

Curriculum Vitae: Tae-Sun Kim (as of Sept 2022)

<http://www.astro.wisc.edu/our-people/scientists/kim-tae-sun/>

Education:

University of Hawaii, Hawaii	Physics & Astronomy	Ph.D.	1999
Yonsei University, Seoul, S. Korea	Astronomy & Meteorology	M.S.	1992
Yonsei University, Seoul, S. Korea	Astronomy & Meteorology	B.S.	1990

Appointments

University of Wisconsin-Madison	Scientist II	2016–
Osservatorio di Trieste, Trieste, Italy	Research Scientist	2013–2016
University of Wisconsin-Madison	Associate Scientist	2010–2013
Leibniz-Institut für Astrophysik Potsdam, Potsdam, Germany (f.k.a. Astrophysikalisches Institut Potsdam)	Research Scientist	2005–2010
Institute of Astronomy, Cambridge, UK	Postdoc	2002–2005
European Southern Observatory, Garching, Germany	ESO fellow	1999–2002

Research Interests

Redshift evolution of the intergalactic medium (IGM) using UV and optical spectra; Evolution of the CIV circumgalactic medium (CGM) and its connection to galactic outflows and star formation; High- z C III CGM absorbers and their connection to galaxies; Local warm-hot intergalactic medium using O VI and the missing baryons; Statistics on the transmitted flux distribution and the power spectrum; Intensity and shape of the ionizing UV background radiation; Testing predictions from various cosmological simulations using observational results; Nuclear outflow of the Milky Way; Metallicities of local star-forming galaxies; Surface brightness profiles of elliptical galaxies

Teaching Experience

1. Department of Astronomy, University of Wisconsin-Madison: 2010–2013, 2016–
 - Lecturer: *The evolving universe: stars, galaxies, and cosmology* (Astro 103) in Spring 2022 (introductory astronomy class for about 185 non-STEM majors)
 - Substitute lecturer: Astro 103 for four classes in Fall 2021
 - Substitute lecturer: *Observational Cosmology* (Astro 735), one class in Fall 2016
2. Department of Physics and Astronomy, University of Hawaii
 - Teaching assistant: Astronomy Survey (Astro 101) in Fall 1992 and Spring 1993
3. Department of Astronomy and Atmospheric Science, Yonsei University, S. Korea
 - Teaching assistant: Spherical Astronomy in 1991

Supervision Experience

1. Department of Astronomy, University of Wisconsin-Madison: 2010–2013, 2016–
 - Joint supervision of one PhD student (Dr. B. Rosenwasser, received a PhD in 2022)

- Supervising 2 REU students
 - D. Ranquist in 2011 (received a PhD in 2020 from CU Boulder)
 - A. Mizener in 2018
- 2. Osservatorio Astronomico di Trieste, Italy: 2013–2016
 - Joint supervision of one PhD student (Dr. C. Mongardi, received a PhD in 2017)
- 3. Leibniz-Institut für Astrophysik Potsdam, Germany: 2005–2010
 - Joint supervision of two PhD students
 - A. Partl (received a PhD in 2011)
 - N. Draganova (received a PhD in 2013 from Universität Potsdam)
- 4. Joint supervision of several undergraduate students in Cambridge, UK (2003-2004) and UW-Madison (2019)

PI Grant Proposals

- HST Proposal AR-12842 (2012, US): The evolution of intergalactic neutral hydrogen (H I) over cosmic time
- HST Proposal GO-14265 (2015, Italy): Proposal PI: Crossing the redshift desert: ionizing background radiation and intergalactic hydrogen at $z \sim 1$
- HST Proposal AR-15033 (2017, US): A COS archival survey for proximate absorbers at $z \sim z_{\text{em}}$ in AGN spectra at $z < 0.4$
- NSF Proposal 2108702 (2020, US): The temperature of the circumgalactic and intergalactic medium over cosmic time
- HST proposal AR-17027 (2022, US): Thermal properties of the IGM and CGM: Confronting simulations with observations

