

Table of contents

Acknowledgement	xiv
Abstract	xix
List of Symbols	xxiii
List of figures	xxvii
List of tables	xxxv
1 Introduction	1
1.1 Different traces of galaxy elements	3
1.2 Interstellar medium at large scales	5
1.2.1 ISM Turbulence	5
1.2.2 Anisotropy in ISM	7
1.3 Interaction between ISM and star formation	9
1.4 Motivation	10
2 Probing large scale turbulence	15
2.1 H I as a probe for structure and dynamics	15
2.2 Radio Interferometric observation	18
2.3 Two point correlation statistics	22

2.3.1	Autocorrelation function and Structure function	22
2.3.2	Power spectrum	23
2.4	Efficacy of reconstructed image	25
2.4.1	Simulating model visibility dataset	25
2.4.2	Simulated visibility data	31
2.4.3	One Point statistics: large-scale distribution of specific intensity .	33
2.4.4	Power Spectrum estimators	34
2.4.5	Analysis and Results	37
2.5	Visibility moment estimators	49
2.5.1	Visibility moments	50
2.5.2	Power spectrum of column density and velocity	51
2.6	Summary	53
3	Energy cascade in external disc	55
3.1	Sample selection	55
3.2	Observations and data analysis	58
3.2.1	NGC 5236	58
3.2.2	NGC 6946	59
3.2.3	Combining with the THINGS data	60
3.3	Implementation of the visibility moment estimator	60
3.4	Results	63
3.5	Discussion	69
3.5.1	Compressive turbulence in NGC 5236	73
3.5.2	Nature of turbulence in NGC 6946	76
3.6	Summary	78
4	Instability and star formation in the Interstellar Medium	79

4.1	Instability in two fluid disc	80
4.2	Sample selection and observations	83
4.3	Estimation of two-fluid Toomre parameter	87
4.4	Results and Inferences	91
4.4.1	Correlation with H I	92
4.4.2	Correlation with H ₂ , Σ_* , SFR	98
4.4.3	Role of turbulence	99
4.5	Summary and Conclusions	103
5	Anisotropic modes in spiral galaxies	105
5.1	Anisotropy and bending waves	105
5.2	Quantifying anisotropies using harmonic decomposition	108
5.3	Sample selection	113
5.4	Anisotropic signature for the galaxy NGC 3621	114
5.5	Results for entire sample	118
5.5.1	Identifying anisotropic modes	122
5.6	Summary	129
6	Conclusions and Summary	131
References		137