# YOUNGIL KO

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## RESEARCH INTERESTS

Non-Equilibrium Flow, Rarefied Gas Dynamics, Gas-Surface Interaction (GSI), Plasma-Surface Interaction (PSI)

## EDUCATION

**Korea Advanced Institute of Science and Technology (KAIST)** Aug 2023 — Present
*M.S. in Aerospace Engineering | Advisor: Prof. Eunji Jun* *Daejeon, Republic of Korea*
*4.15 / 4.3 (Cumulative) | 4.22 / 4.3 (Major)*
*Full Tuition Scholarship*

**Korea Advanced Institute of Science and Technology (KAIST)** Aug 2017 — Aug 2023
*B.S. in Aerospace Engineering* *Daejeon, Republic of Korea*
*Magna Cum Laude | 3.86/4.3 (Cumulative) | 4.06/4.3 (Major)*
*Full Tuition Scholarship | Leadership Mileage Award*

## PUBLICATIONS

[J2] **Youngil Ko**, Eunji Jun. "Mechanism-specific chemical energy accommodation with finite-rate surface chemistry in non-equilibrium flow." *Physics of Fluids* 36 no.9 (2024): 096115 | DOI: 10.1063/5.0222518

[J1] **Youngil Ko**, Sangwon Kim, Geonwoong Moon, Minwoo Yi, Kangmin Park, Younho Kim, Eunji Jun. "Parametric study on the flight envelope of a radio-frequency ion thruster based atmosphere-breathing electric propulsion system." *Acta Astronautica* 212 (2023): 198-212. | DOI: 10.1016/j.actaastro.2023.07.043

## CONFERENCE

[C8] **Youngil Ko**, Eunji Jun. "Reaction mechanism-specific chemical energy accommodation in Direct Simulation Monte Carlo." *33rd International Symposium on Rarefied Gas Dynamics* (Göttingen, Germany, Jul 2024)

[C7] Geonwoong Moon, **Youngil Ko**, Eunji Jun. "Feasibility Analysis of a Cryogenic Active Intake Device for Atmosphere-Breathing Electric Propulsion." *33rd International Symposium on Rarefied Gas Dynamics* (Göttingen, Germany, Jul 2024)

[C6] **Youngil Ko**, Eunji Jun. "Surface Reaction Chemical Energy Accommodation Model for Re-entry Flows." *The Korean Society for Aeronautical & Space Sciences KSAS* (Changwon, Republic of Korea, Jun 2024)

[C5] **Youngil Ko**, Eunji Jun. "Surface Catalytic Effect on Chemical Heat Flux using Direct Simulation Monte Carlo." *The 3rd International Conference on High-Speed Vehicle Science and Technology* (Busan, Republic of Korea, Apr 2024)

[C4] Geonwoong Moon, **Youngil Ko**, Sangwon Kim, Minwoo Yi, Younho Kim, Eunji Jun. "Conceptual system analysis of atmosphere-breathing electric propulsion for very-low-Earth-orbit operation." *The Korean Society for Aeronautical & Space Sciences KSAS* (Yeosu, Republic of Korea, Jun 2023)

[C3] Eunji Jun, Geonwoong Moon, **Youngil Ko**, Sangwon Kim. "Conceptual System Analysis of Very-Low-Earth-Orbit Satellites with Atmosphere-Breathing Electric Propulsion." *The 11th Asian Joint Conference on Propulsion and Power AJCPP* (Kanazawa, Japan, Mar 2023)

[C2] **Youngil Ko**, Sangwon Kim, Geonwoong Moon, Eunji Jun. "Flight Envelope Determination of Atmosphere-Breathing Electric Propulsion System." *The Korean Society of Propulsion Engineers KSPE* (Jeju, Republic of Korea, Mar 2023)

[C1] **Youngil Ko**, Sangwon Kim, Geonwoong Moon, Eunji Jun. "Drag Compensation Feasibility of an Atmosphere-Breathing Electric Propulsion System." *The Korean Society of Propulsion Engineers KSPE* (Busan, Republic of Korea, Nov 2022)

