

SungWon Kwak

Office: KH/0.23, An d. Sternwarte 16, 14482 Potsdam, Germany
skwak@aip.de / kwakcosmo@gmail.com

EDUCATION

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| Ph.D. in Astronomy at the University of Rome , joint by Sapienza and Tor Vergata Thesis: The Formation and the Chemodynamical Evolution of the Milky Way and its Stellar Halo Supervisor: Prof. Giuseppe Bono | 2019 – 2023 |
| M.S. in Astronomy at Seoul National University Thesis: Origin of Non-Axisymmetric Features of dE galaxies in the Virgo Cluster Supervisor: Prof. Woong-Tae Kim | 2014 – 2016 |
| B.S. in Physics & Astronomy at the University of Washington , Seattle Protoplanetary Disk Simulation (Prof. Thomas Quinn) Radio Astronomy (Prof. Woodruff Sullivan) ATLAS-CERN Inner Tracker Upgrade (Prof. Shih-Chieh Hsu) AstroML: Machine Learning and Data Mining (Dr. Jake Vanderplas) | 2009 – 2013 |
| The Storm King High School, New York | 2007 – 2009 |

EMPLOYMENT

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| Postdoc at the Leibniz Institute for Astrophysics Potsdam (AIP) | 2023.09 – <i>present</i> |
| Postdoc at Seoul National University (Prof. Woong-Tae Kim) | Summer 2023 |
| Research Assistant at Seoul National University (Prof. Woong-Tae Kim) | Summer 2019 |
| Technical Personnel (military service) at Korea Astronomy and Space Science Institute | 2016 – 2019 |
| Research Assitant at CERN, Switzerland | Winter 2014 |

PROJECTS/COLLABORATIONS

SMUGGLE-Ring: Nuclear Ring & Bar Formation using Multiphase Hydrodynamics Model (SMUGGLE)
N-body Simulation: Bar and Spiral Formation
4-MOST Spectroscopic Survey: S3-Milky Way Bulge and Disk Low Resolution Survey
Auriga SuperStars: Cosmological Zoom-in Simulations of the Milky Way-like Galaxies

RESEARCH INTEREST

Galactic Dynamics, Bar, Spirals, Nuclear Ring, Chemodynamics, Disk Instabilities
Galaxy Formation, Stellar Halo, Dark Matter Halo, Galaxy Cluster

GRANTS/SCHOLARSHIPS

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| Computing Grant at NHR@ZIB in Germany (Co-PI & Project Manager, 17.08M core hours) <i>The Galactic Hearts Chronicle: Chemodynamical Archives of Galaxy Evolution Histories in Nuclear Rings</i> | 2026 |
| PhD Fellowship for the AASS program in Rome (43,200EUR/3yr) | 2019 – 2022 |
| Kim In Ha Scholarship at Seoul National University | 2015 – 2016 |
| Brain Korea 21 Scholarship at Seoul National University | 2014 – 2016 |
| AstroMundus Scholarship–Category A (offered: 48,000EUR/2yr) | 2014 – 2016 |
| UM-CERN Internship Program by Richard Lounsbery Foundation (10,000USD/3months) | Winter 2014 |

PROGRAMMING

Simulation CHANGA, GIZMO, GADGET, and AREPO
Software Pynbody (Python), IRAF, Solidworks

PUBLICATION

- (9) **Kwak, SungWon**; Minchev, Ivan; Steinmetz, Matthias; Yi, Sukyoung K. “*Effects of Resolution and Local Stability on Galactic Disks: 2. Halo Resolution and Softening on Bar Formation*” (In prep.)
- (8) **Kwak, SungWon**; Minchev, Ivan; Pfrommer, Christoph; Steinmetz, Matthias; Yi, Sukyoung K. “*Effects of Resolution and Local Stability on Galactic Disks: I. Multiple Spiral Mode Formation via Swing Amplification*” (Submitted to A&A)
- (7) Fiorentino, G. et al. including **Kwak, SungWon** “*On the early formation of the Galactic halo traced by RR Lyrae stars*” 2022MmSAI, 93d, 47F
- (6) Braga, V. F. et al. including **Kwak, SungWon** “*On the use of field RR Lyrae as galactic probes - VI. Mixed mode RR Lyrae variables in Fornax and in nearby dwarf galaxies*” 2022MNRAS, 517, 5368B
- (5) Braga, V. F. et al. including **Kwak, SungWon** “*On the Use of Field RR Lyrae as Galactic Probes. V. Optical and Radial Velocity Curve Templates*” 2021ApJ, 919, 85B
- (4) Bach, Yoonsoo P. et al. including **Kwak, SungWon** “*The Geometric Albedo of (4179) Toutatis Estimated from KMTNet DEEP-South Observations*” 2019JKAS, 52, 71B
- (3) **Kwak, SungWon**; Kim, Woong-Tae; Rey, Soo-Chang; Quinn, Thomas R. “*Origin of Nonaxisymmetric Features of Virgo Cluster Early-type Dwarf Galaxies. II. Tidal Effects on Disk Features and Stability*” 2019ApJ, 887, 139K
- (2) Seo, Woo-Young; Kim, Woong-Tae; **Kwak, SungWon**; Hsieh, Pei-Ying; Han, Cheongho; Hopkins, Phil F. “*Effects of Gas on Formation and Evolution of Stellar Bars and Nuclear Rings in Disk Galaxies*” 2019ApJ, 872, 5S
- (1) **Kwak, SungWon**; Kim, Woong-Tae; Rey, Soo-Chang; Kim, Suk “*Origin of Non-axisymmetric Features of Virgo Cluster Early-type Dwarf Galaxies. I. Bar Formation and Recurrent Buckling*” 2017ApJ, 839, 24K

TALK/POSTER

- Talk:* **Kwak, SungWon** “*The Effects of Resolution and Disk Stability on the Multi-armed Spiral Formation*” 10th East Asia Numerical Astrophysics Meeting (EANAM 10), September 2025, Jeju, Korea
- Talk:* **Kwak, SungWon** “*Spirals, Bar, Bulge, and Nuclear Ring*” Auriga Collaboration Meeting 2024, Durham, UK
- Colloquium:* **Kwak, SungWon** “*Assembly History of the Ancient Halo and Disk in the Auriga Simulation*” Yonsei University, November 2024, Seoul, Korea
- Talk:* **Kwak, SungWon** “*Bar and Nuclear Ring Formation*” Auriga Collaboration Meeting 2024, Munich, Germany
- Talk:* **Kwak, SungWon** et al. “*Origin of Non-axisymmetric Features of dEs in the Virgo Cluster*” AAS Meeting #228, id.202.08, June 2016, San Diego, USA
- Talk:* **Kwak, SungWon** et al. “*Non-axisymmetric Features of Dwarf Elliptical Galaxies*” KAS Meeting 2016BKAS, 41Q, 39K
- Poster:* Yoachim, P. et al. including **Kwak, SungWon** “*Bulge Kinematics of Giant Low Surface Brightness Galaxies*” AAS Meeting #223, id.453.06
- Poster:* Schmitz, D. et al. including **Kwak, SungWon** “*IFU Observations of Giant Low Surface Brightness Galaxies*” AAS Meeting #223, id.453.05