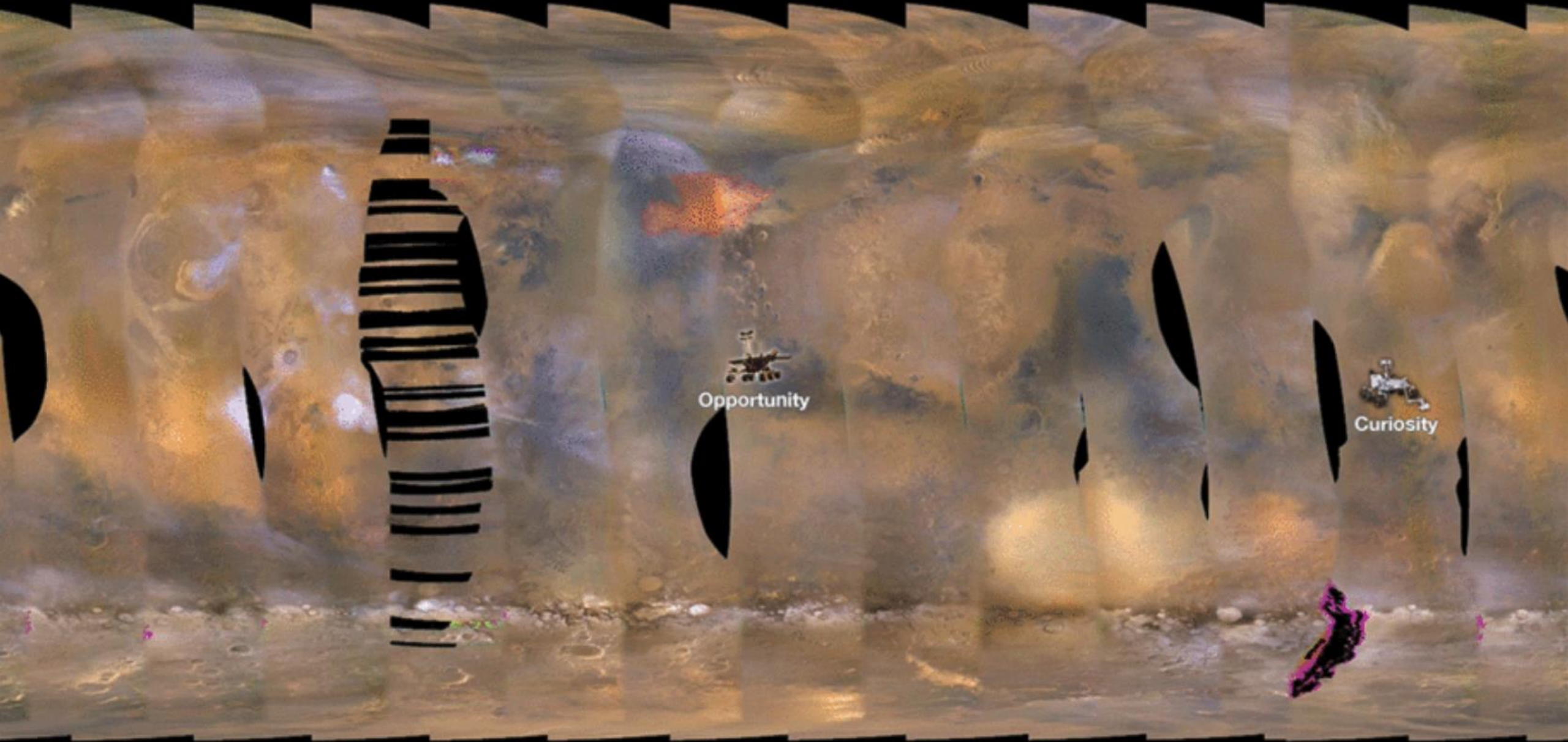


# The Aerospace Update



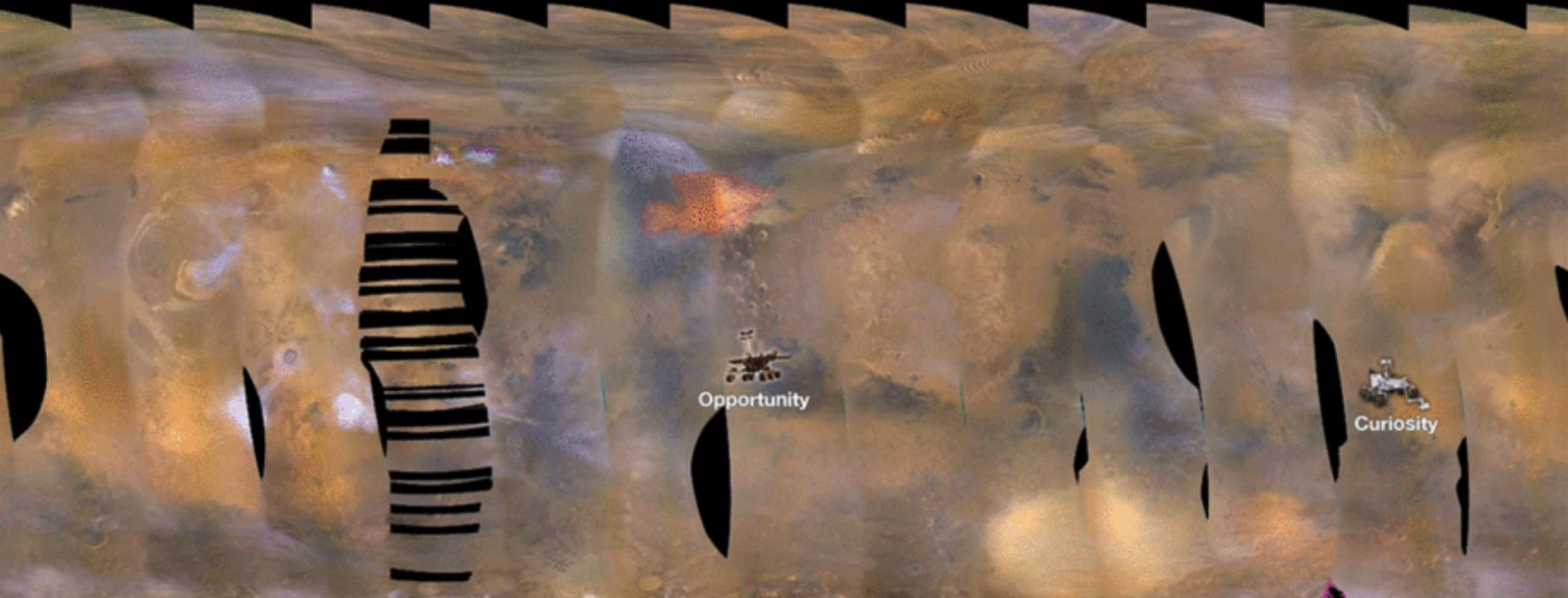
June 14, 2018

Dust Storm On Mars

Video Credit: NASA/JPL-Caltech/MSSS



# NASA Encounters the Perfect Storm for Science



Opportunity

Curiosity

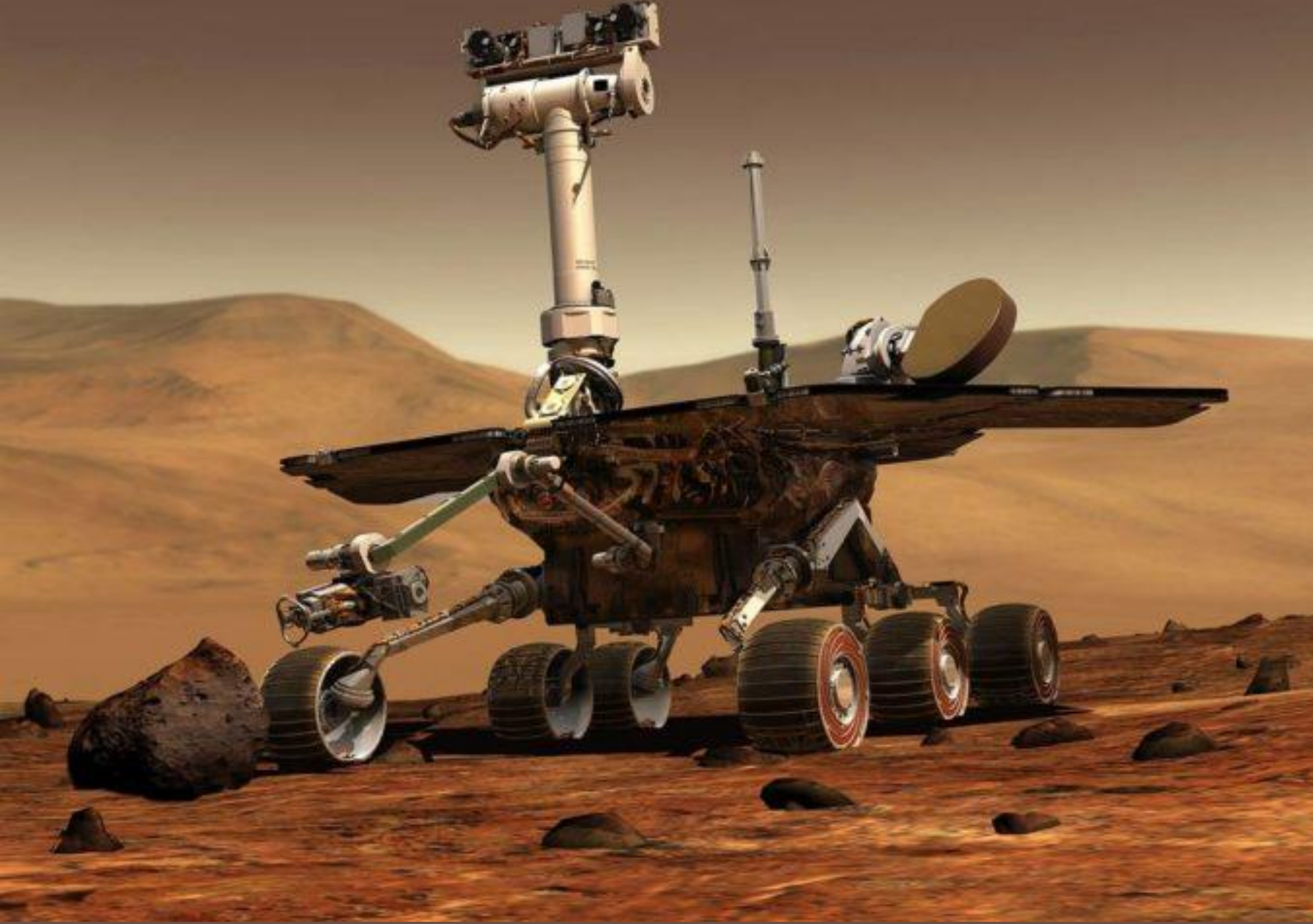
One of the thickest dust storms ever observed on Mars has been spreading for the past week and a half. The storm has caused NASA's Opportunity rover to suspend science operations, but also offers a window for four other spacecraft to learn from the swirling dust. NASA has three orbiters circling the Red Planet, each equipped with special cameras and other atmospheric instruments. Additionally, NASA's Curiosity rover has begun to see an increase in dust at its location in Gale Crater.

