

Ümit Kavak, PhD | CV

Associate Scientist, Universities Space Research Association (USRA) &
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Research Interests

astrochemistry, photo-dissociation regions, massive star formation, molecular clouds, HII regions, star formation, ISM, radio jets in massive star forming regions, interferometric observation, radio, millimeter, sub-millimeter telescopes, and data reduction and analysis

Professional Experiences

SOFIA Science Center/USRA

Promoted to Associate Scientist

Manager: Ed Chambers

NASA-ARC

Jan 2023–current

SOFIA Science Center/USRA

Postdoctoral Researcher

Manager: Elizabeth Barker, B-G Andersson

NASA-ARC

Jan 2022–2023

Leiden Observatory

Postdoctoral Researcher

in group of Prof. Dr. A.G.G.M. (Xander) Tielens

Universiteit Leiden

Aug 2021–Jan 2022

Education

Kapteyn Instituut at RuG, SRON

Ph.D. student in group of Prof. Dr. F. F. S. van der Tak

Co-Supervisor: Prof. Dr. A.G.G.M. (Xander) Tielens

Rijksuniversiteit Groningen

Dec 2016–Nov 2021

Leiden Observatory

Leiden/ESA Astrophysics Program for Summer Students (LEAPS) 2016

Supervisors: Dr. Vianney Taquet, Dr. Catherine Walsh

Universiteit Leiden

June–August, 2016

I. Physikalisches Institut, Math.-Naturwiss. Fakultät

MSc (ERASMUS+ Student Exchange Program)

Master's thesis supervised by Prof. Dr. Peter Schilke

Universität zu Köln

Oct 2014–Aug 2015

Graduate School of Science and Engineering

MSc, Coursework completed

Thesis supervisor: Prof. Dr. Tansel Ak

Istanbul University

Sep 2012–May 2016

Department of Astronomy and Space Sciences, Faculty of Science

BSc (ranked top 2nd at the department)

Istanbul University

Sep 2008–Jun 2012

PhD thesis

Title: *The Interaction of Stars with Gas Clouds in the Milky Way*

Supervisors: Prof. Dr. F.F.S. van der Tak, Prof. Dr. A.G.G.M. (Xander) Tielens

Submission Date: July 17th, 2021

Graduation Date: December 3rd, 2021

Link: <https://doi.org/10.33612/diss.187660161>

Description: My thesis examines the formation of massive stars and their impact on the surrounding gas environment. I use observations with a ground-based radio telescope (EVLA/NRAO), a space-based infrared telescope (*Herschel*/ESA), and an infrared telescope which flies in the stratosphere (STO-2 and SOFIA/NASA). To interpret these data, I use models of radiative transfer and chemical evolution of interstellar clouds.

Master's thesis

Title: *A quest for radio jets in high-mass young stellar objects*

Supervisors: Prof. Dr. Peter Schilke, Prof. Dr. Tansel Ak

Thesis No in the CoHE Thesis Center: 427905

DOI: 10.5281/zenodo.53119

Description: Worked on the analysis of a sample of high-mass star-forming regions, searching for radio jets from massive young stellar objects by using continuum observations obtained via the Very Large Array (VLA). CASA (Common Astronomy Software Applications) is used to reduce and analyse the VLA continuum data.

Team Memberships

SOFIA FEEDBACK Legacy Program: FEEDBACK is a SOFIA legacy project using the upGREAT heterodyne receiver to map the [CII] 158 μm line in Galactic molecular clouds. We study the interaction of massive stars with their environment in a sample of sources that span a range in stellar characteristics from single OB stars, to small groups of O stars, to rich young stellar clusters, to mini starbursts. The aim of these observations is to quantify the mechanical energy injection and radiative heating efficiency in regions dominated by these different processes (stellar winds, thermal expansion, radiation pressure).

The Stratospheric Terahertz Observatory (STO-2): STO2 is a NASA balloon-borne mission, led by the University of Arizona and with significant contributions from SRON. This collaboration aims to survey massive star-forming regions in the galactic plane with an 80-cm telescope at 158 μm line of [CII]. I was part of the team for data reduction and testing the data quality and involved in the paper published with [CII] observations of Eta Carinae.

