

VU Research Portal

Rabinowitz Floer Homology for Tentacular Hamiltonians

Wisniewska, J.J.

2017

document version

Publisher's PDF, also known as Version of record

[Link to publication in VU Research Portal](#)

citation for published version (APA)

Wisniewska, J. J. (2017). *Rabinowitz Floer Homology for Tentacular Hamiltonians*. [PhD-Thesis - Research and graduation internal, Vrije Universiteit Amsterdam].

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

E-mail address:

vuresearchportal.ub@vu.nl

CONTENTS

1	Introduction	4
1.1	A short historic overview	4
1.1.1	From classical mechanics to Hamiltonian dynamics	4
1.1.2	Rabinowitz action functional	7
1.1.3	Morse and Morse-Bott homology	9
1.2	Rabinowitz Floer homology	12
1.2.1	Construction	12
1.2.2	Developments in the field	15
1.3	Subject of this thesis	16
1.4	Conclusions and future work	20
2	General framework of RFH	22
2.1	Preliminaries	22
2.1.1	Metric on the loop space	23
2.1.2	Floer trajectories	25
2.2	The non-compact setting	26
2.3	Moduli spaces of cascades	29
2.3.1	Flow lines with cascades	29
2.3.2	Manifold structure	31
2.4	Compactness	40
2.4.1	Compactness of Floer trajectories	40
2.4.2	Floer-Gromov compactness	46
2.5	Definition of RFH	52
2.6	Independence	55
2.7	Genericity of the Morse-Bott property	68
2.8	Morse dynamics on the hypersurface	87
3	Tentacular Hamiltonians	93
3.1	Rabinowitz Floer Homology for tentacular Hamiltonians	95
3.2	Openness under compact perturbations	99
3.3	Bounds on the moduli spaces	101

CONTENTS

3.4	Bounds on the action	106
3.5	Set of infinitesimal action derivation	113
3.6	Floer trajectories near the critical set	120
3.6.1	Tubular neighborhood and projection onto the critical set . . .	121
3.6.2	Taylor expansion of the action functional	124
3.6.3	Properties of the Hessian of the action functional	125
3.6.4	Projecting a Floer trajectory	127
3.7	Oscillations and L^2 bounds	131
3.8	Maximum principle	137
3.8.1	Plurisubharmonic functions	138
3.8.2	Elliptic differential inequality	139
3.9	Invariance of RFH under perturbation	142
4	Examples of Tentacular Hamiltonians	154
4.1	Hypersurface with cylindrical ends	156
4.2	Quadratic Hamiltonians	159
4.2.1	Symplectic classification of quadratic forms	159
4.2.2	Coercive Liouville vector fields	160
4.2.3	Boundedness of periodic orbits	167
4.3	Geometry of 0-level sets of tentacular Hamiltonians	171
	Appendix	178
A	Calculations on maximum principle	178
	References	184