Who is Who UZH Space Hub

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MSc ETH Martin Gerber

Affiliation: Swiss SkyLab Foundation

Area of research

Airborne research, sustainable aviation

Description of research

The Swiss SkyLab Foundation supports scientific, technological and academic utilization of research flight platforms in Switzerland to promote education, professional training and development. SkyLab provides access for researchers for experiments in weightlessness with the recurring parabolic flight campaigns at the Dubendorf airfield.

In addition, SkyLab is involved in various research projects that use flight platforms as research infrastructure. These include the development of fuel-efficient approach procedures and the implementation of methods on airliners for the transmission of real-time weather data.

Platforms and associated services, shareable equipment/infrastructure/database

- Access to various airborne research platforms

Special expertise

- Organization of flight test campaigns
- Project management for multidisciplinary aerospace research projects

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- 2020 – 2022: Horizon 2020 SESAR Joint Undertaking Exploratory Research ER4-05 “Environment and Meteorology for ATM“, Project DYNCAT (Dynamic Configuration Adjustment in the TMA), Grant Agreement No. 893568.
- 2018 – 2020: BAZL SFLV 2017-040, Project LNAS (Optimisation of approach procedures to reduce noise at Zurich Airport with the DLR pilot assistance system LNAS).
- 2018 – 2020: BAZL SFLV 2017-039, Project EDR (Real-time recording of turbulence on airliners using EDR and evaluation for better forecasts)

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Prof. Dr. Ravit Helled

Area of activity: Theoretical Astrophysics
Affiliation: Institute for Computational Science, MNF
University of Zurich

Area of research

Astrophysics, planetary science

Description of research

Planetary Structure and Evolution, Planet Formation, Solar System Exploration, Extrasolar Planets.
Some of the key questions my research addresses include:
How do planets form and evolve?
How can we link planet formation with planet evolution and composition?
What physical processes affect the evolution and final structure/composition of planets?
What are the compositions of the planets in our Solar System?
What are exoplanets made of?
What determines the final architecture of planetary systems?

Special expertise

- Theoretical/numerical models of planet formation, evolution and internal structure

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- Lead, NCCR PlanetS Academic Platform
- Science team member, Juno, NASA mission to Jupiter
- Science team member, PLATO, ESA mission to detect and characterize exoplanets
- Co-investigator, JUICE, ESA mission to Jupiter and the Galilean satellites
- Interior working group leader and consortium member ARIEL, ESA selected mission for exoplanetary characterization

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Dr. Andreas Hueni

Area of activity: Remote Sensing
Affiliation: Department of Geography, MNF
University of Zurich

Area of research

Airborne spectroscopy, spectroradiometer calibration, uncertainty and traceability, spectral information systems, spectral processing chains

Description of research

The Spectroradiometric Observing Systems group at the Remote Sensing Laboratories (RSL) focusses on the calibration, characterization, and operation of spectroradiometric pointing and imaging systems and the subsequent data calibration.
Mission statement: From light to radiance and reflectance with known uncertainties.
We strive to provide analysis ready data to our colleagues at RSL and to our national and international collaborators and customers.
We calibrate and/or operate the following sensors and systems:

- APEX - Airborne Prism Experiment Imaging Spectrometer (http://apex-esa.org)
  - Mission planning and operations (https://twitter.com/APEX_RSL), characterisation, calibration, PAF development, data processing, vicarious CAL-VAL using Spectral Ground Control Points (SGCP), uncertainty analysis
- AVIRIS-ng - NASA-owned Imaging Spectrometer (https://aviris-ng.jpl.nasa.gov)
  - Mission planning for European flight missions in collaboration with NASA/JPL (https://twitter.com/AVIRIS_NG_RSL), vicarious CAL-VAL using Spectral Ground Control Points (SGCP)
- ARES - Airborne Research Facility for the Earth System (https://ares-observatory.ch)
  - Project management to build the next generation of airborne observing systems
- ASD, SVC, UniSpec and FLoX point spectrometers
  - Characterisation, calibration, operation for Spectral Ground Control Points (SGCP) collection, SPECCHIO spectral database-centric processing chain, uncertainty analysis
- SPECCHIO Spectral Information System (https://specchio.ch)
  - Design and implementation