Source: NASA.gov

Video Credit: NASA/JPL-Caltech/MSSS



# Opportunity Mars Rover Out of Contact with Earth

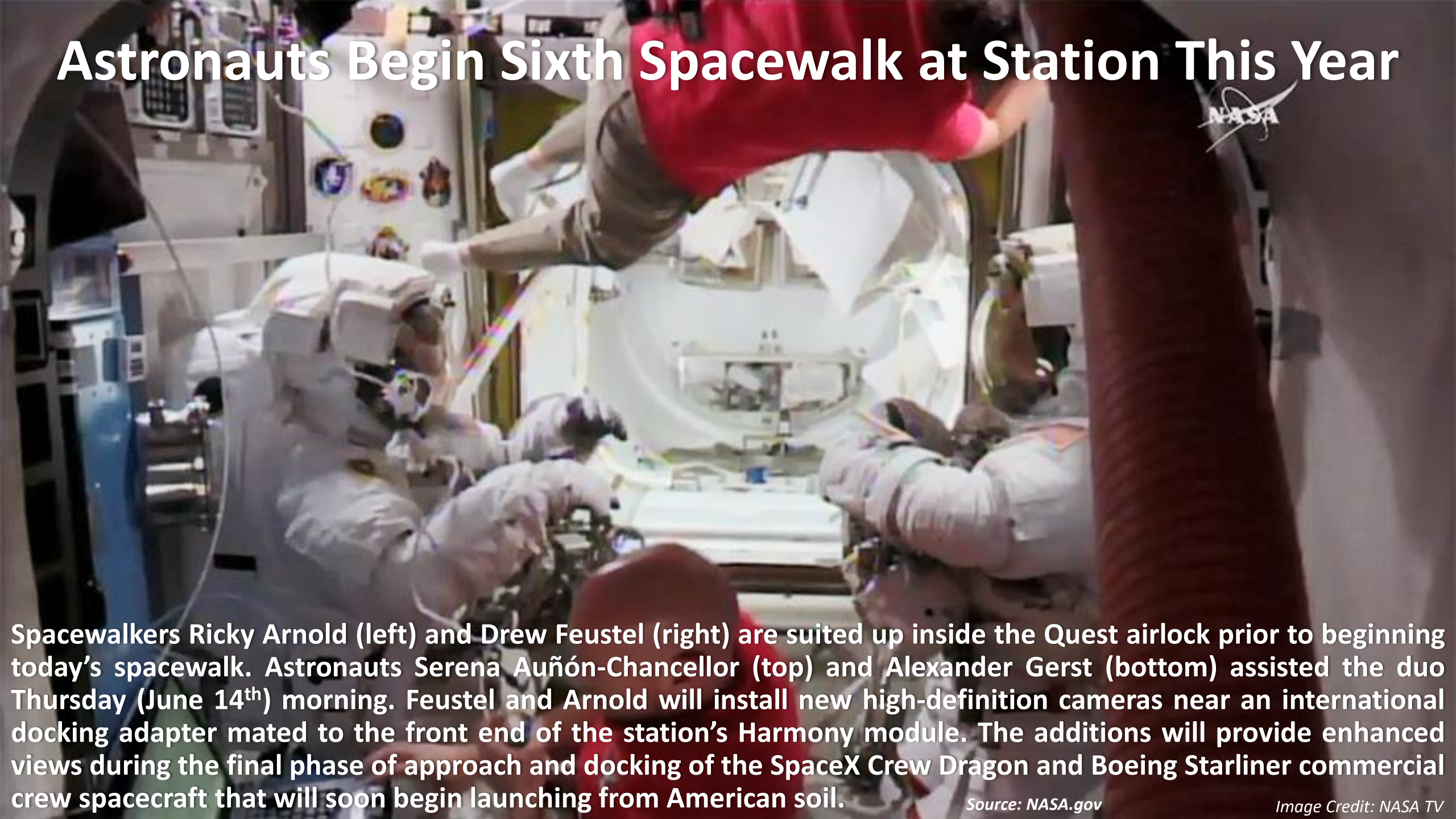


NASA's Opportunity Mars rover, 14 years past its original 90-day design life, has dropped out of contact with Earth after powering down everything but its master clock in a bid to weather a huge dust storm that is blotting out the sun, preventing the solar-powered rover from recharging its batteries. In low-power fault mode, Opportunity's master clock is programmed to wake up the flight computer periodically to check the battery charge but if it's not sufficient, the computer will put itself back to sleep and the clock will set another alarm to wake it back up for another check. If power levels drop far enough, even the clock will stop ticking. In that case, the rover will simply remain asleep until the sky clears and the battery charge increases enough to trigger safety routines that will wake up the flight computer.

*Source & Image Credit: NASA*



# Astronauts Begin Sixth Spacewalk at Station This Year



Spacewalkers Ricky Arnold (left) and Drew Feustel (right) are suited up inside the Quest airlock prior to beginning today's spacewalk. Astronauts Serena Auñón-Chancellor (top) and Alexander Gerst (bottom) assisted the duo Thursday (June 14<sup>th</sup>) morning. Feustel and Arnold will install new high-definition cameras near an international docking adapter mated to the front end of the station's Harmony module. The additions will provide enhanced views during the final phase of approach and docking of the SpaceX Crew Dragon and Boeing Starliner commercial crew spacecraft that will soon begin launching from American soil.

Source: NASA.gov

Image Credit: NASA TV

# Japanese Intelligence-Gathering Satellite Successfully Launched



An all-weather spy satellite for the Japanese government launched Tuesday on top of an H-2A rocket, extending the country's surveillance reach with coverage of North Korea and other strategic locations worldwide. The radar-equipped reconnaissance craft lifted off at 0420 GMT (12:20 a.m. EDT) Tuesday, June 12<sup>th</sup> from the Tanegashima Space Center, Japan's primary launch base, located on an island in the southern part of the country. The IGS Radar 6 satellite is Japan's seventh radar reconnaissance satellite. The radar observers operate in tandem with electro-optical surveillance satellites, which offer better resolution, but only when their imaging targets have clear skies overhead. Japan started its spy satellite program in 1998 after a North Korean missile test flew over Japanese territory.



