



早期科研经历分享

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2021级强基班

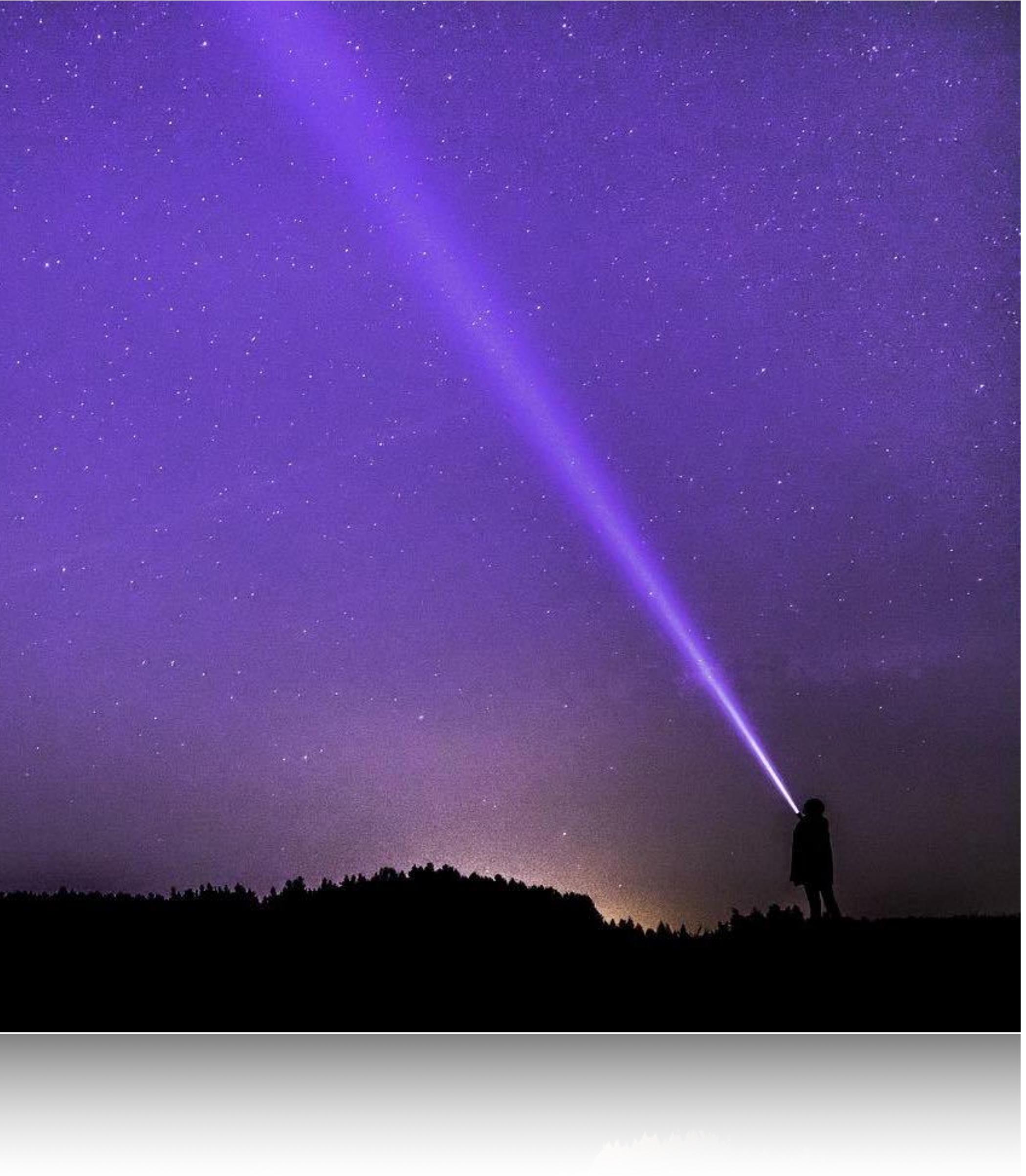
Dec 9. 2023

目录



- 我的经历
- 如何开始?
- 学会调节

我的经历



我的经历



为什么选择天文学？

梦想、热爱

理解、支持

越学越觉得自己渺小，但越对宇宙充满着敬畏



我的经历

大一

美其名曰

“探索适应阶段”

