TITLE OF THESIS	**:**	MATHEMATICAL MODELLING OF SNOWFALL BASED ON OROGRAPHIC STUDIES AND SATELLITE DATA OVER INDIAN REGION
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ABSTRACT : The Thesis entitled **"MATHEMATICAL MODELLING OF SNOWFALL BASED ON OROGRAPHIC STUDIES AND SATELLITE DATA OVER INDIAN REGION"** consists of six Chapters. In Chapter-1, an overall introduction and objective of the study has been presented. This chapter further deals with basic definitions of Meteorology used in the thesis and various terminologies, equations governing the problems related to Mathematical Modeling for the rainfall/snow fall. The work done by some scholars has also been referred in this chapter. The concept of orography has been discussed with the mountain waves, lee waves etc. for the various snow mountain ranges in Asia, Europe and USA with emphasis on the Himalayas Mountain ranges in Northern part of country.

Chapter-2 has been titled as "**Linear hydrostatic model of a stably stratified air-stream flow over 2-D profile for rainfall/snowfall over Pirpanjal hills of Kashmir valley".** In this chapter, a mathematical model has been developed to derive mountain drag across Pirpanjal hills of Kashmir valley of India considering the earth's rotation. It has been observed that due to orographic waves generated by mountain drag, windward side of Pirpanjal hills get rainfall/snowfall due to passage of saturated air masses.

Chapter-3 is **Drag and energy flux for critical wind profile across Pirpanjal hills of India.** The aim of the study is to evaluate the mountain drag and energy flux for backward linear shear with a critical level across Pirpanjal hills of India and to develop a mathematical model involving the basic equations of conservation of momentum, mass and density. It is found that mountain drag and energy flux for

the lower level are independent on Richardson number R_i, level z_1 while it depends on the width as well as the height of both the ridges. It can be seen that mountain drag and energy flux for upper level depend on Richardson number as well as sine of level z_1.

Chapter-4 is "**Use of SSM/I derived products for diagnostic studies of Heavy rainfall events over Coastal area of India".** The aim of the study is to use the American Defense Meteorological Polar Orbiting Satellite derived products by courtesy of US Govt. Passive Microwave observations taken by the Special Sensor Microwave Imager (SSM/I) flown on the polar orbiting satellites of USA under the Defence Satellite Meteorological Program (DSMP), for meteorological analysis and weather forecasting under virtually all weather conditions.

The study of Observations of Total Precipitable Water(TPW) over oceanic areas along with ocean surface wind speeds derived from Passive Microwave Radiometer onboard satellites data provide an insight into the areas of low level moisture convergence which is one of the important factors responsible for heavy rainfall. TPW data & surface winds over the oceanic region.

Chapter-5 is the study on "**Potential Use of MSMR data received from IRS-P4 for forecasting heavy rainfall events over Indian Coastal areas".** Heavy precipitation are one of the most common devastating natural weather hazards and forecasting of such events has been studiedusing MSMR data for predicting heavy rainfall particularly over coastal India and neighbourhood.

The study clearly brings out that the application of 6.7 micron WV imageries and satellite derived PW for detecting conditions favorable for occurrence of heavy precipitation is very promising as it clearly brings out that heavy rainfall takes place when both PW & WVP coexists.

Chapter-6 is titled as "**An operational status and overview of Kalpana-1 VHRR derived products at IMD New Delhi: 2003-2006".** In our study done in this chapter we have examined for error abnormalities on eccentricity, semi-major axis and semi-minor axis of Kalpana-1 satellite. In the past KALPANA-1 derived quantitative precipitation estimates (QPE) over the Indian sub-continent and Indian ocean are generated following the algorithm as described by Arkin [2]. The study shows that the QPE is able to produce large-scale features of Indian summer monsoon, but it has certain biases. The difference between the QPE and the observed rainfall indicates that the QPE under-estimates orographic rainfall along west coast of India and along the foothills of Himalayas.