefficient.

5) Flood prediction using passive microwave polarization index.

6) Flood prediction using precipitation data.

7) Cloudburst prediction using passive microwave brightness temperature difference.

8) Soil moisture estimation from passive microwave brightness temperature and polarization index values.

Apart from these contributions, modification of existing method of flood detection and monitoring using passive microwave brightness temperature ratio has also been done.

## 7.3 SCOPES FOR FUTURE RESEARCH

Following are the future scopes of the research work.

1) Assimilation of passive and active microwave remote sensing techniques together for better spatial as well as temporal resolution flood mapping.

2) Use of ancillary data for improving the accuracy of the methods developed.

3) Testing of the validity of the developed methods in other parts of the world for more generalised applications.

4) Study on soil moisture determination using remote sensing accurately still remains an open area. The present study may therefore be extended further by using variety of ANN algorithms.