# Carrier Jet With Pegasus Rocket Returning to California, Postponing NASA Satellite Launch



NASA and Northrop Grumman officials decided Friday to return a Pegasus rocket and its carrier aircraft from Hawaii to California, aborting a trip to Kwajalein Atoll in the Pacific Ocean for next week's scheduled launch of a NASA research satellite to conduct additional testing. The air-launched Pegasus XL rocket, nestled under the belly of an L-1011 carrier jet, departed Vandenberg Air Force Base, California, on Wednesday, heading for an overnight stop at Hickam Air Force Base, Hawaii, en route to Kwajalein Atoll, home to a U.S. military launch range in the mid-Pacific Ocean. But teams reversed course after detecting a technical problem on the first leg of the journey. The nature of the "off-nominal data" found during the ferry flight was not announced as of Friday afternoon, and a NASA spokesperson did not provide further information when asked. The return trip to California will postpone the launch of NASA's Ionospheric Connection Explorer, known as ICON, indefinitely.

Source: Stephen Clark @ SpaceFlightNow.com

Image Credit: NASA/Randy Beaudoin

# Chang'e-4 Relay Satellite Enters Halo Orbit Around Earth-Moon Lagrange Point 2


The relay satellite which will facilitate China's Chang'e-4 lunar far side landing mission late in 2018 has entered its intended halo orbit around Earth-Moon Lagrange point 2. The relay satellite was launched from Xichang, southwest China, on May 20, and performed a braking maneuver May 25 when passing within 100 kilometers of the lunar surface, sending it on a trajectory towards the second Earth-Moon Lagrange point, some 65,000-80,000 kilometers beyond the moon. The relay satellite is a precursor mission to the launch of the Chang'e-4 lander and rover, which will attempt to land in the vicinity of the Von Kármán crater within the South Pole-Aitken Basin on the lunar far side around November or December. No such mission has been attempted before. As the lunar far side at no time faces the Earth, due to the moon's orbital period matching its rotational period, a relay satellite is required to facilitate communications with the Earth.



