

SungWon Kwak

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EDUCATION

Ph.D. in Astronomy at the University of Rome , joint by Sapienza and Tor Vergata Thesis: The Formation and 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 Exchange Student with Scholarship at CERN	2009 – 2013 Spring 2014
The Storm King High School, New York	2007 – 2009

POSITIONS

Postdoc at the Leibniz Institute for Astrophysics Potsdam (Prof. Matthias Steinmetz)	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 Research Personnel (mandatory military service)	2016 – 2019
Research Assistant at the University of Washington	2012 – 2013
Protoplanetary Disk Simulation (Prof. Thomas Quinn), Radio Astronomy (Prof. Woodruff Sullivan), ATLAS Inner Tracker Upgrade (Prof. Shih-Chieh Hsu), AstroML: Machine Learning (Dr. Jake Vanderplas)	

PROJECTS/COLLABORATIONS

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

RESEARCH INTEREST

Galactic Dynamics, Bar, Spiral, Nuclear Ring, Disk Instabilities
Galaxy Formation, Stellar and Dark Matter Halo, Galaxy Cluster, Dwarf Galaxies
Simulation: CHANGA (GASOLINE), GIZMO, GADGET, and AREPO

GRANTS/SCHOLARSHIPS

Computing Grant at NHR@ZIB in Germany: 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 Master Degree Scholarship (offered: 48,000EUR/2yr)	2014 – 2016
UM-CERN Internship Program by Richard Lounsbery Foundation (10,000USD/3months)	Spring 2014

PUBLICATION

- (13) **Kwak, SungWon** et al. “*SMUGGLE-Ring: Bar-driven mass growth, alignment, and inspiral of star clusters into nuclear star cluster*” (in prep.)
- (12) **Kwak, SungWon** et al. “*SMUGGLE-Ring: Evolutionary link between nuclear star cluster and nuclear disk*” 2026, A&A, 712, L25
- (11) **Kwak, SungWon** et al. “*The SMUGGLE-Ring Project: Bar and Bulge Effects on Nuclear Disk and Ring Formation*” 2026, A&A, 711, A295
- (10) **Kwak, SungWon**; Minchev, Ivan; Steinmetz, Matthias; Yi, Sukyoung K. “*Effects of Resolution and Local Stability on Galactic Disks: Halo Resolution and Softening on Bar Formation*” 2026, A&A, 712, A38
- (9) **Kwak, SungWon**; Minchev, Ivan; Pfrommer, Christoph; Steinmetz, Matthias; Yi, Sukyoung K. “*Effects of Resolution and Local Stability on Galactic Disks: Multiple Spiral Mode Formation via Swing Amplification*” (Submitted to OJAp)
- (8) Bono, G. et al. including **Kwak, SungWon** “*On the Use of field RR Lyrae as Galactic Probes - VIII. Early Formation of the Galactic Spheroid*” 2026, ApJ, 998, 86
- (7) Fiorentino, G. et al. including **Kwak, SungWon** “*On the early formation of the Galactic halo traced by RR Lyrae stars*” 2022, MmSAI, 93d, 47
- (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*” 2022, MNRAS, 517, 5368
- (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*” 2021, ApJ, 919, 85
- (4) Bach, Yoonsoo P. et al. including **Kwak, SungWon** “*The Geometric Albedo of (4179) Toutatis Estimated from KMTNet DEEP-South Observations*” 2019, JKAS, 52, 71
- (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*” 2019, ApJ, 887, 139
- (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*” 2019, ApJ, 872, 5
- (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*” 2017, ApJ, 839, 24

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 2025, 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, 39