Committee

- Zoom Host: “Blair, Happy 80th Birthday: A Virtual Birthday Celebration of Blair Savage” May 24-25, 2022
- SOC and LOC: “Diffuse matter in space: a workshop in honor of Blair Savage’s career”, planned on May 28-30, 2020, Madison WI (postponed due to the COVID-19 pandemic)
- NSF (National Science Foundation) review panel: 2017
- HST (Hubble Space Telescope) review panel: 2012 (Cycle 20), 2013 (Cycle 21), 2022 (Cycle 30)
- LBT (Large Binocular Telescope) time allocation committee: 2009–2010
- LOC: “When the Universe formed stars”: Nov. 17–21, 2008, Martinique, France

Community and Public Outreach

- Volunteer coach for Science Olympiad at a local high school (West High: Remote Sensing event in 2016-2018, 2022) and a middle school (Hamilton Middle: Density Lab event in 2018-2021)
- Vice director of the REU program at University of Wisconsin at Madison in 2017–2019

- Annual Public Open House: University of Cambridge (2002–2005), Leibniz-Institut für Astrophysik Potsdam (2005–2010)
- Public Observations: University of Hawaii (1992-1993)

Technical Experience and Computer Skills

- Quality check of data/instrument as a UVES (high-resolution spectrograph at the VLT) commissioning and Science Verification team member: 1999-2001
- Developing and testing the UVES pipeline as a commissioning team member: 1999-2001
- UVES night-time support astronomer at Paranal Observatory, Chile, in 2001-2002
- Developing and testing a custom-made data processing program for *HST*/COS at the University of Wisconsin at Madison: 2010–2013
- Observations and related experience: University of Hawaii 2.2 meter telescope (Hawaii, about 15 runs), UKIRT (United Kingdom Infrared Telescope, Hawaii, 1 run), Keck-I (Hawaii, 1 run) for various optical, near-infrared spectroscopic and imaging observations; UVES service-mode observation (4 runs); *HST* COS GO observations (4 runs)
- Programming in IDL and Python; data reduction and analysis of spectroscopic (UV and optical) and imaging (optical and near-infrared) data from *HST*, *FUSE*, Keck-I, VLT, UKIRT, CFHT and University of Hawaii Telescope; data reduction using astronomical software including IRAF, PyRAF, EsoReflex and MIDAS; radio data reduction and analysis using AIPS; analysis of absorption and emission lines using the line profile fitting program VPFIT; photoionization code CLOUDY

Bibliography

Work in progress:

1. Kim T.-S. et al. 2022, MNRAS, *The temperature of intergalactic and circumgalactic C IV absorbers over cosmic time*
2. Kim T.-S. et al. 2022, MNRAS, *The evolution of the low-density H I IGM from $z = 3.6$ to 0: II. Detection of a turnover in the temperature-density relation*

For Refereed Journals (from http://adsabs.harvard.edu/abstract_service.html)

1. Bolton, J. S., Gaikwad, P., Haehnelt, M. G., Kim, T.-S., Nasir, F., Puchwein, E., Viel, M., Wakker, B. P. 2022, MNRAS, 513, 864, Limits on non-canonical heating and turbulence in the intergalactic medium from the low redshift Lyman α forest
2. Kim T.-S., Wakker B. P., Nasir F., Carswell R. F., Savage B. D., Bolton J. S., Fox A. J., Viel M., Haehnelt M. G., Charlton J. C., Rosenwasser B. E. et al. 2021, MNRAS, MNRAS, 501, 581, The evolution of the low-density H I intergalactic medium from $z = 3.6$ to 0: Data, transmitted flux and H I column density
3. Cashman F. H., Fox A. J., Savage B. D. et al. 2021, ApJ, 923, 11, Molecular gas within the Milky Way's nuclear wind