Publications

1. **Kavak, Ü**, et al., "*SOFIA FEEDBACK Legacy Program: Energetics of the bubbles in NGC 7538*" (**in prep**).
2. Tiwari, M., M. Wolfire, M. Pound, E. Tarantino, R. Karim, L. Bonne, C. Buchbender, R. Güsten, C. Guevara, S. Kabanovic, **Ü. Kavak**, N. Schneider, R. Simon, J. Stutzki, and A. G. G. M. Tielens, "*SOFIA FEEDBACK survey: PDR diagnostics of stellar feedback in different regions of RCW 49*" (**Submitted to ApJ**).
3. **Kavak, Ü**, Bally, J., Goicoechea, R. J., Pabst, C. H. M., van der Tak, F. F. S., and Tielens, A.G.G.M., "*Dents in the Veil: Protostellar feedback in Orion*" (**A&A**).
4. **Kavak, Ü**, Goicoechea, R. J., Pabst, C. H. M., van der Tak, F. F. S., and Tielens, A.G.G.M., "*Breaking Orion's Veil bubble with fossil outflows*" (**A&A**).
5. **Kavak, Ü**, Á. Sánchez-Monge, A. López-Sepulcre, R. Cesaroni, F. F. S. van der Tak, L. Moscadelli, M. T. Beltrán, and P. Schilke, 2020, "*Search for radio jets from massive young stellar objects. Association of radio jets with H₂O and CH₃OH masers*" [**arXiv**] [**A&A**]
6. Shipman, R., Seo, Youngmin, Tolls, Volker, Peters, William, **Kavak, Ümit**, Kulesa, Craig; Walker, Chris 2019, "*Data Processing of the Stratospheric Terahertz Observatory-2 [CII] Survey*", Astronomical Data Analysis Software and Systems XXVIII. ASP Conference Series, Vol. 523, Published in [**ASPC**]
7. **Kavak, Ü**, van der Tak, F.F.S., Tielens, A.G.G.M., and Shipman, F.F.S., 2019, "*Origin of the Hydrogen Fluoride in the Orion Bar: An excellent tracer for CO-dark H₂ gas clouds in PDRs*", A&A, Vol 52,

- p.25–75 [arXiv] [A&A]
8. Youngmin S., Goldsmith, P., Walker, C., Hollenbach, D. J., Wolfire, M. G., Kulesa, C., Tolls, V., Bernasconi, P. N., **Kavak, Ü**, van der Tak, F., Shipman, R., Rong Gao, J., Helmich, F., Tielens, A.G.G.M., Burton, M. G., Yorke, H., Young, E., Peter, W., Young, A., Groppi, C., Davis, K., Pineda, J. L., Langer, W. D., Kawamura, J. H., Stark, A., Melnick G., Robello, D., Wong, G. F., Horiuchi, S., and Kuiper, T. B., 2019, "Probing ISM Structure in Trumpler 14 & Carina I using Stratospheric Terahertz Observatory 2", A&A, Vol 52, p.25–75 [arXiv] [ApJ]
 9. Goldsmith, Paul; Seo, Youngmin; Walker, Chris; Kulesa, Craig; Tolls, Volker; Shipman, Russ; Wolfire, Mark; Hollenbach, Dave; **Team, STO**, 2019, "STO2 Observations of [CII] and the Structure of the Tr14 Region", American Astronomical Society, AAS Meeting #233, id.311.03
 10. Tolls, V., Seo, Y.; Peters, B.; Goldsmith, P.; Hollenbach, D., **Kavak, Ü.**, Kulesa, C., Melnick, G., Shipman, R. F., Stark, A. A., and Walker, C., 2019, "Stratospheric Terahertz Observatory 2 (STO2) Data Reduction", AAS 223rd Meeting, Session Title: Computation, Data Science, and Image Analysis [ADS]

