Max **Mahlke**

PhD in Astronomy · Minor Bodies of the Solar System

max.mahlke@ias.u-psud.fr | github.com/maxmahlke

Education

PhD in Astronomy

Nice, France

Observatoire de la Côte d'Azur · Supervisor: Benoit Carry — *Oct. 2019 - Sept. 2022*

- Thesis title *Asteroid Taxonomy: A Probabilistic Synthesis of Spectrometry and Albedo from Complete and Partial Observations*
- Derived a new asteroid taxonomy from reflectance spectroscopy and albedos using a novel machine learning approach
- Studied the composition of Main Belt asteroids in the context of planetary formation

Master of Science in Physics

Aachen, Germany

RWTH Aachen University · Graduated with Distinction — *2014 - 2017*

- Thesis title *Probing the Periodicity of Active Galactic Nuclei with the First G-APD Cherenkov Telescope*
- Courses included *Astronomy and Astrophysics* and *Laboratory Course in Astronomy*
- 2015-2016: Erasums stay at the *Universidad Autónoma de Madrid* in Master of Theoretical Physics: Astrophysics and Physics of the Cosmos
- Courses included *Radiative Processes in Astrophysics*, *Observational Techniques in Astrophysics*, and *Computational Astrophysics*

Bachelor of Science in Physics

Aachen, Germany

RWTH Aachen University — *2011 - 2014*

- Thesis title *Stabilization of Imaging Acquisition Techniques using Field Cancellation*
- Courses covered *Experimental Physiscs* and *Theoretical Physics*

Research Experience

Institut d'Astrophysique Spatiale

Orsay, France

Post-Doctoral Research — *Nov. 2022 - Present*

- Description of aqueous-alteration history of (162173) *Ryugu* using laboratory spectral data (*MicrOmega*) of carbonate minerals
- Linkage of L-type asteroids to meteoritic analogues (CV/CO chondrites) using
  - Observations with ESO/X-SHOOTER *PI of Observation Proposal*
  - Laboratory experiments to simulate spectral alteration through space weathering *PI of Funding Proposal to French PNP*

Observatoire de la Côte d'Azur

Nice, France

PhD Research — *Oct. 2019 - Sept. 2022*

- Revision of asteroid taxonomy using visible-near-infrared spectroscopy and albedo — Mahlke et al. 2022
- Unsupervised machine learning approach allows for probabilistic classification of complete and partial observations
- Exploring connections between asteroids and meteorite via spectroscopy — Eschrig, Mahlke et al. 2022
- Compilation of asteroid phase curve coefficients from ATLAS observations using Bayesian statistics — Mahlke et al. 2021

Centro de Astrobiología, CSIC-INTA

Madrid, Spain

Pre-PhD Research Contract — *2018 - 2019*

- Detection of near-Earth asteroid and Mars-Crosser observations in the ESA Hubble Science Archive — Racero, Mahlke et al. 2021
- Launch of Zooniverse project *Hubble Asteroid Hunters* to recover minor bodies with citizen-scientists — Kruk, Mahlke et al. 2022
- Development of instrument-agnostic asteroid detection pipeline for astronomical images — Mahlke et al. 2019
- Search for minor bodies in images of Gran Telescopio Canarias and UKIRT WFCAM Transit Survey — Cortés-Contreras, Mahlke et al. 2019, 2020

RWTH Aachen University

Aachen, Germany

Master Research — *2016 - 2017*

- Analysis of time-series data of Active Galactic Nuclei to investigate periodic variability
- Simulation of red-noise processes to assess the significance of periodicity in AGN using Bayesian statistics

ESAC, European Space Agency

Madrid, Spain

Trainee Programme — *Feb. - Aug. 2016*

- Development of a method to detect minor bodies in wide-field imaging surveys using a pipeline of SExtractor, SCAMP, and Python data analysis
- Successful application of pipeline to the ESO/VST Kilo-Degree Survey DR-3 — Mahlke et al. 2018

RWTH Aachen University

Aachen, Germany

Bachelor Research — *April - Sept. 2014*

- Research in the context of medical physics and magnetic particle imaging
- Development of novel coil set-up for signal read-out in imager with application to test-system — Schulz, Mahlke et al. 2015