4. Morrison S., Pieri M. M., Syphers D. & Kim T.-S. 2019, MNRAS, 489, 868, Probing inhomogeneity in the helium ionizing UV background
5. Mongardi C., Vie M., D’Odorico V., Kim T.-S. et al. 2018, MNRAS, 478, 3266, Absorption systems at $z \sim 2$ as a probe of the circumgalactic medium: a probabilistic approach
6. Fahad N., Bolton J. S., Matteo V., Kim T.-S. et al. 2017, MNRAS, 471, 1056, The effect of stellar and AGN feedback on the low-redshift Lyman α forest in the Sherwood simulation suite
7. Savage B. D., Kim T.-S., Fox A. J., Massa D. et al. 2017, ApJS, 232, 25, Probing the outflowing multiphase gas ~ 1 kpc below the Galactic center
8. Iršič V., Viel M., Haehnelt M. G., Bolton J. S. et al. 2017, PhRvD, 96, 023522, New constraints on the free-streaming of warm dark matter from intermediate and small scale Lyman- α forest data
9. Viel M., Haehnelt M. G., Bolton J. S., Kim T.-S. et al. 2017, MNRAS, 467, 86, Diagnosing galactic feedback with line broadening in the low-redshift Ly α forest
10. Iršič V., Viel M., Berg T. A. M., D’Odorico V. et al. 2017, MNRAS, 466, 4332, The Lyman α forest power spectrum from the XQ-100 Legacy Survey
11. Rorai A., Becker G. D., Haehnelt M. G., Carswell R. F. et al., 2017, MNRAS, 466, 2690, Exploring the thermal state of the low-density intergalactic medium at $z=3$ with an ultra-high signal-to-noise QSO spectrum
12. Bolton J. S., Puchwein E., Sijacki D., Haehnelt M. G., Kim T.-S. et al., 2017, MNRAS, 464, 897, The Sherwood simulation suite: overview and data comparisons with the Lyman- α forest at redshifts $2 \leq z \leq 5$
13. Bordoloi R., Fox A. J., Lockman, F. J., Wakker B. P. et al. 2017, ApJ, 834, 191, Mapping the nuclear outflow of the Milky Way: studying the kinematics and spatial extent of the Northern Fermi Bubble
14. D’Odorico V., Cristiani S., Pomante E., Carswell R. F. et al. 2016, MNRAS, 463, 2690, Metals in the $z \sim 3$ intergalactic medium: results from an ultra-high signal-to-noise ratio UVES quasar spectrum
15. Lopez S., D’Odorico V., Ellison S. L., Becker G. D. et al. 2016, A&A, 594, 91, XQ-100: A legacy survey of one hundred $3.5 \leq z \leq 4.5$ quasars observed with VLT/X-shooter
16. Kim T.-S., Carswell R. F., Mongardi C., Partl A. M., Mucket J. P., Barai P., & Cristiani S. 2016, MNRAS, 4567, 2005, Triple-ionized carbon associated with the low-density neutral hydrogen gas at $1.7 < z < 3.3$: the integrated $N_{\text{H I}}-N_{\text{C IV}}$ relation
17. Kim T.-S., Carswell R. F. & Ranquist D. 2016, MNRAS, 456, 3509, Evidence of bimodal physical properties of intervening, optically thin C III absorbers at $z \sim 2.5$
18. Wakker B. P., Hernandez, A. K., French D. B., Kim T.-S., Oppenheimer B. D. & Savage B. D. 2015, ApJ, 814, 40, Nearby galaxy filaments and the Ly α forest: confronting simulations and the UV background with observations
19. Fox A. J., Bordoloi R., Savage B. D., Lockman F. J. et al. 2015, ApJ, 799, 7, Probing the Fermi Bubbles in ultraviolet absorption: a spectroscopic signature of the Milky Way’s biconical nuclear outflow
20. Stocke J. T., Keeney B. A., Danforth C. W., Syphers D. et al. 2014, ApJ, 791, 128, Absorption-line detections of 10^5 - 10^6 K gas in spiral-rich groups of galaxies
21. Savage B. D., Kim T.-S., Wakker B. P., Keeney B., Shull J. M., Stocke J. T. & Green J. C. 2014, ApJS, 212, 8, The properties of low redshift intergalactic O VI absorbers determined from