Awards and Scholarships

- **A&A's front cover**, A figure from my paper (Kavak et al., 2022) used by Astronomy and Astrophysics, a world-renowned scientific journal, as their front cover figure for Volume 660 **April 22, 2022**
- **PhD Scholarship** at the University of Groningen/SRON (€100k) **Dec 2016–2020**
- **LKBF Grant**, Leids Kerkhoven-Bosscha Fonds Grant for a conference in Chile [Not used due to the corona-virus pandemy] (€1000) **April 2020**
- **LKBF Grant**, Leids Kerkhoven-Bosscha Fonds Grant for USA trip (€1500) **July 2018**
- **Certificate Social Responsibility Project of the Istanbul University**: "Children's University 2016", Istanbul, Turkey, (Volunteer) **Feb 2016**
- **Grant The Sci. and Tech. Research Council of Turkey (TUBITAK)**, National Grants of TUBITAK Intended for Priority Fields, 2210-C (€6200) **Oct 2014–2015**
- **ERASMUS+ Grant** The European Union - European Commission Lifelong Learning Programme (LLP) (2000 €) **Oct 2014–Mar 2015**
- **Grant The Sci. and Tech. Research Council of Turkey (TUBITAK)**, Participate Grants For Scientific Events Abroad BIDEB, 2224-A (€700) **Feb 10–14, 2014**
- **Student Award** Istanbul University, Science Faculty, The degree of graduation Department of Astronomy and Space Sciences **July 2012**

Observing Experience

- **SOFIA Observatory; GREAT Instrument** (Palmdale, US) Observation of two regions within the FEEDBACK Project (PI: Xander Tielens): M17 and M16 **Apr 13–16, 2022**
- **SOFIA Observatory; GREAT Instrument** (Palmdale, US) Observation of two regions within the FEEDBACK Project (PI: Xander Tielens): NGC 7538 and Cygnus X **Dec 4–13, 2019**
- **IRAM30m Telescope; EMIR Instrument** (Sierra Nevada, Spain) "Chemical evolution of the circumstellar envelopes around evolved stars: IRC+10216 and NGC 7027" **Sep 12–15, 2015**

Organization Experience

- **Kapteyn ISM Group** Organized the biweekly ISM group meeting **Apr 2018–Jun 2020.**
- **SRON Young Minds** Organized SRON meeting in Utrecht/NL **March 20, 2019.**

Academic Activities

Teaching Duties

- **Interstellar Medium (ISM)**, Teaching Assistant of Inga Kamp, Rijksuniversiteit Groningen, Groningen, The Netherlands **Feb - April, 2018**
- **Prognum 2017** 'Python and Linux Course', Teaching Assistant of Martin G. R. Vogelaar, University of Groningen, Groningen, The Netherlands **Feb - April, 2017**

Talks

- **Protostellar feedback in massive star-forming regions** at AAS 20213, Seattle, WA **Jan 10, 2023**
- **Protostellar feedback in massive star-forming regions** at Chile-Cologne-Bonn Symposium, Puerto Varas, Chile **Sept 26, 2022**
- **Breaking Orion's Veil bubble via fossil outflows** at Virtual NOVA Network Meeting, the Netherlands **March 3rd, 2021**
- **Watch out: Exoplanets are in the Netherlands** at EAS 2020 Leiden Virtual (SS23: NAC: Outreach Session), Leiden, the Netherlands **July 1st, 2020**
- **Origin of the Hydrogen Fluoride (HF) Emission in the Orion Bar** at JPL Lunch Talk, NASA/JPL-Caltech, Pasadena, California, USA **July 9th, 2018**
- **Origin of the Hydrogen Fluoride (HF) Emission in the Orion Bar** at the Olympian Symposium 2018, Paralia Katerini, Mount Olympus, Greece **May 29th, 2018**
- **Origin of the Hydrogen Fluoride Emission in the Orion Bar**, 73rd Netherlands Astronomers Conference (NAC2018) **May 15th, 2018**
- **The Interaction of Stars with Gas Clouds: HF in the Orion Bar**, Wednesday Launch Talk (WLT) of Interstellar Medium, A.G.M.M. (Xander) Tielens, Leiden Observatory, Leiden, the Netherlands **Oct 18th, 2017**
- **Understanding the Chemical Complexity in Protostellar Outflows: L1157-B1**, Wednesday Lunch Talk (WLT) of Kapteyn Institute, Groningen, The Netherlands **Oct 4th, 2017**
- **Massive Star Formation at Radio Wavelengths**, VIII. URSI-Turkey National Scientific Congress, Ankara, Turkey **Sep 1-3, 2016**