Platforms and associated services, shareable equipment/infrastructure/database

- field spectroradiometers in the solar reflective spectral range
- airborne imaging spectrometers
- spectral database for single spectra including extensive flexible metadata support

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- ARES - Airborne Research Facility of the Earth System: imaging spectrometer instrument development in collaboration with NASA/JPL
- AVIRIS-NG flight campaign organisation on behalf of the ESA CHIME satellite mission and in collaboration with NASA/JPL
- Work on uncertainty and traceability in the framework of MetEOC (http://www.meteoc.org)

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Prof. Dr. Philippe Jetzer

Area of activity: Gravitation and Astrophysics
Affiliation: Department of Physics, MNF
University of Zurich

Area of research

Astrophysics, cosmology, general relativity, gravitational waves, tests of general relativity

Description of research

The main focus of research activities of the group is theoretical and observational aspects of general relativity (GR), in particular gravitational-wave (GW) science and experimental tests of GR predictions. We are members of the LISA (Laser Interferometric Space Antenna) consortium and of the LIGO (Laser Interferometer Gravitational-Wave Observatory) Scientific Collaboration.
LIGO (Laser Interferometer Gravitational-Wave Observatory) is a large-scale physics experiment and observatory with two big instruments located in two different sites in US to detect GW and to develop gravitational-wave observations as an astronomical tool.
We take part in the analysis of the LIGO (Laser Interferometer Gravitational-Wave Observatory) data and we are involved in the definition of the scientific objectives of LISA (Laser Interferometric Space Antenna), which is a large ESA mission now under study and development.
Moreover, we are also involved in the ESA mission ACES (Atomic Clock Ensemble in Space) whose aim is to test GR using very precise atomic clocks which will be put on the International Space Station.

Platforms and associated services, shareable equipment/infrastructure/database

- LIGO (Laser Interferometer Gravitational-Wave Observatory) /Virgo GW ground based detectors
- LISA (Laser Interferometric Space Antenna)
- ACES (Atomic Clock Ensemble in Space)

Special expertise

Various aspects of general relativity: in particular we compute using Einstein's equations of general relativity accurate gravitational wave forms taking into account several parameters describing, e.g., two coalescing black holes. These gravitational wave forms are then used for the analysis of the data inferred by the LIGO /Virgo detectors or in future by LISA.

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- LIGO (Laser Interferometer Gravitational-Wave Observatory) /Virgo
- LISA (Laser Interferometric Space Antenna)
- ACES (Atomic Clock Ensemble in Space)

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Dr. Florian Kehl

Area of activity:	In-Situ Instruments for Planetary Science, Life Detection, Astrobiology, Microgravity Research
Affiliation:	University of Zurich, Lucerne University of Applied Sciences, NASA Jet Propulsion Laboratory

Area of research

Instrument development, biosensing, planetary exploration, life detection, fluid handling and automation, microgravity, In-Situ resource scouting and utilization, astrobiology

Description of research

Florian Kehl is a senior research and teaching assistant at the University of Zurich's Space Hub, a lecturer at the Lucerne University of Applied Sciences, and a subcontractor at NASA's Jet Propulsion Laboratory. He develops instruments for in-situ liquid analysis for space biology, and for the detection of potential biosignatures on Mars, Europa, Enceladus, and other alien worlds. His current projects focus on planetary exploration, astrobiology, microgravity research, fluid handling in space, and in-situ sensing. Florian Kehl is co-leading the project GLIMPSE ("Geological lunar in-situ mapper and prospector for surface exploration"), funded by the European Space Agency ESA, to search for resources on the Moon by autonomous, legged robots equipped with scientific payloads..