## EXPERIENCE

**KAIST Non-equilibrium Gas and Plasma Dynamics Lab (KNGPDL)** Aug 2023 — Present
*Graduate Student Researcher* | Advisor: Prof. Eunji Jun Daejeon, Republic of Korea

| **Reusable Unmanned Space Vehicle Research Center** | Korea Research Institute for defense Technology planning and advancement (KRIT)

- Implemented chemical energy accommodation in a gas-surface reaction module within a C++-based Direct Simulation Monte Carlo (DSMC), resulting in a 14.4% reduction in heat flux prediction [J2, C6, C8]
- Evaluated gas-phase and gas-surface interaction models for hypersonic flows using DSMC [C5]

| **Aerodynamics Analysis of Supersonic Retro-Propulsion (SRP) System** | Korea Aerospace Research Institute (KARI)

- Devised a criterion of mesh generation and refinement for high-enthalpy flow DSMC simulations
- Analyzed DSMC results of SRP flow during atmospheric re-entry and compared them with CFD results

| **Prediction of Gas-Surface Interaction (GSI) in Very Low Earth Orbit (VLEO) Using an Atomic Oxygen-Surface Chemistry Models** | Air Force Office of Scientific Research (AFOSR)

- Integrated a gas-surface reaction model for rarefied atmosphere intake in VLEO in DSMC
- Identified up to 50% mole fraction variations in Atmosphere-Breathing Electric Propulsion (ABEP) intake gas composition with surface reactions in VLEO conditions

**KAIST Non-equilibrium Gas and Plasma Dynamics Lab (KNGPDL)** Feb 2022 — Aug 2023
*Undergraduate Researcher* | Advisor: Prof. Eunji Jun Daejeon, Republic of Korea

| **Undergraduate Research Participation (URP) Program** | KAIST

- Led a study on the ABEP system, predicting its feasibility at 196 - 248 km altitudes during moderate solar activity [J1, C1, C2]
- Developed a 0D ABEP discharge charge chamber model with 10% deviation from experiments with MATLAB[C3, C4, C7]
- Won Excellent Award in KAIST Undergraduate Research Participation (URP) program

**Republic of Korea Army Special Warfare Command** Jul 2020 — Jan 2022
*UH-60 Blackhawk Aircrew* | *Squad Leader* | *Sergeant* Eumseong, Republic of Korea

- Performed multiple aerial missions with a high level of skill, discipline, and teamwork
- Received the Best Aircrew of the Quarter award for being a valuable asset to the battalion

## HONORS AND AWARDS

**Magna Cum Laude** | *KAIST* Aug 2023

**Excellent Award in Undergraduate Research Participation (URP) Program** | *KAIST* Feb 2023
Awarded to the top three teams among URP participants

**KAIST-Boeing Scholarship** | *KAIST & Boeing* Aug 2022, Mar 2019
Merit-based scholarship awarded by Boeing

**Leadership Mileage Award** | *KAIST* Mar 2022
Awarded to the top 3% of KAIST undergraduates for outstanding leadership achievements

**Best Aircrew of the Quarter Award** | *Republic of Korea Army Special Warfare Command* Dec 2021
Recognized for significant contributions to the battalion, on and off the field

**Full Tuition Scholarship** | *KAIST & Ministry of Science and ICT* Aug 2017 — Present
Scholarship awarded for both undergraduate and graduate studies

## TEACHING & MENTORING

**International Student Mentor** | *KAIST* Sep 2024 — Present
Mentored international students in Aerospace Engineering at KAIST

**Undergraduate Research Participation (URP) Program Mentor** | *KAIST* Dec 2023 — Jul 2024
Guided undergraduate participants of the URP program (Suyoun Ma)

**SpaceKids Mentor** | *Hanwha Space Hub & KAIST* Mar 2022 — Feb 2024
Co-developed and led a space project and curriculum for grade 6 and 7 students nationwide

**Freshman Cultural Activity (FCA) Lecturer** | *KAIST* Mar 2019 — Dec 2019
Designed and led two 13-week undergraduate freshman courses as a student lecturer