*Credit: Chinese Academy of Sciences*




# Orbital ATK, SSL and others are gearing up to make house calls to ailing satellites



Satellite owners, satellite manufacturers, NASA and DARPA are planning a series of demonstrations to prove spacecraft can be repaired or refueled in orbit without the type of ambitious and expensive effort NASA devoted to servicing the Hubble Space Telescope. The two largest geostationary communications satellite fleet operators, SES and Intelsat, are taking different approaches to satellite life extension. Intelsat awarded contracts to Orbital ATK subsidiary SpaceLogistics for two Mission Extension Vehicles, slated to launch in 2019 and 2020. The Mission Extension Vehicles will dock with the client vehicles and keep them in their proper orbits for five years, Froelinger said. SES, in contrast, is hiring Space Systems Loral to refuel propellant tanks on one of its geostationary communications satellites with a robotic vehicle SSL plans to launch in 2021. SSL also is working with NASA on Restore-L, a mission to refuel the Landsat -7 Earth-observation satellite, and with the Defense Advanced Research Projects Agency to send a mobile servicing vehicle into geostationary orbit through the Robotic Servicing of Geosynchronous Satellites program



# NASA Selects Mission to Study Solar Wind Boundary of Outer Solar System

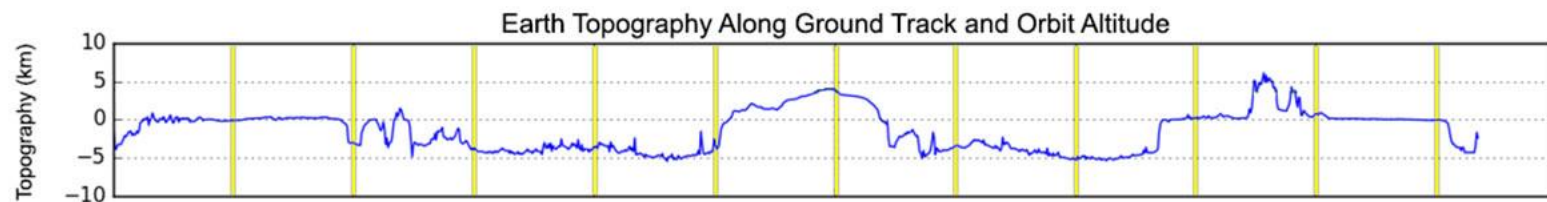
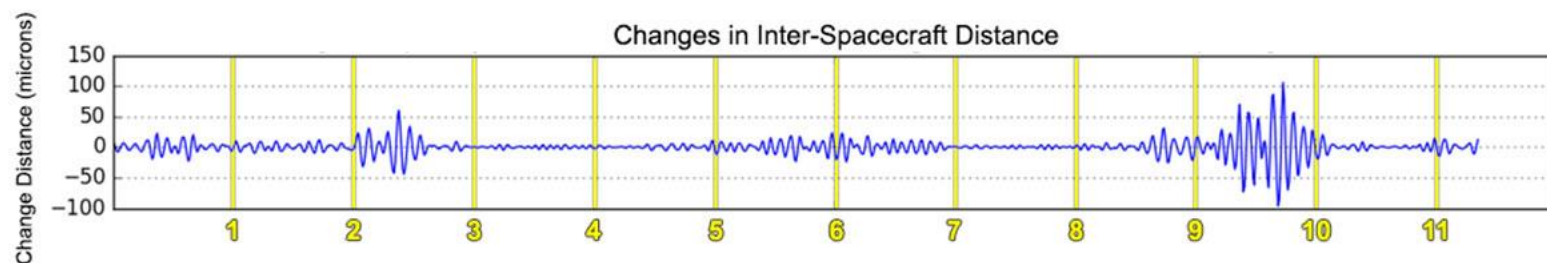
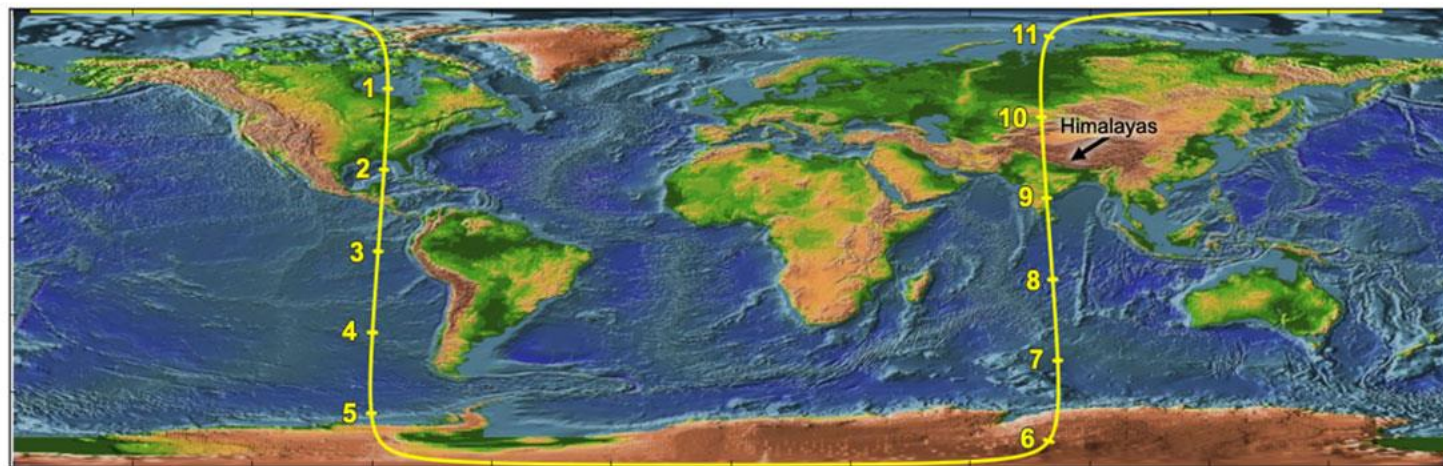