Platforms and associated services, shareable equipment/infrastructure/database

- Random Positioning Machines (RPM) to simulate microgravity conditions
- Precise Flow and Pressure Sensors
- Surface Mount Device Soldering Station

Special expertise

Planetary Science Instruments, Biosensing Systems Engineering, Microfluidics, Integrated Optics, Electrical Engineering, Prototype Development

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- 2018 – present: OWLS "Ocean Worlds Life Surveyor", NASA Jet Propulsion Laboratory
- 2021 – present: GLIMPSE "Geological lunar in-situ mapper and prospector for surface exploration", European Space Agency ESA
- 2019 – 2021: EMILI "Europan Molecular Indicators of Life Investigation", NASA Goddard Space Flight Center
- 2016 – 2020: MILA "Microfluidic Life Analyzer", NASA Jet Propulsion Laboratory
- 2016 – 2019: ARADS "Atacama Rover Astrobiology Drilling Studies", NASA Ames Research Center
- 2012 – 2015: RADAR "Rationally Designed Aquatic Receptors", European FP7 Project
- 2012 – 2014: aTORCH "acTive Optical Resonator CHip", CTI Project
- 2009 – 2010: INNOBond, CTI Project

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Prof. Dr. Vartan Kurtcuoglu

Area of activity: Computational and Experimental Physiology
Affiliation: Institute of Physiology, MeF
University of Zurich

Area of research

Biofluidics, transport processes, biomechanics, mechanobiology, biomedical engineering, fluid physiology

Description of research

My research group's vision is to answer fundamental questions of physiology and address clinical needs through the convergence of engineering, biological and medical research. We combine computational techniques with experimental methods to establish comprehensive models of investigated systems. Our focus is on fluid flow and mass transport processes in the cardiovascular system, the brain and the kidneys.

Platforms and associated services, shareable equipment/infrastructure/database

- High performance computing of biofluid dynamics
- In vitro cell cultures under flow-induced shear stress
- Multi-modal ex vivo vascular imaging

Special expertise

- Craniospinal pressure and fluid dynamics

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- NCCR Kidney.CH
- Zurich Heart UMZ flagship project

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Dr. Reik Leiterer

Area of activity: Education, Earth Observation
Affiliation: Science Lab UZH, MNF, University of Zurich
ExoLabs GmbH (CEO) / Bern University of the Arts

Area of research

Earth observation/remote sensing, environmental monitoring, climate change, science communication

Description of research

How can Earth observation data (e.g. satellite-, airborne-, or drone-based) contribute to describing our environment, capturing and quantifying its temporal dynamics, and supporting estimates of future developments under climatic and anthropogenic impacts? My focus is on operational data-driven and multi-sensor data fusion, especially in the field of vegetation and cryosphere.

How can research and science as well as integrative approaches such as citizen science or open innovation be communicated in a modern way across disciplines? How can you evaluate successful science communication in terms of its impact?

Platforms and associated services, shareable equipment/infrastructure/database

- Science Lab UZH: drone with thermal camera, extensive multidisciplinary outreach and learning material
- ExoLabs GmbH: daily updated raster layer for the alps with snow coverage, snow depth and snow water equivalent for research

Special expertise

- Earth Observation (certified drone operator)
- Date Science & Machine Learning
- Art & Science
- Science Communication & Outreach
- Innovation

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- Innosuisse: Deep Snow - ETHZ
- WSL/SLF
- MountaiNow
- OutdoorActive
- H2020 PARSEC: SNOWi – UBIMET
- ThinkOutside

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PD. Dr Andreas Losch, MBA

Area of activity: Theology and science
Affiliation: Institute of Hermeneutics, Faculty of Theology
University of Zurich

Area of research

Theology and science, critical realism, planetary sustainability, ETL, Martin Buber

Description of research

The pressing problem of space debris and current space mining efforts demand that the sustainability discussion becomes an even broader one about “planetary sustainability”, including the space surrounding Earth. The problem is assessed making use of the philosophical and theological approach of a constructive-critical realism.

Special expertise

- Dialog theology and science
- Critical Realism
- Planetary Sustainability
- Religious implications of potential extraterrestrial life
- Martin Buber

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- www.planetarysustainability.info (PI)
- www.theonat.info (editor in chief)

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Prof. Dr Lucio Mayer

Area of activity: Computational Astrophysics
Affiliation: Institute for Computational Science and
Department of Physics, MNF
University of Zurich

Area of research

Astrophysics, cosmology, high performance computing, computational fluid dynamics, gravitational physics, black holes, supercomputers, galaxies, exoplanets, gravitational waves

Description of research

My group focuses on the application of complex computer simulation methods on the largest supercomputer facilities worldwide, to better understand the origin and evolution of cosmic structure, from as small as planetary bodies to the largest known objects, clusters of galaxies. Lately we focus a lot on how the largest black holes in the Universe can be studied via the gravitational wave signal that they emit when they collide with one another.