Meetings & Workshops

Work Visit

- **Leiden Observatory**, Invited by Xander Tielens to discuss SOFIA [CII] Observations of NGC 7538 and various stellar feedback mechanisms, Leiden, The Netherlands **20 May–13 June, 2022**
- **Leiden Observatory**, Invited by Xander Tielens to discuss SOFIA [CII] Observations of the Orion Veil, Leiden, The Netherlands **9–13 Sept, 2019**
- **NASA/JPL-Caltech**, Invited by Paul Goldsmith to JPL/Caltech to discuss the data reduction pipeline of STO-2 Project and the source selection from the Survey, Pasadena, California **2–6 July, 2018**

Conferences, Internships & Workshops

- **Our Galactic Ecosystem: Opportunities and Diagnostics in the Infrared and Beyond**, UCLA Lake Arrowhead, CA, USA [[LINK](#)] **Feb 28th–Mar 4th, 2022**
- **4th Institute of Space Sciences Summer School: Artificial Intelligence for Astronomy**, (during the Covid-19 pandemic) Barcelona, Spain **July 12th–16th, 2021**
- **European Astronomical Society 2020 (EAS 2020 Virtual)**, (during the Covid-19 pandemic) Leiden, The Netherlands **June 29–July 2, 2020**
- **Celebrating the first 40 years of Alexander Tielens' contribution to Science: The physics and chemistry of the ISM**, Avignon, France [[LINK](#)] **Sept. 2–6, 2019**

- **SPICA collaboration meeting** in Groningen, The Netherlands [[LINK](#)] **April 2–4, 2019**
- **Astrochemistry: Past, Present, & Future** A Meeting in Celebration of Ewine van Dishoeck, Pasadena, California, [[LINK](#)] **Jul 10-14, 2018**
- **Olympian Symposium 2018: Gas and stars from milli- to mega- parsecs** Paralia Katerini, Mount Olympus, Greece **May 29th, 2018**
- **NOVA Network Meeting**, Amsterdam, The Netherlands **Apr, 2017**
- **ALMA Allegro**, Leiden Observatory, Leiden, The Netherlands **Mar, 2016**
- **LEAPS 2016** Leiden–European Space Agency (ESA) Astrophysics Program for Summer Students, Leiden, The Netherlands [[LINK](#)] **June 11– Aug 11, 2016**
- **8th IRAM30 Summer School**, Sierra Nevada, Granada, Spain [[LINK](#)] **Sep 11-18, 2015**
- **SOFIA Winter School**, I. Physikalisches Institut, Math.-Naturwiss. Fakultät, Universität zu Köln [[LINK](#)] **Feb 10-14, 2014**

Proceedings.....

- **Kavak, U.**, Sanchez-Monge, A., Schilke, P., Yildiz, U., Ak, T. 2016, *Radyo Dalgaboylarında Büyük Kütleli Yıldız Oluşumu - Massive Star Formation at Radio Wavelengths*, URSI-Turkey 2016 VIII. Scientific Congress, Ankara, Turkey [[Link](#)] **Sep 1-3, 2016**

Posters.....