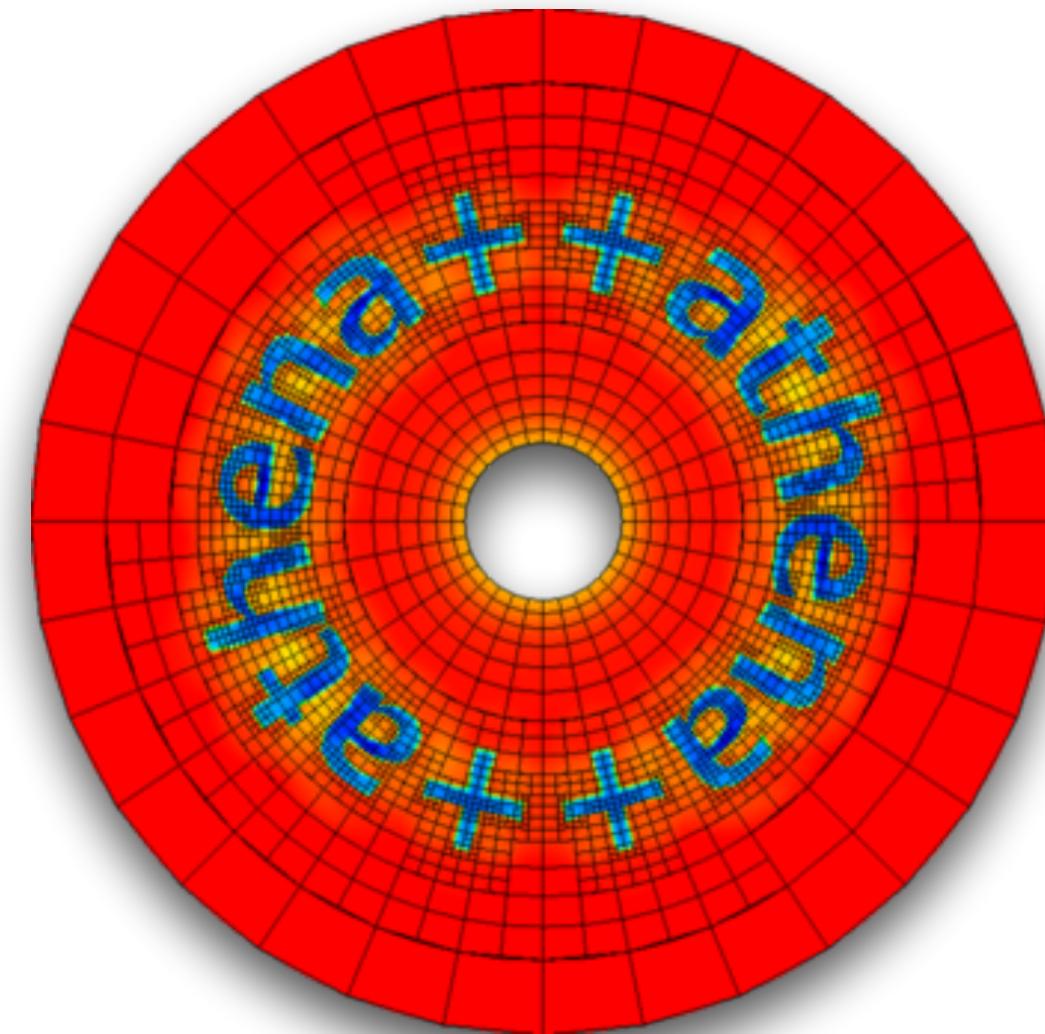
大二

寻找自己的节奏

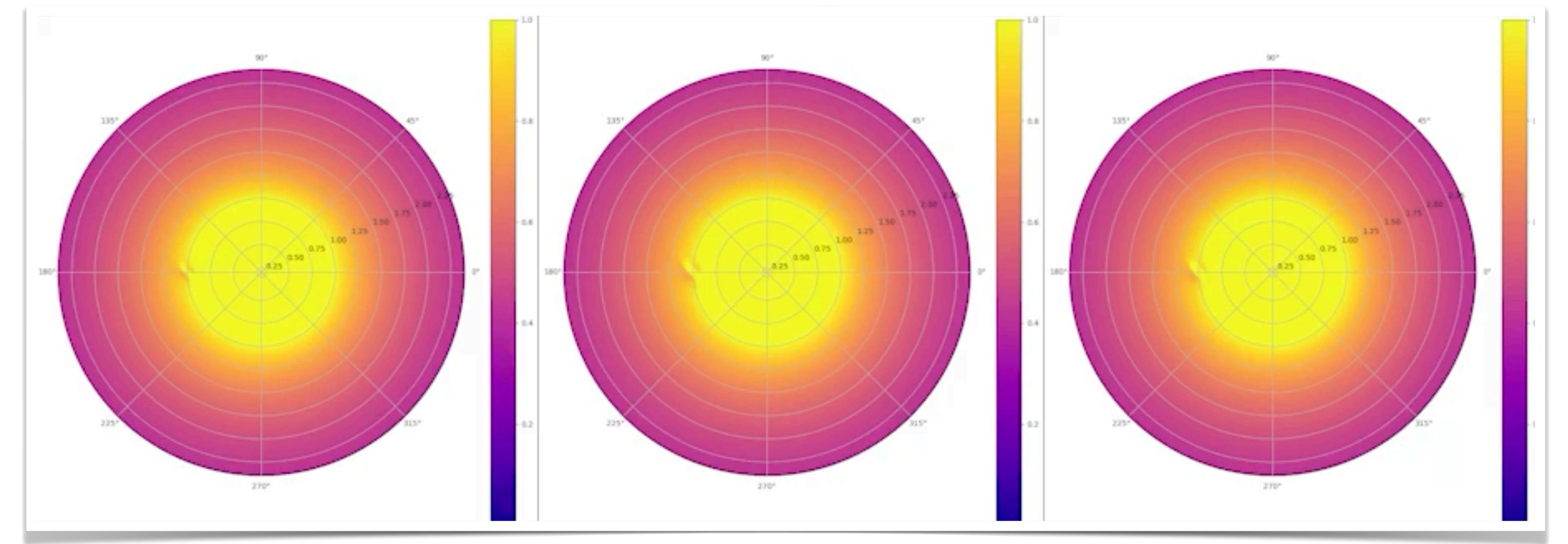
挑战一下？



我的经历



ATHENA++

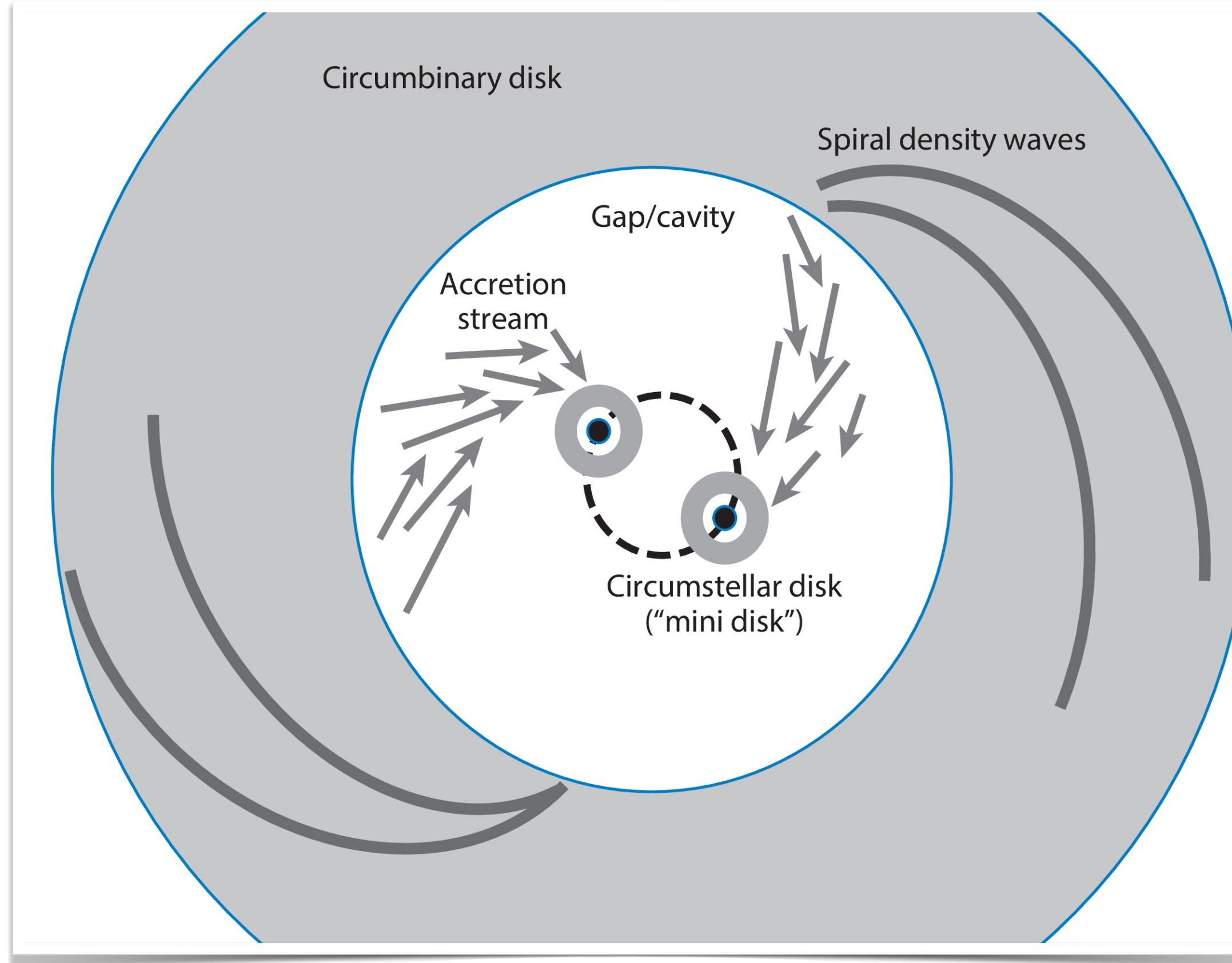


原行星盘的流体力学数值模拟

Protoplanetary disks



我的经历



Lai, Muñoz . 2023

ATHENA++

环双星盘的流体力学数值模拟

Circumbinary disks



我的经历

综合性强

知识“活”了起来

如何开始？



方向选择



兴趣为导向

- 通过学院主页了解不同老师的方向，和老师约时间线下面对面交流
- 参加组会，听学术报告，问学长学姐
- 从综述文献出发，找出想做的小方向



方向选择

- 星系宇宙学（宇宙大尺度结构、星系形成与演化、暗物质与暗能量、早期宇宙、原初黑洞、原初引力波等）
- 恒星与行星科学（恒星物理、天体化学、星际介质、行星科学等）
- 高能天体物理（致密星物理、宇宙射线、引力波多信使天文学等）
- 天文技术方法（天文仪器、南极天文、空间科学、天体力学和天体测量学等）
- 观测：数据获取，数据处理，科学信息，验证模型
- 理论：建立模型，数值模拟
- 技术与仪器：科学仪器等