Platforms and associated services, shareable equipment/infrastructure/database

- Complex parallel programs for astrophysical fluid dynamics and other applications of simulation science (some are publicly available already)
- Visualization tools for simulations, access to facilities of the Swiss Supercomputing Center (in possible through collaboration with ICS groups).

Special expertise

- Parallel programming for scientific computing in multiple languages, advanced numerical techniques for simulations and visualization.
- Mathematical models of physical systems
- Parallel programming for supercomputing applications
- Advanced Numerical Techniques

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- Laser Interferometer Space Antenna (LISA, Large ESA space mission)
- Square Kilometer Array (SKA)
- PLATO (ESA Exoplanetary Mission)
- PASC SPH-EXA (development of Exascale code for astrophysics and fluid dynamics)
- NCCR PlanetS

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Dr. Claudia Röösli

Area of activity: Earth Observation Application and Services
Academic affiliation: Remote Sensing Laboratories, National Point of Contact for satellite data NPOC, MNF, UZH Space Hub, University of Zurich

Area of research

Earth observation, biodiversity, satellite observations, remote sensing, innovation, land surface phenology

Description of research

Within my research I'm focused on applications and services using satellite data, mainly with Sentinel-2 multispectral images looking at biodiversity signals like land surface phenology. Sentinel-2 is well suited to analyze dense time series to observe the phenological cycle of vegetation around the world, knowing when vegetation starts their green-up until senescence at the end of the season. Nevertheless, thanks to my work as head of the National Point of Contact for Satellite data (NPOC) and to my background in geodesy, geomatics, glaciology and seismology, I'm applied in any type of Earth observation using satellite observations or remote sensing technologies in general. Thus, if you have questions regarding remote sensing and/or want to use Earth observation data, just contact the NPOC (npoc@geo.uzh.ch).
I also apply my network and knowledge as an expert for Earth observation within the core operational team of the UZH Space Hub. We support the community doing innovative projects and campaigns for instance with organizing workshops, networking events, seminars, lectures, back ground information and inform or promote the members via social media and the homepage.

Platforms and associated services, shareable equipment/infrastructure/database

- Scientific support for using satellite data for Earth observation
- Outreach material (e.g., sandbox, AR-App, satellite image banners)
- Help with access to satellite data
- Get insights into the ESA-system
- UZH Space Hub facilitates access to:
  - Research platforms on parabolic flights, Zeppelin NT, International Space Station ISS and more
  - Dübendorf Airfield
  - Innovation Park Zurich

Special expertise

- Earth Observation
- Geodesy including GNSS
- Glacioseismology
- Networking and fostering innovation

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- ESA's GlobDiversity
- National Point of Contact for Satellite Data (NPOC), funded by the Swiss Space Office SSO
- Real-time Observations of Greenland's Under-ice Environment ROGUE
- UZH Space Hub
- Collaboration with UniGe's Swiss Data Cube

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Prof. Dr. Maria J. Santos

Area of activity: Earth System Science
Affiliation: University Research Priority Program in Global Change and Biodiversity and Department of Geography, MNF, University of Zurich

Area of research

Social-ecological co-evolution, biodiversity, ecosystem services, livelihoods, land use, economics, remote sensing, earth observation

Description of research

The ESS research asks questions around the co-evolution of social-ecological systems, a fundamental step to place Earth System Sciences in the context of the Anthropocene. Such approach is by necessity interdisciplinary given the multi-sectorial and complex nature of the problem. The ESS group develops and applies multi- and inter-disciplinary approaches to observe, describe, assess drivers, and model the interactions and feedbacks between Earth System spheres and the human system. We specialize in biosphere- and hydrosphere- human interactions, for example examining the impact of land use or other resource use decisions on biodiversity, resource provisioning and ecosystem services in several model systems around the world. For this purpose, we combine methods from many disciplines, including field sampling and surveys, participatory methods, historical archival research, remote sensing, GIS and modeling. The outcomes of our research will contribute towards a better understanding of the co-evolution of social-ecological systems fundamental to examine options to tackle the key societal challenges expressed in the UN Sustainable Development Goals.