- high S/N observations of 14 QSOs with the Cosmic Origins Spectrograph
22. Kim T.-S., Partl A. M., Carswell R. F. & Müller V. 2013, *A&A*, 552, 77, The evolution of H I and C IV quasar absorption line systems at $1.9 < z < 3.2$
 23. Garzilli A., Bolton J. S., Kim T.-S., Leach S. & Viel M. 2012, *MNRAS*, 424, 1723, The intergalactic medium thermal history at redshift $z = 1.7\text{--}3.2$ from the Ly α forest: a comparison of measurements using wavelets and the flux distribution
 24. Savage B. D., Kim T.-S., Keeney B., Narayanan A., Stocke J. T., Syphers D. & Wakker B. P. 2012, *ApJ*, 753, 80, The properties of two low-redshift O VI absorbers and their associated galaxies toward 3C 263
 25. Calura F., Tescari E., D’Odorico V., Viel M., Cristiani S., Kim T.-S. & Bolton J. S., 2012, *MNRAS*, 422, 3019, The Lyman- α forest flux probability distribution at $z > 3$
 26. Narayanan A., Charlton J. C., Misawa T., Green R. E. & Kim T.-S. 2008, *ApJ*, 689, 782, The chemical and ionization conditions in weak Mg II absorbers
 27. Viel M., Colberg J. M. & Kim T.-S. 2008, *MNRAS*, 386, 1285, On the importance of high-redshift intergalactic voids
 28. Bolton J. S., Viel M., Kim T.-S., Haehnelt M. G. & Carswell, R. F. 2008, *MNRAS*, 386, 1131, Possible evidence for an inverted temperature-density relation in the intergalactic medium from the flux distribution of the Ly α forest
 29. Kim T.-S., Bolton J. S., Viel M., Haehnelt M. G. & Carswell, R. F. 2007, *MNRAS*, 382, 1657, An improved measurement of the flux distribution of the Ly α forest in QSO absorption spectra: the effect of continuum fitting, metal contamination and noise properties
 30. Péroux C., Dessauges-Zavadsky M., D’Odorico S., Kim T.-S. & McMahon R. G. 2007, *MNRAS*, 382, 177, A homogeneous sample of sub-damped Lyman systems - IV. Global metallicity evolution
 31. Mshar A. C., Charlton J. C., Lynch R. S., Churchill C. & Kim, T.-S. 2007, *ApJ*, 669, 135, The kinematic evolution of strong Mg II absorbers
 32. Schaye J., Carswell R. F. & Kim, T.-S. 2007, *MNRAS*, 379, 1169, A large population of metal-rich, compact, intergalactic C IV absorbers – Evidence for poor small-scale metal mixing
 33. Lopez S., Ellison S. L., D’Odorico S. & Kim T.-S. 2007, *A&A*, 469, 61, Clues to the nature of high-redshift O VI absorption systems from their (lack of) small-scale structure
 34. Narayanan A., Misawa T., Charlton J. C. & Kim T.-S. 2007, *ApJ*, 660, 1093, A survey of weak Mg II absorbers at $0.4 < z < 2.4$
 35. Gabel J. R., Arav N. & Kim T.-S. 2006, *ApJ*, 646, 742, The AGN outflow in the HDF-S target QSO J2233–606 from a high-resolution VLT UVES spectrum
 36. Zaroubi S., Viel M., Nusser A., Haehnelt M. G., & Kim, T.-S. 2006, *MNRAS*, 369, 734, The matter power spectrum from the Ly α forest: an optical depth estimate
 37. Lynch R. S., Charlton J. C. & Kim, T.-S. 2006, *ApJ*, 640, 81, A survey of weak Mg II absorbers at redshift $z \geq 1.78$
 38. Péroux C., Dessauges-Zavadsky M., D’Odorico S., Kim T.-S. & McMahon R. G. 2005, *MNRAS*, 363, 479, A homogeneous sample of sub-DLAs III: Total gas mass $\Omega_{\text{HI}+\text{HeII}}$ at $z > 2$
 39. Aguirre A., Schaye J., Kim T.-S., Theuns T., Rauch, M. & Sargent, W. L. W. 2004, *ApJ*, 602, 38, Metallicity of the intergalactic medium using pixel statistics: III. Silicon
 40. Viel M., Haehnelt M. G., Carswell R. F. & Kim T.-S. 2004, *MNRAS*, 349, 33, The effect of (strong) discrete absorption systems on the Ly α forest flux power spectrum

