

Contents

Abstract (German)	8
Abstract (English)	10
1 Introduction	12
2 Dynamics in Planetary Atmospheres	16
2.1 Dynamics in the Venusian Atmosphere	17
2.2 Dynamics in the Martian Atmosphere	27
2.3 Dynamics in the Earth Atmosphere	34
3 The Tuneable Heterodyne Infrared Spectrometer: THIS	36
3.1 Characteristics of a Heterodyne Receiver	36
3.2 Setup of the Spectrometer THIS	38
3.2.1 Optical Receiver	41
3.2.2 Electronical Equipment	50
3.3 Data Acquisition and Reduction Scheme	53
3.4 Receiver Performance	55
3.5 Important Specifications for the Cologne Heterodyne Receiver THIS.	60
4 Observation of Dynamics in Planetary Atmospheres	61
4.1 Observation of Dynamics in Venus Upper Atmosphere . . .	63
4.1.1 Observing Conditions: Venus	63
4.1.2 Data Handling and Results for Venus Observations	74
4.1.3 Venus Observations - Data Interpretation and Comparison to other Observing Techniques	80
4.2 Observation of Dynamics in the Martian Mesosphere . . .	85
4.2.1 Observing Conditions: Mars	86
4.2.2 Data Handling and Results of Mars Observations .	98

4.2.3	Mars Observations - Data Interpretation and Comparison to Model Prediction and other Observing Techniques	103
5	Summary of Results and Outlook	111
5.1	Summary of Results	112
5.1.1	Wind Measurements on Venus	112
5.1.2	Wind Measurements on Mars	115
5.2	Outlook Instrument	117
5.3	Outlook on Applications	118
5.3.1	Venus	118
5.3.2	Mars	119
5.3.3	Beyond Venus and Mars	119
A	Sensitivity of Heterodyne Detection	122
B	Temperatures and Fluxes	124
C	Venus Data Acquisition	125