

# Table of Contents

Acknowledgements .....	iii
Zusammenfassung .....	v
Abstract .....	vii
Table of Contents .....	ix
1. Introduction .....	1
2. Background of Northern Chile .....	6
2.1. <i>Climate and Geographical background</i> .....	6
2.2. Geological background of northern Chile .....	7
2.2.1. Tectonic Framework of the Central Andes in Northern Chile .....	7
2.2.2. <i>Morphotectonic Units of the Central Andes</i> .....	8
2.2.3. Main Faults of the North Chilean Forearc (Tectonic Setting) .....	9
2.2.4. Mega-thrust earthquakes, downdip segmentation and their influence on vertical deformation along the coast .....	10
2.2.5. The Oceanic Nazca Plate - from past to present motions .....	14
2.2.6. Along strike variations of the Nazca subduction zone .....	15
2.3. The coast of Northern Chile .....	17
2.3.1. Shape of the Coast .....	17
2.3.2. Marine terrace formations .....	19
2.3.3. Focus on areas of interest .....	20
3. Methods .....	25
3.1. Cosmogenic $^{10}\text{Be}$ exposure dating .....	25
3.2. $^{10}\text{Be}$ sampling strategy .....	25
3.2.1. Marine terrace sampling sites and sample criteria .....	25
3.2.2. Sample features .....	27
3.2.3. Sampling sites .....	29
3.3. Sample preparation and derivation of $^{10}\text{Be}$ concentrations .....	45
3.4. Exposure age determination .....	46
3.4.1. Exposure age scatter resulting from geological processes .....	46
3.5. Calculating uplift rates .....	47
3.6. Mapping .....	49
3.6.1. Coast Indentation measurements .....	50
4. Results .....	51
4.1 Terrace ages and related findings .....	51
4.1.1. Rio Loa .....	53

4.1.2. Hornitos.....	54
4.1.3. Mejillones.....	56
4.1.4. Taltal.....	60
4.1.5. Caldera.....	61
4.1.6. Huasco river terraces.....	66
4.1.7. Carrizalillo.....	68
4.1.8. La Serena.....	70
4.2. Methodological considerations.....	72
4.2.1. Calculation of a mean age.....	72
4.2.2 Outliers discarded due to geological evidence.....	74
4.2.3. Final exposure ages.....	82
5. Interpretation.....	83
5.1. Uplift rates.....	83
5.1.1. Low elevation sites – Rio Loa, Taltal and Hornitos.....	84
5.1.2. Chronosequences.....	86
5.2.3. Huasco River terraces.....	99
5.3. Large scale uplift rate pattern along the coast of northern Chile and its variation over time... 106	
5.3.1. The relationship between continental slope and terrace preservation.....	110
5.3.2. Evaluation of possible mechanisms responsible for the uplift rate pattern along the northern Chilean Coast.....	115
6. Conclusions.....	119
List of Figures.....	121
List of Tables.....	126
References.....	128
Appendix.....	138
Curriculum Vitae.....	151