

About the department

At the [Space Science Department](#) (catalog designation: SPA) at UAH we study cosmic plasmas and radiation and how they interact with each other from microscopic to galactic scales. In fact, over 99% of the visible Universe is in a plasma state. We employ cutting edge observational and modeling techniques to learn about this most abundant, yet still enigmatic, form of matter.

Students from the heliophysics REU posing at the UAH entrance with the program director,

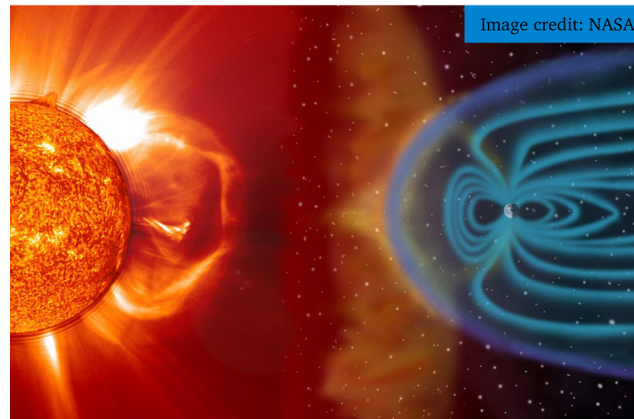


We are a graduate-only degree department with a strong research focus. Our students develop a broad spectrum of skills, including computational science, data analysis, analytic theory, and even space instrumentation development. Our graduates work at NASA centers, national labs, universities in the US and abroad, as well as in private industry. The Department also runs several summer schools and an NSF Research Experience for Undergraduate (REU) program.

Research thrust areas

Solar and heliospheric physics

- Outer atmosphere of the Sun,
- Solar wind,
- Heliosphere,
- Interstellar medium



The Sun is the engine powering the processes that shape the environment of the solar system and profoundly affect Earth's magnetic shield, known as the magnetosphere.

The solar wind creates a bubble in space, four times larger in size than the orbit of Neptune, we call the [heliosphere](#). This colossal plasma shield protects us from harmful radiation permeating the Galaxy. In 2012 NASA's Voyager 1 space probe left the solar system and is now humanity's first outpost in interstellar space. Our faculty and researchers use data from Voyager and other space missions to understand how the heliosphere works.

Research thrust areas

Astrophysics

- Gamma-ray bursts
- Cosmic rays

The Crab Nebula is a remnant of a star explosion first observed by astronomers in 1054 AD. A tiny, but extremely dense object known as a neutron star is hidden in the center of the cloud of debris.



The Universe is filled with sources of very energetic plasma, which may be highly directional, in the form of jets. These can be observed at [X-ray](#) and [gamma-ray](#) wavelengths, as well as in the form of energetic particles, known as cosmic rays, that have been accelerated at the sources. In collaboration with NASA's MSFC, researchers in the Department of Space Science have access to Chandra Observatory X-ray and Fermi Observatory gamma-ray data. Such observations can be used to map out the parameters of the expanding Universe.

Scientific computing

Much of today's science is done on a computer. No, we are not talking about your grandma's quad-core desktop – science relies on powerful supercomputers with thousands of CPU cores, some of which can perform up to a million billion operations per second! The department is at the forefront of scientific computing at the UAH and the region. We have a 840 CPU computer cluster in operation, the largest at the UAH, and a 14'-wide, 12 MPixel video wall to visualize our data in unprecedented detail. Our most demanding simulations are performed on the nation's largest supercomputers at national labs and NASA centers. We also teach a series of courses on Computational Physics that explore applications to many diverse areas including biology, aerospace engineering and finance.

NASA's Pleiades supercomputer is one of the fastest in the US. SPA scientists use it to perform high resolution simulations of the heliosphere.



Our partners

We share a building and enjoy close research and academic ties with the UAH Center for Space Plasma and Aeronomic Research (CSPAR) and NASA's Marshal Space Flight Center (MSFC). Scientists from these world class space research centers often serve as research and dissertation advisers, and teach several of our specialty courses.



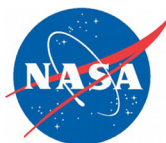
NASA/MSFC scientist David Hathaway giving a lecture on solar physics to SPA graduate students in the CSTAR visualization center.

How to contact us

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