

Contents

	Page No.
List of Tables	vii
List of Figures	viii
Acknowledgements	xv
Abstract	xvi
CHAPTER I : Introduction	
1.0 Background	2
1.1 Objectives of the Study	3
1.2 The Deccan Basalt Province (DBP): An Introduction	4
1.2.1 The Deccan Flood Basalts	4
1.2.2 Mega-geomorphic Units of the DBP	7
1.3 The Study Area: An Introduction	7
1.3.1 Geomorphological Characteristics of the Mega-geomorphic Features of the DBP	8
1.3.2 Climate – Rainfall	11
1.3.3 Laterites	11
1.4 Previous Geomorphological Studies	12
1.4.1 Geomorphological Studies on the DBP	12
1.4.2 GIS/DEM-based Studies in Geomorphology	14
1.5 Methodology	17
1.5.1 Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM) data	17
1.5.2 Digital Geomorphometry Analysis	19
1.6 Arrangement of Text	21
CHAPTER II : Morphological Characteristics of the DBP	
2.0 Introduction	25
2.1 Methodology	26

	Page No.
2.2 Size Properties	27
2.3 Relief Properties	29
2.3.1 Absolute Relief	29
2.3.2 Local Relief	30
2.3.3 Relief Ratio	33
2.3.4 Hypsometric Integral	33
2.4 Surface Properties	34
2.4.1 Maximum Slope	34
2.4.2 Aspect	37
2.4.3 Slope Curvature	37
2.5 Shape Properties	41
2.6 Texture Properties	41
2.6.1 Stream Network generation and Basin Delineation	43
2.6.2 Drainage Density and Constant Channel Maintenance	44
2.6.3 Stream Frequency (SF)	46
2.6.4 Bifurcation Ratio (R _b)	46
2.7 Landscape Fractal Dimension	46
2.8 Interrelationship Between Various Morphometric Parameters	48
2.8.1 River Length and Basin Area Relationships	49
2.8.2 Hypsometric Integral and Maximum Slope	49
2.8.3 Hypsometric Integral and Elongation Ratio	50
2.8.4 Relations Amongst Absolute Relief, Maximum Slope and Drainage Density	50
2.8.4.1 Absolute Relief and Maximum Slope	50
2.8.4.2 Absolute Relief and Drainage Density	51
2.8.4.3 Maximum Slope and Drainage Density	51
2.9 Résumé	51
CHAPTER III : Analysis of Longitudinal Profiles	
3.0 Introduction	55
3.1 Methodology	56

	Page No.
3.2 Description of Long Profile Forms	57
3.3 Normalized Longitudinal Profiles	60
3.4 Semi-Logarithmic Profiles and Average SL Index	61
3.5 Stream Gradient Index	63
3.6 Profile Concavity and Steepness	65
3.7 Résumé	67
CHAPTER IV : Morphology and Morphometric Controls	
4.0 Introduction	70
4.1 Methodology	70
4.2 Control of Lithology	71
4.3 Control of Structure	72
4.4 Response to Gravity Anomaly	74
4.5 Control of Rainfall	76
4.6 Role of Tectonics	77
4.6.1 Drainage Basin Asymmetry	77
4.6.2 Hypsometric Integral	78
4.6.3 Average Stream Gradient Index	80
4.6.4 Valley Width-Height Ratio	81
4.6.5 Hierarchical Classification of Basins	82
4.7 Résumé	83
CHAPTER V : Morphology of the Western Ghat	
5.0 Introduction	86
5.1 Methodology	87
5.2 Ghat Escarpment Morphology	87
5.2.1 Ghat Local Relief and Slope	87
5.2.2 Relief Properties of the Ghat Zone	89
5.2.3 Fractal Dimension of the Western Ghat Zone	90
5.2.4 Swath Profiles	90
5.3 Ghat Rim Planform	93
5.3.1 Escarpment Sinuosity	93

	Page No.
5.3.2 Fractal Dimension of the Western Ghat scarpline	94
5.4 Ghat Offshoots	95
5.5 Beheaded Valley Lengths	96
5.6 Résumé	99
CHAPTER VI : Erosional History of the DBP Landscape	
6.0 Introduction	101
6.1 Methodology	102
6.2 The Evolution of the Upland Landscape	103
6.2.1 The Deccan Trappean Landscape	103
6.2.2 Development of Upland Laterites and Erosion of Valleys	106
6.2.3 Formation of the High-level Surfaces of the Upland	108
6.2.4 Evolution of the Box-shaped Valleys of the Upland	110
6.3 Evolution of the Western Ghat Escarpment	111
6.3.1 Origin of the Western Ghat Escarpment	112
6.3.2 Mode of Origin and Recession of the Western Ghat Escarpment	113
6.3.3 Mechanism of Western Ghat Escarpment Recession	116
6.3.4 Ghat Palaeo-position and Rate of Escarpment Recession	118
6.4 Formation of the Coastal Lowland	122
6.5 Résumé	124
CHAPTER 7 : Overview and Conclusions	
7.0 Introduction	127
7.1 Major Findings	127
7.2 Model of Landscape Evolution in the DBP	135
7.3 Outstanding Questions	136
7.4 Future Research Directions	137
REFERENCES	139