Platforms and associated services, shareable equipment/infrastructure/database

- Field spectrometer
- Video cameras, recorders
- Field materials for environmental sampling
- Imaging spectroscopy database
- Ecosystem services database

Special expertise

- imaging spectroscopy
- social survey methods
- biodiversity survey methods
- computational/statistical methods for large-scale data analysis

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- GEOBON Ecosystem function and freshwater
- RESPONSE - to society and policy needs through plant, food and energy sciences

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Prof. Dr. Davide Scaramuzza

Area of activity: Robotics and Perception Group
Affiliation: Institute of Informatics/WWF, Institute of Neuroinformatics/MNF, University of Zurich

Area of research

Robotics, computer vision, machine learning, autonomous drones, mobile robots

Description of research

The Robotics and Perception Group works at the intersection of robotics, computer vision, machine learning, and neuroscience. The lab develops artificial intelligence algorithms that can make autonomous drones fly better and faster than human pilots by using only onboard cameras and computation. Indeed, current commercial drones are completely blind: they navigate using GPS or a human pilot, which prevents their use in complex missions (search and rescue, cargo delivery, flying cars, inspection of bridges or power lines). By equipping drones with cameras, they can navigate also in absence of GPS, like indoors, under bridges or tree canopies. Another aspect that the lab investigate is on fast navigation of drones. Because the battery of drones is limited to 30 minutes, we need to make them faster so that they can accomplish more within the limited battery time. But to do so, they need to use faster sensors and algorithms. One of the key sensors that our drones use is an "event camera", a novel high-speed sensor with much lower latency (the delay between the moment when an image is captured and the moment when it is displayed) and higher dynamic range than standard cameras; however, these cameras function very differently than conventional cameras, so that new algorithms must be developed for them.

Platforms and associated services, shareable equipment/infrastructure/database

- Large-scale tracking arena in Hangar 9, Dubendorf: 1,000m^2 space with 36 Vicon cameras.

Special expertise

- Autonomous navigation of drones without GPS, using onboard cameras only
- Computer Vision and Machine Learning for Robotics

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- NASA/JPL Mars 2030 helicopter
- ERC Consolidator grant on autonomous drone racing
- EU H2020 AERIAL-CORE project on autonomous inspection and maintenance of power lines with drones

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Prof. Dr. Uwe Schneider

Area of activity: Medical Physics and Radiation
Affiliation: Department of Physics, MeF
University of Zurich

Area of research

Radiation research, space radiation research, nanodosimetry, radiation protection models, dosimetry of ionizing radiation, induction of radiation induced cancers, biological modeling of side effects of radiation (NTCP, TCP, cancer), proton radiography and tomography, intensity modulated radiotherapy, image guided radiotherapy, dose calculation models

Description of research

We are conducting research and development in Medical Physics, Theoretical Biology, Medical Modelling and Radiation Research. We are involved in projects which pursue research and development towards next generation radiotherapy and imaging and novel space radiation detectors and protection models. The main research topics include the development of radio-biological models, space radiation research, Monte Carlo simulations for space radiation research, dosimetry for radiotherapy and imaging and the development of novel detector systems for ionizing radiation.
Our space radiation research is focusing on two main topics: the quantifications of biological damage from space radiation and the development of radiation protection models to estimate the long-term detrimental health risks to astronauts from mission exposures. This research is based on bio-physical experiments and theoretical calculations. Ionization measurements are essential in reliable quantifications of relative biological effectiveness of different ion species found in space radiation. A nanodosimeter for measuring the number of ionizations of radiation in DNA structures is under development. The results of such measurements, combined with results of large Earth based epidemiological studies on radiation effects, can be used to build theoretical radiation protection models. Such models are important in contributing to the understanding and improved quantification of the risk for astronauts to develop biological damaging effects from space radiation on the International Space Station and for future long-duration space exploration on the Moon and possibly on Mars.