科研方式

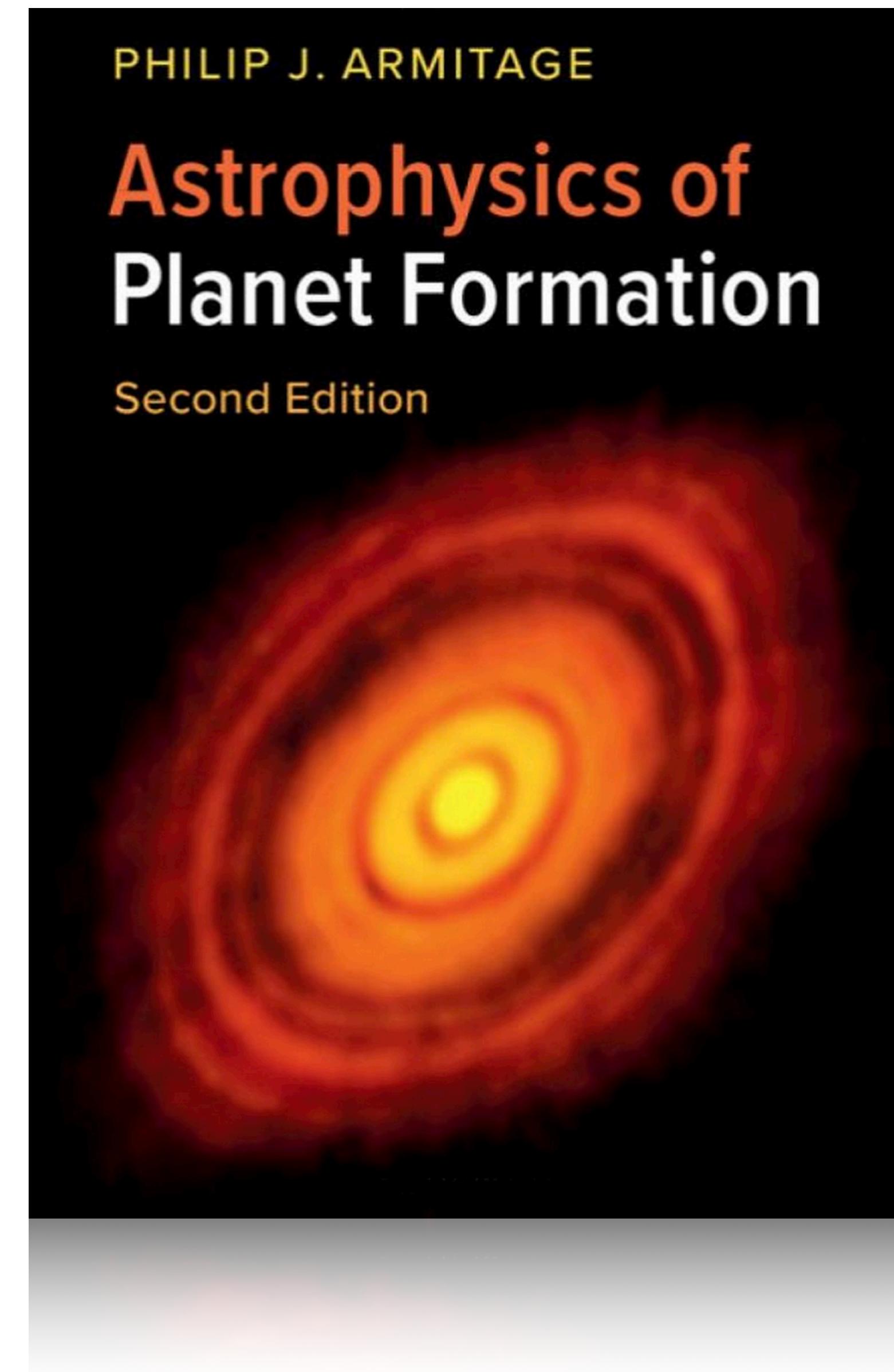
- 参加比赛（大创、各种学术竞赛）
- 做课题，发论文（保研、出国）

适当的难度

复现⇒创新

基础知识

- 以问题为导向
- 专著
- 图书馆，电子书
- 重点围绕关于自己方向的几篇论文，争取啃透





英语学习

文献阅读

论文撰写

报告分享



英语学习

Cicumbinary_Disks_CN.key

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简介

原行星盘
HD 98800
Kennedy et al. 2019/ALMA

原恒星盘
IRS 43
Brinch et al. 2016/ALMA

**星系合并
(超) 大质量黑洞**
NGC 4676
HST

Circumbinary_Disks_EN.key — Edited

View Add Slide Play Table Chart Text Shape Media Share Format Animate Document

Introduction

**Protoplanetary
disks**
HD 98800
Kennedy et al. 2019/ALMA

**Protostellar
disks**
IRS 43
Brinch et al. 2016/ALMA

**Galaxy merge
Massive black holes**
NGC 4676
HST



文献阅读与管理

文献阅读

- arXiv
[\(https://arxiv.org/\)](https://arxiv.org/)
- ADS
[\(https://ui.adsabs.harvard.edu/\)](https://ui.adsabs.harvard.edu/)





文献阅读与管理

文献管理



Zotero

The screenshot shows the Zotero desktop application interface. On the left, a sidebar displays a hierarchical library structure under 'My Library'. The 'Circumbinary disk' folder is currently selected. The main pane lists a collection of academic papers with columns for Title, Creator, and Year. A specific paper titled 'Circumbinary Accretion: From Binary Stars to Massive Binary Black Holes' by Lai and Muñoz from 2023 is highlighted. The right pane provides detailed information about this selected item, including its citation key, item type (Journal Article), title, authors (Lai, Dong; Muñoz, Diego J.), abstract, publication details (Annual Review of Astronomy and Astrophysics, Volume 61, Issue 1, 2023, pages 517-560), DOI (10.1146/annurev-astro-052622-022933), URL (https://doi.org/10.1146/annurev-astro-052622-022933), and date added/modified.