41. Viel M, Matarrese S., Heavens A., Haehnelt M. G., Kim T.-S., Springel V. & Hernquist L. 2004, MNRAS, 347, 26, The bispectrum of the Ly α forest at $z \sim 2-4$ from a Large sample of UVES QSO Absorption Spectra (LUQAS)
42. Kim T.-S., Viel M, Haehnelt M. G., Carswell R. F. & Cristiani, S. 2004, MNRAS, 347, 355, The power spectrum of the flux distribution in the Ly α forest of a Large sample of UVES QSO Absorption Spectra (LUQAS)
43. Schaye J., Aguirre A., Kim T.-S., Theuns T., Rauch M. & Sargent W. L. W. 2003, ApJ, 596, 768, Metallicity of the intergalactic medium using pixel statistics. II. The distribution of metals as traced by C IV
44. Peroux C., Dessauges-Zavadsky M., D'Odorico S., Kim T.-S. & McMahon R. G. 2003, MNRAS, 345, 480, A homogeneous sample of sub-DLAs II: Statistical, kinematic and chemical properties
45. Dessauges-Zavadsky M., Peroux C., Kim T.-S., D'Odorico S. & McMahon R. G. 2003, MNRAS, 345, 447, A homogeneous sample of sub-DLAs I: Construction of the sample and chemical abundance measurements
46. Kim T.-S., Carswell R. F., Cristiani S., D'Odorico S. & Giallongo, E. 2002, MNRAS, 335, 555, The physical properties of the Ly α forest at $z > 1.5$
47. Carswell R. F., Schaye J. & Kim T.-S. 2002, ApJ, 578, 43, The enrichment history of the intergalactic medium: O VI in Ly α forest systems at $z \sim 2$
48. Kim T.-S., Cristiani S. & D'Odorico S. 2002, A&A, 383, 747, The evolution of the physical state of the IGM
49. Stockton A., MacKenty J. W., Hu E. M. & Kim T.-S. 2002, ApJ, 572, 735, The extended emission-line region of 4C 37.43
50. Theuns T., Zaroubi S., Kim T.-S., Tzanavaris P. & Carswell R. F. 2002, MNRAS, 332, 367, Temperature fluctuations in the intergalactic medium
51. Theuns T., Schaye J., Zaroubi S., Kim T.-S., Tzanavaris P. & Carswell, R. F. 2001, ApJ, 567, L103, Constraints on reionization from the thermal history of the intergalactic medium
52. Bianchi S., Cristiani S. & Kim T.-S. 2001, A&A, 376, 1, The contribution of galaxies to the UV ionizing background and the evolution of the Lyman forest
53. Kim T.-S., Cristiani S. & D'Odorico S. 2001, A&A, 373, 757, The Ly α forest at $1.5 < z < 4$
54. Schaye J., Rauch M., Sargent W. L. W. & Kim T.-S. 2000, ApJ, 541, L1, Detection of oxygen in the low-density intergalactic medium
55. Kim T.-S., Hu E. M., Cowie L. L. & Songaila A. 1997, AJ, 114, 1, The redshift evolution of the Ly α forest
56. Hu E. M., Kim T.-S., Cowie L. L., Songaila A. & Rauch, M. 1995, AJ, 110, 1526, The distribution of column densities and b values in the Ly α forest
57. Kim T.-S., Hu E. M., Cowie L. L. & Songaila A. 1996, JKASS, 29, 39, The evolution of Lyman α forest clouds at $z > 2$ (no online electronic copy available)
58. Cowie L. L., Songaila A., Kim T.-S. & Hu, E. M. 1995, AJ, 109, 1522, The metallicity and internal structure of the Ly α forest