Contents

1	Introduction	9
2	Theoretical Background	13
2.1	Extreme Weather and Climate Events	13
2.2	Drought and Dry Periods	15
2.3	Heavy Precipitation and Wet Periods	25
3	Global and Regional Climate Change	29
3.1	Atmospheric Circulation	31
3.2	Temperature	34
	3.2.1 Changes in Mean Surface Temperatures	34
	3.2.2 Temperature Variability and Extremes	38
3.3	Tropospheric Water Vapour	40
3.4	Precipitation	40
	3.4.1 Mean Precipitation Trends	40
	3.4.2 Changes in Precipitation Extremes and Droughts	44
4	Trend and Time Series Analysis	51
4.1	Time Series Theory	51
4.2	Calculation of Trends	52
4.3	Significance, Spatial and Temporal Representativeness of Trends	54
4.4	Statistical Tests	55
4.5	Possible Sources of Error	56
5	Study Area and Data Base	59
5.1	Climatic Characteristics of Saxony	60
5.2	Data Base	61
5.3	Data Quality	62
5.4	Spatial Representativeness	
5.5		

6	Precipitation and Drought Characteristics of Saxony	73
6.1	General Characterisation of Precipitation Conditions	73
	6.1.1 Average Precipitation Indices	73
	6.1.2 Annual Precipitation Cycle	
	6.1.3 Percentile Values of Daily and Monthly Precipitation	78
	6.1.4 Resume	81
6.2	Drought and Wet Period Characteristics based on Monthly Indices	82
	6.2.1 Percent of Normal Indicator PNI	82
	6.2.2 Rainfall Anomaly Index RAI	88
	6.2.3 Decile Dry and Wet Periods	
	6.2.4 Resume	103
6.3	Extreme Precipitation Description based on Daily Indices	104
	6.3.1 Heavy Precipitation Indicators	104
	6.3.2 Meteorological Dry Periods	106
	6.3.3 Meteorological Dry Periods with Sliding Thresholds (DPST)	109
	6.3.4 Resume	116
7	Changes in Saxon Precipitation Characteristics	119
	•	
7.1	Variations in the General Characteristics of Precipitation	
	7.1.1 Trends of Precipitation Totals	
	7.1.2 Spatiotemporal Characteristics of Precipitation Tends7.1.3 Changes in the Annual Precipitation Cycle	
	7.1.4 Shifts in the Probability Distribution of Monthly Precipitation	
	7.1.5 Resume	
7.2	Changes in Drought Characteristics and Patterns	
	7.2.1 Duration of Dry Periods	
	7.2.2 Frequency of Dry Periods	
	7.2.3 Frequency and Severity of Drought Events	
	7.2.4 Timing of Drought	166
	7.2.5 Spatial Drought Characteristics	167
	7.2.6 Resume	168
7.3	Trend Analysis of Wet Period Indices and Heavy Precipitation Event	s 171
	7.3.1 Changes in the Characteristics of Average Daily Precipitation	
	Indices	
	7.3.2 Frequency of Heavy Precipitation Events	
	7.3.3 Magnitude of Heavy Precipitation Events	184
	7.3.4 Spatiotemporal trend characteristics of heavy precipitation	400
	indicators	188

	7.3.5 Duration of Wet Periods	. 191
	7.3.6 Frequency and Severity of Monthly Wet Extremes and Periods.	. 193
	7.3.7 Timing of Wet Periods	. 199
	7.3.8 Spatial Characteristics of Wet Periods	
	7.3.9 Resume	. 201
8	Relations between selected Indices	205
0	Relations between selected marces	. 203
8.1	Comparison of Drought and Dry Period Indicators	. 205
8.2	Comparison of Heavy Precipitation and Wet Period Indicators	. 213
9	Conclusions	221
References		
Figures		. 241
Tables		. 251
Abb	previations	. 257
Abs	etract	. 261
Zusammenfassung		. 263
Acknowledgements		
Annex (digital on enclosed CD-Rom)		