Collaborations

SsODNet

Developer *2022 - Present*

- Development of `python` client `rocks` for database of asteroid, comet, and natural-satellite data Berthier et al. 2023

J-PLUS Collaboration

Member of the Solar System Science group *2020 - Present*

- Responsible for detection of minor bodies in images of J-PLUS DR1 Mahlke et al. 2019
- Calibration of magnitudes for ultraviolet-visible spectrophotometry catalogue Morate, Mahlke et al. 2021

J-VAR Collaboration

Responsible for Detection of Minor Bodies in Images *2019 - Present*

- Collaboration executes observations at Observatorio Astrofísico de Javalambre for a wide range of transient sources
- Implemented fully-automatic pipeline to detect and recover minor bodies in all acquired images

Teaching

2024 Université Paris-Saclay Tutorial Sessions (TD) at License 1 level in *Électromagnétisme*
2024 École Les Houches Class on data access for minor body science at winter school
2022 Observatoire de la Côte d'Azur Lectures on `python` for master students
2021 Observatoire de la Côte d'Azur Lectures on `python` and Linux for master students

Skills

Minor Bodies Composition and Taxonomy · Spectroscopy · Phase Curves · Detection in Telescope Exposures
Languages German *Native* · English *Fluent in Written and Spoken* · Spanish *Advanced* · French *Advanced*
Data Analysis SExtractor · SCAMP · SWARP · TOPCAT
Programming Python · Bash · Lua · SQL · LaTeX · Unix

Open Science and Outreach

I enjoy participating in open-source software development and in outreach activities, to share my research with the minor-body community and the general public.

Member of SpaceBus France

Participation in various outreach activities throughout France, such as in schools and at astronomy festivals. *Since 2023*

`classy`

A command-line client and python package for taxonomic classification of asteroid observations. Mahlke et al. 2022 *Since 2020*

`rocks`

A command-line client and python package for the SsODNet service of the IMCCE, Paris, and OCA, Nice. Berthier et al. 2023 *Since 2019*

`ssos`

A pipeline to identify minor bodies in telescope images built on top of SExtractor and SCAMP. Mahlke et al. 2019 *Since 2016*

Publications

2024 Carruba, …, Mahlke, et al. *On the identification of the first two young ast. families in g-type non-linear sec. resonances*, MNRAS 528
2023 Mahlke et al. *Spectral analogues of Barbarian asteroids among CO and CV chondrites*, A&A, 676
2023 Berthier, Carry, Mahlke, Normand *SsODNet: The Solar system Open Database Network*, A&A, 671
2022 Mahlke, Carry, Mattei *Asteroid Taxonomy from Cluster Analysis of Spectrometry and Albedo*, A&A, 665 A&A Highlight in August 2022
2022 Eschrig, …, Mahlke et al. *Investigating S-type asteroid surfaces through reflectance spectra of Ordinary Chondrites*, Icarus, 381
2022 Kruk, …, Mahlke et al. *Hubble Asteroid Hunter: I. Identifying asteroid trails in Hubble Space Telescope images*, A&A, 661
2021 Mahlke, Carry, Denneau *Asteroid phase curves from ATLAS dual-band photometry*, Icarus, 354
2021 Morate, …, Mahlke et al. *J-PLUS: A first glimpse at the spectrophotometry of asteroids. The MOOJa catalog*, A&A, 655
2021 Racero, …, Mahlke et al. *ESASky SSOSS: Solar System Object Search Service and the case of Psyche*, A&A, 659
2020 Cortés-Contreras, …, Mahlke et al. *The Gran Telescopio Canarias OSIRIS broad-band first data release*, MNRAS, 491
2019 Cortés-Contreras, …, Mahlke et al. *Identification of asteroids using the Virtual Observatory: the WFCAM Transit Survey*, MNRAS, 490
2019 Mahlke et al. *The ssos pipeline: Identification of Solar System objects in astronomical images*, A&C, 28
2018 Mahlke et al. *Mining the Kilo-Degree Survey for solar system objects*, A&A, 610
2015 Schulz, …, Mahlke et al. *A Field Cancellation Signal Extraction Method for Magnetic Particle Imaging*, IEEE, 51