NASA has selected a science mission planned for launch in 2024 that will sample, analyze, and map particles streaming to Earth from the edges of interstellar space. The Interstellar Mapping and Acceleration Probe (IMAP) mission will help researchers better understand the boundary of the heliosphere, a sort of magnetic bubble surrounding and protecting our solar system. This region is where the constant flow of particles from our Sun, called the solar wind, collides with material from the rest of the galaxy. This collision limits the amount of harmful cosmic radiation entering the heliosphere. IMAP will collect and analyze particles that make it through. Another objective of the mission is to learn more about the generation of cosmic rays in the heliosphere. Cosmic rays created locally and from the galaxy and beyond affect human explorers in space and can harm technological systems, and likely play a role in the presence of life itself in the universe

*Source & Image Credits: NASA.gov*

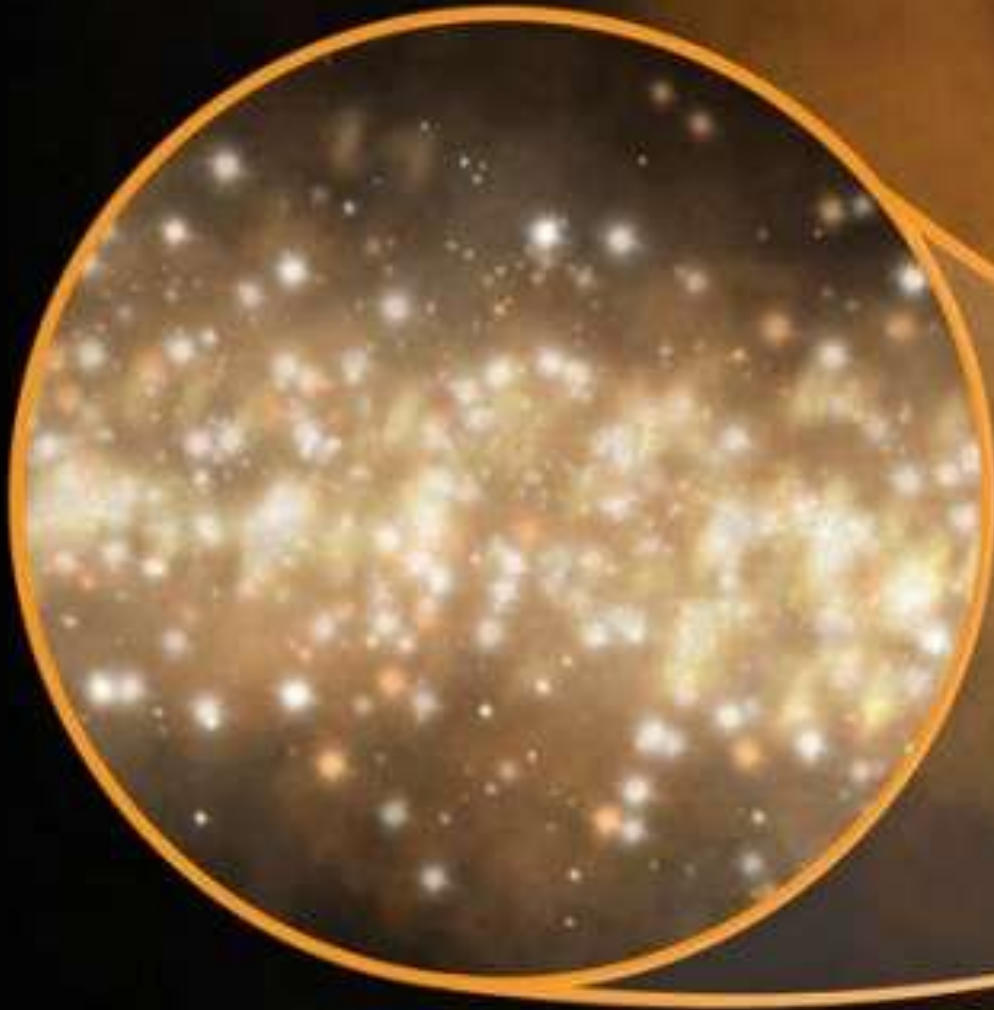
# GRACE-FO Turns on 'Range Finder,' Sees Mountain Effects

Less than three weeks after launch, the Gravity Recovery and Climate Experiment Follow-On (GRACE-FO) mission has successfully completed its first mission phase and demonstrated the performance of the precise microwave ranging system that enables its unique measurements of how mass migrates around our planet. Along the satellites' ground track (top), the interspacecraft distance between them changes as the mass distribution underneath (i.e., from mountains, etc.) varies. The small changes measured by the Microwave Ranging Instrument (middle) agree well with topographic features along the orbit (bottom). The GRACE-FO microwave ranging instruments allow distance measurements with a precision better than one micron -- less than the diameter of a blood cell, or a tenth the width of a human hair.



