



# NASA ADVANCED SUPERCOMPUTING (NAS) DIVISION

## PLEIADES

NASA's Pleiades supercomputer is one of the most powerful systems in the U.S. Pleiades is the central component of an integrated, high-end computing environment providing NASA users with mass storage, high-speed networking, modeling and simulation, data analysis and visualization, application performance optimization, and advanced user services.

### Architecture Overview

- 163 SGI ICE X racks with 11,312 dual-socket nodes
- Intel twelve-, ten-, eight-, and six-core processors: Haswell, Ivy Bridge, Sandy Bridge, and Westmere
- 211,872 cores, 724 terabytes total memory
- 160 nodes enhanced with NVIDIA GPUs (217,088 cores)
- 32 nodes enhanced with Intel Xeon Phi coprocessors (3,840 cores)

### Performance

- Sustained performance of 4.09 petaflops (June 2015)
- Theoretical peak performance: 5.34 petaflops

### Quick Facts

- Features one of the world's largest InfiniBand interconnect networks, with more than 50 miles of quad and fourteen data rate cabling.
- The archive storage systems at the NASA Advanced Supercomputing (NAS) facility can hold up to 134 petabytes of data generated by the simulations run on Pleiades. This data is stored on about 65,000 tapes.



### NASA Mission Support

Pleiades serves as the major computational resource for NASA's four mission directorates: Aeronautics Research, Human Exploration and Operations, Science, and Space Technology. Among the important scientific and engineering advances enabled by Pleiades:

- **Next-Generation Launch Vehicle Design:** Pleiades is crucial for running high-fidelity simulations that supply key aerodynamic data to NASA's aerospace engineers. These simulations help reduce design cycle time and cost—and increase the safety of future space vehicles, including the Space Launch System.
- **Rotorcraft Performance Improvement:** NASA is performing cutting-edge research to help reduce rotorcraft noise and increase fuel efficiency. High-fidelity simulations, enabled by Pleiades, are providing new insights into the complex aerodynamic and aeromechanic phenomena that are at the heart of rotorcraft performance.
- **Space Weather Predictions:** Scientists run petascale simulations on Pleiades to better understand the complex interaction between the solar wind and Earth's magnetic field. This “space weather” affects our planet and its technological systems, causing billions of dollars in damage to satellites.
- **Earth Ocean-Ice Studies:** Scientists use Pleiades to get a more accurate representation of the global sea-ice state by incorporating observations into ocean circulation models. Syntheses are used to quantify the role of the oceans in the global carbon cycle, and to better understand the recent evolution of the polar oceans.
- **Kepler Planet Discoveries:** Pleiades is essential for scientists to calculate high volumes of data collected from the Kepler spacecraft to search for habitable Earth-sized planets in the Milky Way galaxy. To date, the Kepler team has identified more than 4,696 candidate planets and 1,030 confirmed planets.

<http://www.nas.nasa.gov/hecc/resources/pleiades.html>