Max **Mahlke**

PhD in Astronomy · Minor Bodies of the Solar System

(+33) 645 796 726 | 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*

- Compositional characterisation of (101955) *Bennu* and (162173) *Ryugu* using remote and laboratory spectral data with a focus on carbonates
- Description of space weathering of carbonaceous material through irradiation experiments and application to Main Belt asteroids

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

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 Javalamabre for a wide range of transient sources
- Implemented fully-automatic pipeline to detect and recover minor bodies in all acquired images

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

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 *Intermediate*
Data Analysis	SExtractor · SCAMP · SWARP · TOPCAT
Programming	Python · Bash · Lua · SQL · LaTeX · Unix

Open Science

I enjoy participating in open-source software development. These are some of the tools I develop for the minor-bodies community.

`classy`

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

Published in Mahlke et al. 2022, A&A, 665

`rocks`

A command-line client and python package for the SsODNet service of the IMCCE, Paris. *Since 2019*

Published in Berthier, Carry, Mahlke and Normand 2022, A&A, 671

`ssos`

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

Published in Mahlke et al. 2019, A&A, 610

Publications

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*