Platforms and associated services, shareable equipment/infrastructure/database

- Radiation action models to characterize biological effectiveness of radiation
- Radiation protection models
- Nanodosimeter

Special expertise

- Radiobiological modelling of radiation effects
- Design of nanodosimeters
- Radiation protection models

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- ESA Topical Team: Space radiation research for the lunar missions
- HARMONIC: Health risks of ionizing radiation in children

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Dr. David Small

Area of activity: Radar remote sensing
Affilitation: Department of Geography, Remote Sensing Laboratories, MNF, University of Zurich

Area of research

Radar remote sensing, analysis-ready data (ARD), radiometric terrain correction (RTC), SAR geometric calibration, radar interferometry

Description of research

We develop techniques to geometrically calibrate radar sensors. Given a high standard of geometric calibration, we demonstrate new types of data products that can be generated from radar sensor data streams such as Sentinel-1. We interpret radar imagery to evaluate temporal evolution of land cover on the Earth over time. We help standardize properties of high-level radar products within the context of the standards body Committee on Earth Observation Satellites (CEOS).

Platforms and associated services, shareable equipment/infrastructure/database

- Geometric calibration of Sentinel-1
- Sentinel-1 and other SAR sensor data processing to analysis ready data levels

Special expertise

- Theoretical/ Synthetic Aperture Radar data processing
- Geometric and Radiometric Terrain Correction of SAR Data
- Development of standards for high level SAR data products

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- ESA calibration and validation of Sentinel-1

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Dr. Jaap Swanenburg, PhD

Area of Research: Integrative Spinal Research,
Affiliation: Department of Chiropractic Medicine / Physiotherapy and Occupational Therapy Research Center, Balgrist University Hospital/ University Hospital Zurich/ University of Zurich

Area of research

Spine, motor control, vestibulopathy, gravity research, microgravity and hypergravity

Description of research

The research focus of our group is spinal motor control in healthy and low back and neck pain patients, especially the effects of changing gravity conditions and axial load on spinal health.

Platforms and associated services, shareable equipment/infrastructure/database

- Parabolic airplane flights
- International space station (ISS)
- Force plates
- Ultrasound
- EMG (Electromyography)
- Gait analysis
- DEXA (Dual Energy X-Ray Absorptiometry (Knochendichtemessung))

Special expertise

- Motor Control
- Gravity Research
- Vestibulopathy
- Parabolic Flight
- Development of time-effective clinical assessments
- 15 years of clinical experience in musculoskeletal rehabilitation

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- Pre/Post long duration international space station (ISS) mission, 2020-2025:
- "Low back pain of astronauts: Holistic approach to determine origin and medical implications"
- AO-2019-ISS-PP
- In collaboration with ESA, NASA, JAXA (Japan Aerospace Exploration Agency)

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Dr. Valentina Tamburello

Area of activity:	Research Associate and UZH Space Hub operational team
Affiliation:	Dept. of Geography, Remote Sensing Laboratories, National Point of Contact for satellite images NPOC, MNF, and UZH Space Hub University of Zurich

Area of research

Astrophysics and cosmology, data science, earth observation, satellite observations, remote sensing, innovation, outreach

Description of research

During my PhD, I run and analyzed numerical simulations to understand galaxy formation and evolution. To expand my knowledge in the Space sector, in 2019 I attended the International Space University program, where I learned about space law, economy, policy and more. I'm an expert science communicator with a master degree in Scientific Journalism and Corporate Communication of Science, able to adapt every topic to different target audiences, and to organize and lead outreach events.

Currently, I cover two roles at the University of Zurich. On one side, I'm the contact person for Astronomy and Astrophysics at the UZH Space Hub. We support the community with innovative projects and campaigns, by organizing workshops, networking events, seminars, lectures, providing background information and informing or promoting the members via social media, newsletter and webpage. Being constantly in contact with different space experts, I founded the Space Café. This is a monthly events series funded by the Graduate Research Campus, with the aim of fostering interdisciplinary collaborations among young researchers and the industry sector. On the other side, I also work at the National Point of Contact for Satellite images (NPOC), providing scientific consultations and solutions to all Swiss entities (non-governmental, public and private) interested in using Earth Observations, fostering their use and application in the daily life.

