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Bachelor Thesis in Physics  
submitted by

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# Gas accretion onto eccentric planets

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**Abstract**

**Zusammenfassung**

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# Chapter 1

## Introduction

### Protoplanetary disk

- observations
- mathematical description
  - fluid dynamics
  - what kind of approximations are necessary?
- numerical approach

### FARGO2D1D algorithm

### Accretion mechanisms

Two different mechanisms:

1. Machida et al. 2010, accretion  
runaway accretion when  $m_{core} < m_{envelope}$
2. Kley 1999, accretion

### Hill sphere

The Hill sphere is the region around an astronomical body in which its gravitational influence dominates the attraction of satellites [4]. If a body with mass  $m$  orbits a bigger object with mass  $M$  **with** a semi-major axis  $a$  and eccentricity  $e$ , the radius of the Hill sphere can be approximated (**why only approximately?**) by

$$r_H \approx a(1 - e) \sqrt[3]{\frac{m}{3M}} \quad (1.1)$$

...



## Bibliography

- [1] *Lorem ipsum dolor sit amet*  
<https://www.youtube.com/watch?v=dQw4w9WgXcQ>
- [2] *Lorem ipsum dolor sit amet*  
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- [4] D.P. Hamilton & J.A. Burns (1992). "Orbital stability zones about asteroids. II - The destabilizing effects of eccentric orbits and of solar radiation". *Icarus*. **96** (1): 43-64  
<https://www.sciencedirect.com/science/article/pii/001910359290005R>

## **Declaration**

Ich versichere, dass ich diese Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe.

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