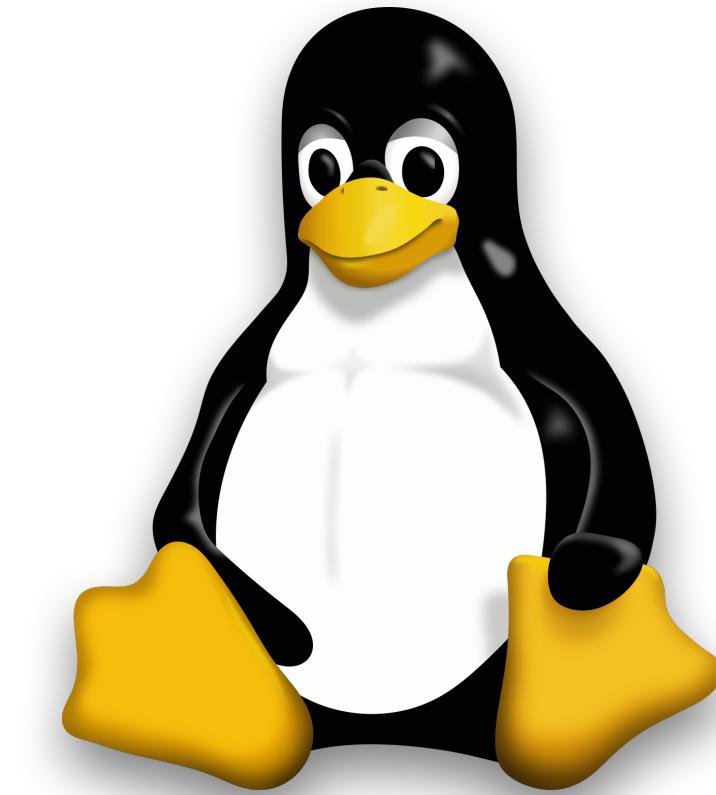
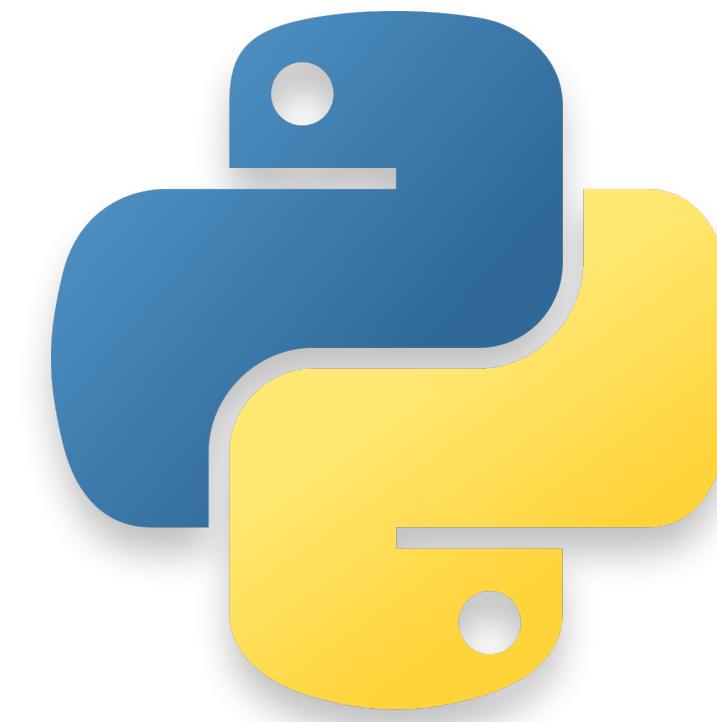
Title	Creator	Year
Viscous hydrodynamics simulations of circumbinary accretion discs: variability, qua...	Miranda et al.	2017
The Evolution of Accreting Binaries: from Brown Dwarfs to Supermassive Black Holes	Dittmann and Ryan	2023
Suppression of the accretion rate in thin discs around binary black holes	Ragusa et al.	2016
PULSED ACCRETION ONTO ECCENTRIC AND CIRCULAR BINARIES	Muñoz and Lai	2016
Pulsed Accretion in the T Tauri Binary TWA 3A	Tofflemire et al.	2017
Planet migration in massive circumbinary discs	Teasdale and Stamat... ...	2023
On the Role of Dynamical Cooling in the Dynamics of Circumbinary Disks	Wang et al.	2023
Long-lived Eccentric Modes in Circumbinary Disks	Muñoz and Lithwick	2020
IMPLEMENTATION OF THE SHEARING BOX APPROXIMATION IN ATHENA	Stone and Gardiner	2010
Hydrodynamics of Circumbinary Accretion: Angular Momentum Transfer and Binary ...	Muñoz et al.	2019
Hydrodynamical simulations of circumbinary accretion: balance between heating an...	Wang et al.	2023
Hydrodynamic Torques in Circumbinary Accretion Disks	Moody et al.	2019
How Binaries Accrete: Hydrodynamic Simulations with Passive Tracer Particles	Tiede et al.	2022
FARGO: A fast eulerian transport algorithm for differentially rotating disks	Masset	2000
Disk-satellite interactions.	Goldreich and Trem... ...	1980
Circumbinary Accretion: From Binary Stars to Massive Binary Black Holes	Lai and Muñoz	2023
Black holes in binary systems. Observational appearance.	Shakura and Sunyaev	1973
ACCRETION AND MAGNETIC RECONNECTION IN THE CLASSICAL T TAURI BINARY DQ...	Tofflemire et al.	2017
AC Her: Evidence of the first polar circumbinary planet	Martin et al.	2023
A survey of disc thickness and viscosity in circumbinary accretion: Binary evolution, ...	Dittmann and Ryan	2022



