Contents

A	ckno	edgments	j			
A	bstra	i i	iii			
\mathbf{R}	ésum		v			
Ta	able	Contents	iii			
Li	st of	'igures xi	iii			
Li	st of	Tables x	Œ			
Li	st of	Publications and Outreach Activities xv	'ii			
1	Antarctica in a Changing World					
	1.1	The Study of the Ice Sheet: Observations, Mechanisms, Projections	2			
		.1.1 The Context of Greenland and Antarctic Ice Sheets	2			
		1.2 Ice Shelves: The Seat Belt of the Antarctic Ice Sheet	4			
		1.3 The Observation of Ice-Shelf Forcing Mechanisms From Space	7			
		1.4 The Specific Case of the Roi Baudouin Ice Shelf	13			
	1.2	Advances in Data Acquisition Techniques	16			
	1.3	Research Question: Does the TOPSAR Acquisition Mode of Sentinel-1 Improve the Monitoring of the Antarctic Ice Sheet?				
2	2 High-Resolution Observations of Driving Factors of the Antarctic Ice-Flow Dynamics					
	2.1	SAR Remote Sensing: Theoretical Background and Recent Changes in the Global Observation Scheme				
	2.2	Surface Displacements – The Foundations of Ice Shelves Dynamics	39			
		2.2.1 Determining Displacements from Image Matching Techniques	39			
		2.2.1.1 Incoherent Speckle Tracking	39			

			2.2.1.2	Analysis of Velocity Time Series over the Roi Baudouin Ice Shelf – An Ongoing Long Term Stability	47		
			2.2.1.3	Coherence Tracking, and its Adaptation to the TOPSAR Acquisition Mode	63		
			2.2.1.4	Computation of Strain Rates over the Roi Baudouin Ice Shelf	71		
		2.2.2	Determin	ning Displacements from Phase-Based Measurements	73		
			2.2.2.1	Ice Displacements from Differential SAR Interferometry	73		
			2.2.2.2	The Importance of Tracking Coherence in Ice Shelves Studies	79		
			2.2.2.3	The Influence of Tides and Inverse Barometer Effect on Measurements	103		
			2.2.2.4	An Observed Stable Grounding Line Around the Roi Baudouin Ice Shelf	119		
			2.2.2.5	Detection of Landfast Sea Ice Along the Calving Front from Dual Polarimetric SAR Interferometry	120		
			2.2.2.6	Along-Track Displacement Estimations Using Multiple Aperture Interferometry and Burst Overlapping Interferometry	124		
	2.3	,	<i></i>	asses, and Calving Front Monitoring: the Causes and the Consec Ice Shelves' Destabilization	146		
	2.4			stimation from SAR Remote Sensing – Comparisons with a Re-Model	158		
3	Disc	cussion	s and C	onclusion: Towards a Narrower Picture of Antarctica	171		
Bi	Bibliography						
\mathbf{G}	Glossary						