- **Breaking the Bubble: SOFIA [CII] observation of the Orion Veil**, Our Galactic Ecosystem, Lake Arrowhead, CA, USA **Feb 28th–Mar 4th, 2022**
- **Breaking the Bubble: SOFIA [CII] observation of the Orion Veil**, EAS 2020 Virtual meeting (SS11: Astrochemistry Session), Leiden, The Netherlands **June 29, 2020**
- **CO-Dark H₂ Gas is not Dark Anymore**, Celebrating the first 40 years of Alexander Tielens' contribution to Science: The physics and chemistry of the ISM, 2019, Avignon, France [[PDF](#)][[Zenodo](#)] **2–6 Sep 2019**
- **Origin of the hydrogen fluoride emission in the Orion Bar**, Astrochemistry 2018, Pasadena, California, USA [[PDF](#)][[Zenodo](#)] **10–14 July Sep 2018**
- **Understanding of Chemical Complexity in Protostellar Outflows: L1157-B1 Star Forming Region**, Fundamentals of the Life In Universe, Rijksuniversiteit Groningen, Groningen, The Netherlands [[Link](#)][[Zenodo](#)] **31 Aug-1 Sep 2017**

Computer Skills

Astronomy Packages: CASA, GILDAS/CLASS, RADEX, ds9

Software: L^AT_EX, HTML5

Operation Systems: MacOS, Ubuntu/Linux, Windows

Languages: Python, SQL

Work Experience

- **IU Solar Observatory** *Istanbul University, Solar Observatory, Assistance Student* **2012–2013**
- **Moon Planetarium** *Planetarium Guide, Istanbul, Turkey* **2011–2012**
- **IU Solar Observatory** *Istanbul University, Solar Observatory, Assistance Student* **2010–2011**

Popular Articles & Talks.....

- **Protostellar feedback in Massive Star Forming regions**, AAS241 Press Conference **Jan 12, 2023**
- **Orion's Veil Comes Out of Its Shell**, USRA Newsroom **July 14, 2022**

- **Flying with a telescope: SOFIA Observatory**, Kapteyn Astronomical Institute **March 11, 2020**
- **A talk about Life in Space in Turkish** FMV Işık Okulları **January, 2019**
- **Astronomers map new emission line to trace most common molecule in the Universe**, SRON Netherlands Institute for Space Research, Groningen **September 2018**
- **Balloon Telescope at Edge of Space: STO-2**, *The Journal of Science and Technique - TÜBİTAK, Turkey* **March, 2017**
- **Where does Oxygen come from?** *Sky - Turkish Astronomical Society (TAD)* **September, 2014**
- **Look to the past with ALMA Sky** - *Turkish Astronomical Society (TAD)* **August, 2013**

Club Activities

- **GUTSA**, *Groningen University Turkish Student Association*, Board Member **2017-18**
- **May Astronomy Festival of AAK** *Istanbul University 'Amateur Astronomers Club (AAK)' Amateur Telescope Making Workshop* **May 2010**
- **Astronomy Days of IKU** *Istanbul Kültür University (IKU) 'Responsible of Amateur Telescope Making (ATM) Workshop'* **2009**
- **Istanbul Yuri's Night 2009** *Istanbul Kültür University (IKU) 'Attendant of AAK'* **April 2009**

I also participated in many meetings and public events, especially for primary and high schools, of Amateur Astronomers Club (AAK) of the Istanbul University (Turkey) throughout my bachelor period.

Languages

Turkish	Mother-tongue
English	Advanced

Outreach Activities and Hobbies

aviation, history, calligraphy, amateur telescope making, and travel (visited 15 countries and more than 40 cities around the globe)

References

- **Prof. Dr. F.F.S. van der Tak**
SRON Netherlands Institute for Space Research
Kapteyn Astronomical Institute, Landleven 12
9747 AD Groningen, The Netherlands
Email: vdtak@sron.nl
Web: <https://personal.sron.nl/~vdtak/>
- **Prof. Dr. A.G.G.M. (Xander) Tielens**
Lorentz Center - Leiden Observatory
P.O. Box 9513 NL-2300 RA
Leiden, The Netherlands
Email: tielens@strw.leidenuniv.nl
Web: <https://home.strw.leidenuniv.nl/~tielens>