代码学习

语言和系统选择

- 以问题为导向
- Python
- C++
- FORTRAN
- Ubuntu
- WSL/WSL2

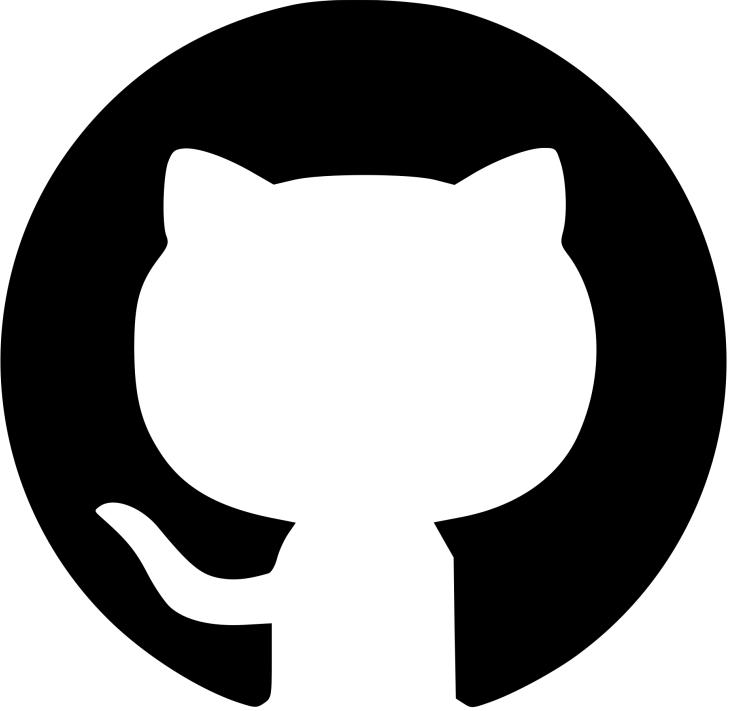


Ubuntu



代码学习 解决问题

- 社区
- Github, Overflow
- ChatGPT



代码学习

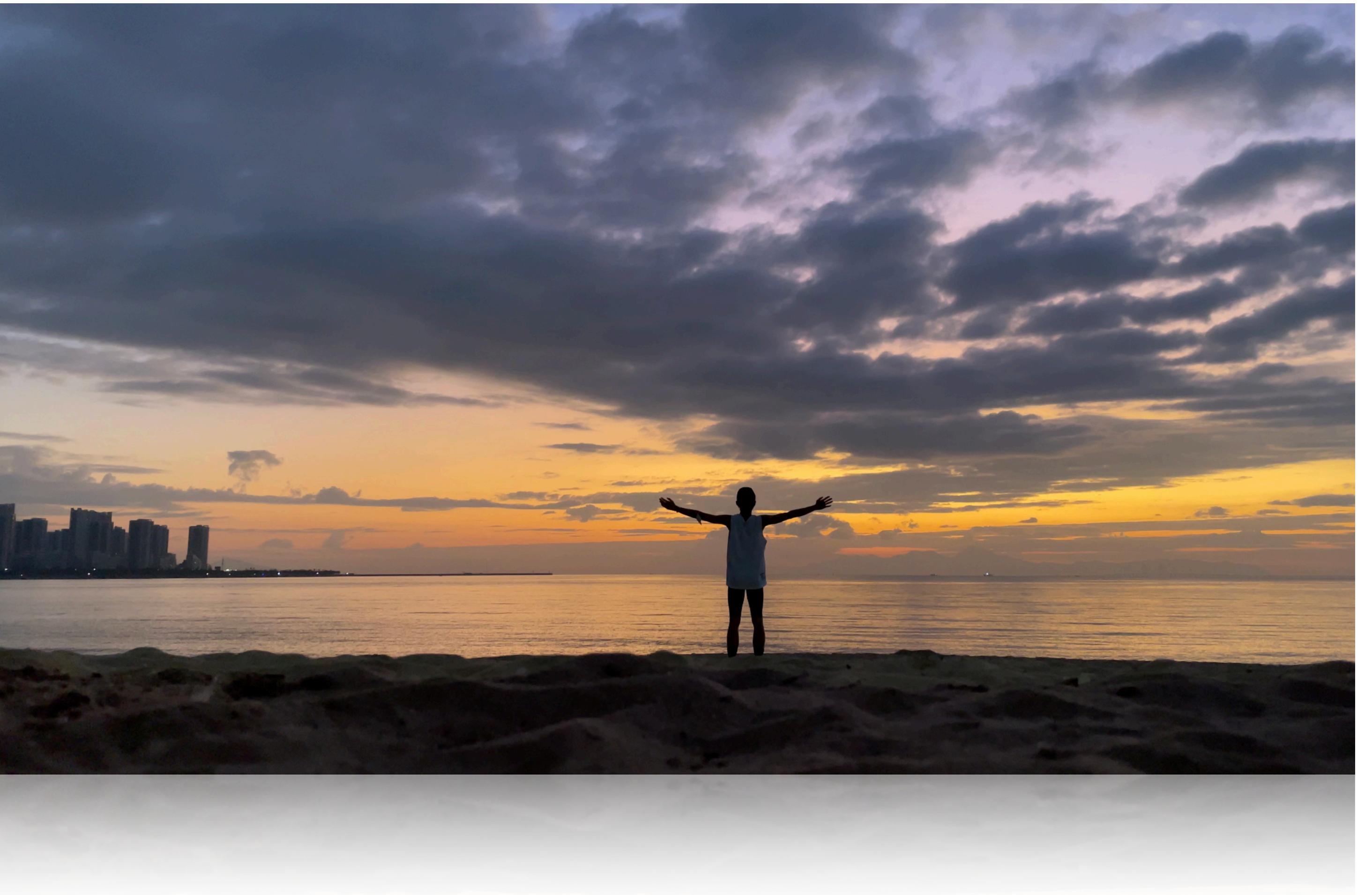


动手





学会调节





学会调节

科研是场“马拉松”

累，消耗心力和体力



学会调节

- 与朋友谈心（开黑）
- 与父母、老师交流
- 与书籍对话
- 爱好：音乐、运动
- 长跑
- 作息

乐观

为祖国健康工作50年



“我不是爱因斯坦，也不会假装自己是爱因斯坦。成为某个很小的领域的专家我就知足了。”

——Adam Riess
Nobel Prize in Physics, 2011

保持好奇心与想象力
不断尝试 勇于探索
找到适合自己的方向



Thanks!