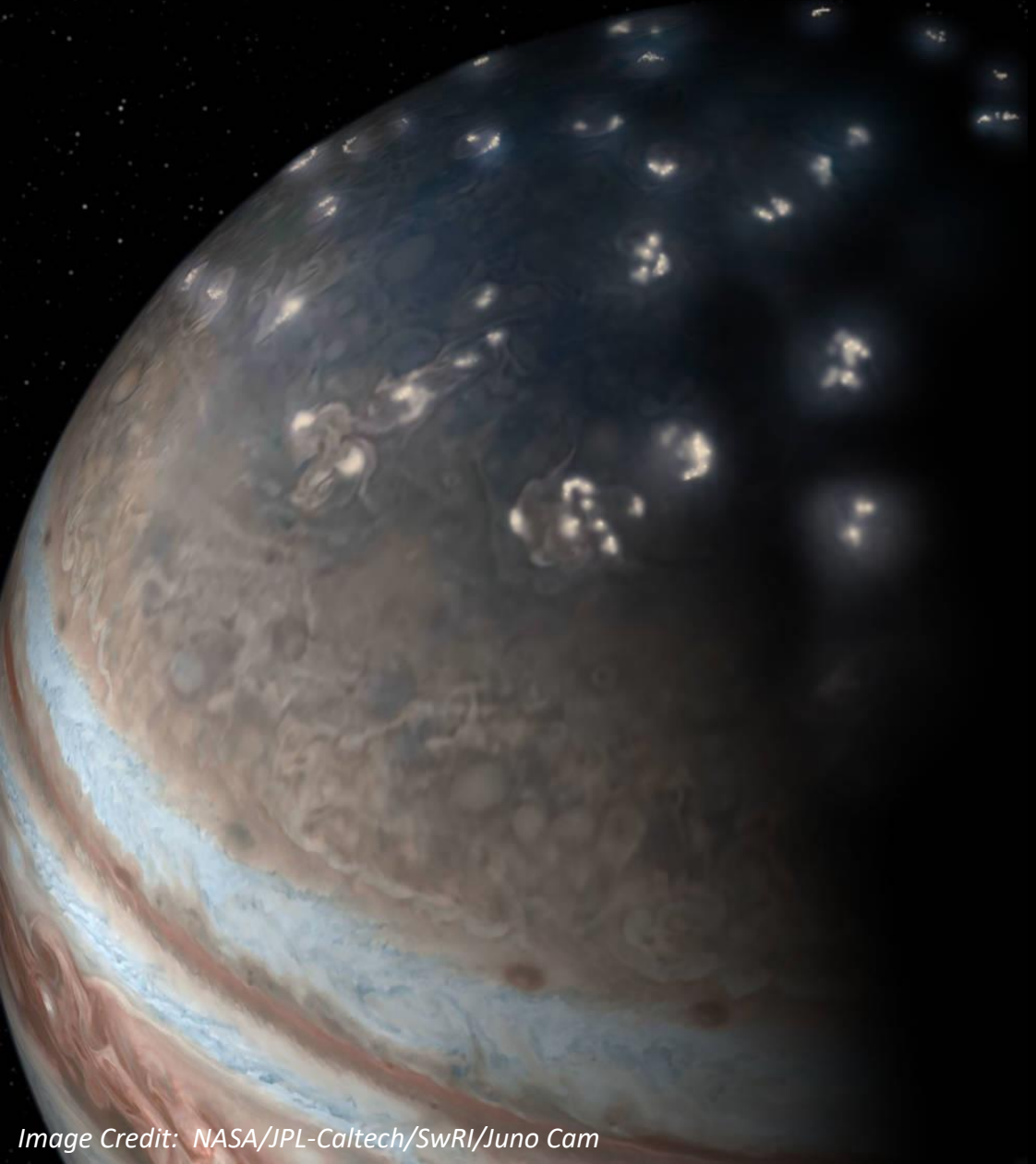


# Nanodiamonds Responsible for Mysterious Source of Microwaves Across the Milky Way



For decades, astronomers have puzzled over the exact source of a peculiar type of faint microwave light emanating from a number of regions across the Milky Way. Known as anomalous microwave emission (AME), this light comes from energy released by rapidly spinning nanoparticles—bits of matter so small that they defy detection by ordinary microscopes. (The period on an average printed page is approximately 500,000 nanometers across.) A series of observations with the National Science Foundation's Green Bank Telescope (GBT) in West Virginia and the Australia Telescope Compact Array (ATCA) has suggested that hydrogenated nanodiamonds, which form naturally within protoplanetary disks and are found in meteorites on Earth, are the most likely source of AME light in our galaxy.