Platforms and associated services, shareable equipment/infrastructure/database

- Scientific support for using satellite data for Earth Observation
- Get insights into the ESA-system
- Research platforms on parabolic flights, Zeppelin NT, International Space Station ISS and more
- Dübendorf Airfield
- Innovation Park Zurich

Special expertise

- Astrophysics & Astronomy
- Earth Observation
- Networking and fostering innovation
- Outreach

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- National Point of Contact for Satellite Data (NPOC), funded by the Swiss Space Office SSO, UZH Space Hub, UZH Science Lab, Kinderuniversität, ESA Parabolic Flight Campaign, Geneva Observatory, NCCR PlanetS, International Space University, INAF – Italian National Institute for Astrophysics

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Dr. Svantje Tauber

Area of activity: Gravitational Biology and UZH Space Hub operational team
Academic affiliation: Institute of Anatomy, MNF and UZH Space Hub University of Zurich

Area of research

Cell biology, gravitational biology, immunology, biomechanics

Description of research

Is Earth's gravity is required for normal cell function in human cells? And if yes, how? In the group of Oliver Ullrich, we expose immune cells to normal gravity on Earth and to microgravity on parabolic flights, sounding rockets and the International Space Station. The aim is to understand the genomic stability and gene regulation homeostasis during altered gravity and how the non-specific gravitational force is transduced into specific gene expression responses. This is not only basic research, but also essential for appropriate risk assessment and potential countermeasures during space exploration missions. Additionally, this knowledge can help to identify new therapeutic possibilities on Earth, e.g. for musculoskeletal degeneration. In this field of research, I have operationally headed experiments e.g., on sounding rockets and on the ISS.

UZH Space Hub:
In the operational team of the UZH Space Hub, I am the contact person for Space Life Science projects and work on our other activities. As a strategic innovation cluster of the UZH, we link fundamental research from the fields of astrophysics, Earth observation and space life sciences with applied and marketable science and industry. We support UZH Members from the areas of Space- and Aviation -related research with organizing workshops, networking events, seminars, lectures and other projects and campaigns. We also provide relevant information and promote our members via social media, newsletter, and our webpage.

Platforms and associated services, shareable equipment/infrastructure/database

- UZH Space Hub facilitates access to research platforms including parabolic flights, Zeppelin NT, International Space Station ISS and more
- Dübendorf Airfield
- Innovation Park Zurich

Special expertise

- Gravitational biology
- Space Life Science experiments conceptualization and conduction

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- See projects/network of Prof. Oliver Ullrich: European Space Agency (ESA), National Aeronautics and Space Administration (NASA)
- Find the huge UZH Space Hub network (Research institutions, space tech industry, agencies) on our homepage: https://www.spacehub.uzh.ch/

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Prof. mult. Dr. Dr. Oliver Ullrich

Area of activity:	Anatomy, Gravitational Biology, Biomechanics, UZH Space Hub
Affiliation:	University of Zurich, EAH Jena, University of Magdeburg, Beijing Institute of Technology, Kennedy Space Center

Area of research

Anatomy, biochemistry, biomechanics / mechanobiology, immunology lymphatic system, microbiology / infectiology, molecular biology, musculoskeletal sciences, pharmacology / toxicology, systems biology, tissue engineering / biointerfaces

Description of research

The most essential characteristics of all biological systems are defined by the universal law of gravity. During the last centuries, research in Anatomy elucidated in detail, how the human body is constructed to withstand and to live under the gravity conditions of Earth. Our aim is to understand how the cellular architecture and function responds to gravity and to identify molecular mechanisms how gravity influences cell function and adaptation. Our research also contributes to an appropriate integrated risk assessment for human space flight and to the understanding of human diseases on Earth. It is crucial to understand if and how homeostasis of the immune system's cellular machinery is maintained in altered gravity. Knowing the cellular and molecular mechanisms through which gravity influences immune cell regulation and their function in nervous, bone and vascular tissue, is an important prerequisite for understanding immune regulation in space at an integrated level and for risk assessment, systematic and validated medical monitoring and potential countermeasures during exploration class missions. In coordinated in vitro studies, combining modern aerospace technology and methods in cellular and molecular biology and multiple research platforms (parabolic flights, suborbital ballistic rockets and the International Space Station), we are working together with research institutions from the U.S., Germany, Italy, Sweden, Russia and China, the European Space Agency (ESA), the Swedish Space Cooperation (SSC), and the National Aeronautics and Space Administration (NASA).

Platforms and associated services, shareable equipment/infrastructure/database

- Parabolic Flights
- Suborbital Ballistic Rocket Experiments
- International Space Station Experiments
- Ground-Based Simulators (2D Clinostat, Hyper-G-Centrifuges)
- Research Hardware for flight and space experiments

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- National Aeronautics and Space Administration (NASA)
- European Space Agency (ESA)

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Prof. Dr. Jan Dirk Wegner

Area of activity: Data Science for Sciences
Affiliation: Institute for Computational Sciences, University of Zurich & EcoVision Lab, University of Zurich

Area of research

Artificial intelligence, deep learning, environmental sciences, ecology, remote sensing, computer vision

Description of research

Jan Dirk Wegner does research at the frontier of machine learning, computer vision, and remote sensing to solve ecological questions. His objective is to invent original, data-driven methods at the interface of computer science, the environmental and geosciences, and engineering that analyze environmental data at very large scale automatically. The research centers on innovative (deep) machine learning and big data analysis technology to solve open scientific questions at global scale.

Special expertise

- Machine learning, computer vision, and remote sensing applied to the environmental sciences

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

Our flagship project is on generating high-carbon stock maps to facilitate sustainable supply chains. We combine spaceborne, full waveform LiDAR data acquired by the NASA GEDI sensor with satellite images from the Sentinel mission to predict biomass, canopy height, and a large variety of land cover classes at global scale with 10 meter ground sampling distance at high temporal resolution. This framework also includes a rapid alert system for deforestation using synthetic aperture radar data.

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Prof. Dr. Matthias D. Wüthrich

Area of activity: Systematic Theology
Affiliation: Institute of Hermeneutics and Philosophy of Religion
University of Zurich

Area of research

Dialogue "Religion and Science", Theology of Karl Barth, Theological Theory of Space (Theologische Raumtheorie), Theodicy/The Problem of Evil, Eschatological Spatial Semantics of Virtual Cemeteries, URPP "Digital Religion(s)"

Special expertise

- Systematic Theology/ Philosophy of Religion

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- URPP "Digital Religion(s)"

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Prof. Dr. Jaiyul Yoo

Area of activity: Theoretical Cosmology
Affiliation: Institute for Computational Science
University of Zurich

Area of research

Cosmology, general relativity, astrophysics, quantum field theory, data analysis

Description of research

I am primarily interested in theoretical astrophysics and cosmology, focusing on large-scale structure such as galaxy clustering, weak gravitational lensing, and cosmic microwave background. The ultimate goal of my research is to explore the dark sector of the Universe and to understand the physical mechanism of perturbation generation in the early Universe. My research involves lots of analytic and numerical computations. On large scales, where modified gravity theories deviate from general relativity and the fingerprint of inflationary epoch remains its pristine form, the relativistic effects become important. These relativistic effects in cosmology are often ignored in the standard Newtonian description, when comparing to observations. However, we need proper relativistic descriptions of what we measure, and such relativistic effects in cosmology provide a great new opportunity to test general relativity and probe the early Universe on cosmological scales. On nonlinear scales, where the measurement precision is highest, I have extensively modeled galaxy clustering and weak lensing measurements, using numerical simulations. In particular, nonlinear modeling of galaxy bias and the matter fluctuation is the main topic. In addition, the relative velocity effect needs to be further constrained, before the baryonic acoustic scale can be used.

Special expertise

- Gauge invariant formalism
- Relativistic perturbation theory

Flagship-project/ Collaboration/ participation in large-scale research project/ Networks

- Dark Energy Spectroscopic Instrument (DESI)
- Euclid Consortium
- LISA (Laser Interferometric Space Antenna) Consortium

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