# Juno Solves 39-Year Old Mystery of Jupiter Lightning



Ever since NASA's Voyager 1 spacecraft flew past Jupiter in March, 1979, scientists have wondered about the origins of Jupiter's lightning. That encounter confirmed the existence of Jovian lightning, which had been theorized for centuries. Data from NASA's Juno mission indicates that most of the lightning activity on Jupiter is near its poles. Shannon Brown of NASA's Jet Propulsion Laboratory in Pasadena, California, a Juno scientist and lead author of a new paper published in *Nature*, said; "Jupiter's lightning distribution is inside out relative to Earth. There is a lot of activity near Jupiter's poles but none near the equator. You can ask anybody who lives in the tropics---this doesn't hold true for our planet." Why do lightning bolts congregate near the equator on Earth and near the poles on Jupiter? Follow the heat.

*Source: [www.nasa.gov/juno](http://www.nasa.gov/juno)*



# Chandra Scouts Nearest Star System for Possible Hazards

ALPHA CEN



ALPHA CEN X-RAY CLOSE-UP



A new study involving long-term monitoring of Alpha Centauri by NASA's Chandra X-ray Observatory indicates that any planets orbiting the two brightest stars are likely not being pummeled by large amounts of X-ray radiation from their host stars. This is important for the viability of life in the nearest star system outside the Solar System. Chandra data from May 2nd, 2017 are seen in the pull-out, which is shown in context of a visible-light image taken from the ground of the Alpha Centauri system and its surroundings. Alpha Centauri is a triple star system located just over four light years, or about 25 trillion miles, from Earth. While this is a large distance in terrestrial terms, it is three times closer than the next nearest Sun-like star.

OPTICAL

Source & Image Credits: Optical: Zdenek Bardon; X-ray: NASA/CXC/Univ. of Colorado/T. Ayres et al.



# NASA Flies Large Unmanned Aircraft in Public Airspace Without Chase Plane for First Time



NASA's remotely-piloted Ikhana aircraft, based at the agency's Armstrong Flight Research Center in Edwards, California, successfully flew its first mission in the National Airspace System without a safety chase aircraft on Tuesday. This historic flight moves the United States one step closer to normalizing unmanned aircraft operations in the airspace used by commercial and private pilots.

Source: [NASA.gov](https://www.nasa.gov)

Image Credit: NASA/Carla Thomas



# China Reveals a Supersonic UCAV



*Photo: Weibo*

China has unveiled a prototype or scale model of the Anjian (Dark Sword) jet-powered unmanned combat aerial vehicle (UCAV). The image showcased the Dark Sword parked behind a team from the program, presumably engineers. Developed by Aviation Industry Corporation of China (AVIC) subsidiary Shengyang Aircraft, the Dark Sword strongly resembles a concept model that was first seen in 2006. The streamlined design features canards ahead of a delta wing, twin slanted vertical stabilizers, and a single engine. The latest image also suggests a diverterless supersonic inlet design, similar to those found on the Shenyang J-10C fighter. The 2006 publicity described the Dark Sword as a “supersonic, super maneuverable, and low observable platform for future air-to-air missions.”

*Source: Chen Chuanren AINonline.com*

# In The News



**Boeing Widens Order Lead Over Airbus in May.** Boeing added 43 orders for commercial aircraft to its backlog in May to widen its strong lead over Airbus through the first five months of the year. Net orders for Boeing aircraft increased to 306 so far in 2018 while Airbus has logged 111 net orders so far this year, including 25 purchases added in May. *(Stephen Trimble @ FlightGlobal.com)*



**F-35 Hits New High, as Lockheed Delivers 300th Fighter.** Lockheed Martin has delivered its 300<sup>th</sup> production example of the F-35 Lightning II, with the conventional take-off and landing, A-model fighter to enter service at the US Air Force's Hill AFB in Utah. The milestone figure comprises 197 F-35As, 75 short take-off and vertical landing F-35Bs and 28 carrier-variant F-35Cs, manufactured for the US armed services and international customers. *(Craig Hoyle @ FlightGlobal.com)*



**Airbus and Bombardier Finalize C Series Deal.** Airbus and Bombardier have finalized the C Series partnership agreement first announced on October 16 last year, the companies announced Friday. Although CSeries Aircraft Limited Partnership (CSALP) already existed, Airbus's "consolidation" of it will come into effect on July 1, 2018, when the European manufacturer takes a controlling stake. *(Ian Sheppard @ AINonline.com)*



**Poll Shows More Public Support for NASA Science Programs than Human Exploration.** A new poll finds that the American public broadly supports NASA but thinks the space agency should be focused more on Earth science and planetary defense than human missions to the moon or Mars. The study by the Pew Research Center, released June 6, also showed support for private space ventures among the general public, but with concerns that such companies won't be able to minimize the creation of space debris. *(Jeff Foust @ SpaceNews.com)*