Space News Update
— March 22, 2013 —

Contents

In the News

Story 1:
Planck Mission Brings Universe into Sharp Focus

Story 2:
Curiosity Triple Sample Set for SAM Before Conjunction

Story 3:
Why Voyager 1’s Solar System Exit Is So Hard to Predict

Departments

The Night Sky
ISS Sighting Opportunities
Space Calendar
NASA-TV Highlights
Food for Thought
Space Image of the Week
1. Planck Mission Brings Universe into Sharp Focus

The Planck space mission has released the most accurate and detailed map ever made of the oldest light in the universe, revealing new information about its age, contents and origins.

Planck is a European Space Agency mission. NASA contributed mission-enabling technology for both of Planck's science instruments, and U.S., European and Canadian scientists work together to analyze the Planck data.

The map results suggest the universe is expanding more slowly than scientists thought, and is 13.8 billion years old, 100 million years older than previous estimates. The data also show there is less dark energy and more matter, both normal and dark matter, in the universe than previously known. Dark matter is an invisible substance that can only be seen through the effects of its gravity, while dark energy is pushing our universe apart. The nature of both remains mysterious.

"Astronomers worldwide have been on the edge of their seats waiting for this map," said Joan Centrella, Planck program scientist at NASA Headquarters in Washington. "These measurements are profoundly important to many areas of science, as well as future space missions. We are so pleased to have worked with the European Space Agency on such a historic endeavor."

The map, based on the mission's first 15.5 months of all-sky observations, reveals tiny temperature fluctuations in the cosmic microwave background, ancient light that has traveled for billions of years from the very early universe to reach us. The patterns of light represent the seeds of galaxies and clusters of galaxies we see around us today.

"As that ancient light travels to us, matter acts like an obstacle course getting in its way and changing the patterns slightly," said Charles Lawrence, the U.S. project scientist for Planck at NASA's Jet Propulsion Laboratory in Pasadena, Calif. "The Planck map reveals not only the very young universe, but also matter, including dark matter, everywhere in the universe."

The age, contents and other fundamental traits of our universe are described in a simple model developed by scientists, called the standard model of cosmology. These new data have allowed scientists to test and improve the accuracy of this model with the greatest precision yet. At the same time, some curious features are observed that don't quite fit with the simple picture. For example, the model assumes the sky is the same everywhere, but
the light patterns are asymmetrical on two halves of the sky, and there is a spot extending over a patch of sky that is larger than expected.

"On one hand, we have a simple model that fits our observations extremely well, but on the other hand, we see some strange features which force us to rethink some of our basic assumptions," said Jan Tauber, the European Space Agency's Planck project scientist based in the Netherlands. "This is the beginning of a new journey, and we expect our continued analysis of Planck data will help shed light on this conundrum."

The findings also test theories describing inflation, a dramatic expansion of the universe that occurred immediately after its birth. In far less time than it takes to blink an eye, the universe blew up by 100 trillion trillion times in size. The new map, by showing that matter seems to be distributed randomly, suggests that random processes were at play in the very early universe on minute "quantum" scales. This allows scientists to rule out many complex inflation theories in favor of simple ones.

"Patterns over huge patches of sky tell us about what was happening on the tiniest of scales in the moments just after our universe was born," Lawrence said.

Planck launched in 2009 and has been scanning the skies ever since, mapping the cosmic microwave background, the afterglow of the theorized big bang that created our universe. This relic radiation provides scientists with a snapshot of the universe 370,000 years after the big bang. Light existed before this time, but it was locked in a hot plasma similar to a candle flame, which later cooled and set the light free.

The cosmic microwave background is remarkably uniform over the entire sky, but tiny variations reveal the imprints of sound waves triggered by quantum fluctuations in the universe just moments after it was born. These imprints, appearing as splotches in the Planck map, are the seeds from which matter grew, forming stars and galaxies. Prior balloon-based and space missions learned a great deal by studying these patterns, including NASA's Wilkinson Microwave Anisotropy Probe (WMAP) and the Cosmic Background Explorer (COBE), which earned the 2006 Nobel Prize in Physics.

Planck is the successor to these satellites, covering a wider range of light frequencies with improved sensitivity and resolution. Its measurements reveal light patterns as small as one-twelfth of a degree on the sky.

"Planck is like the Ferrari of cosmic microwave background missions," said Krzysztof Gorski, a U.S Planck scientist at JPL. "You fine tune the technology to get more precise results. For a car, that can mean an increase in speed and winning races. For Planck, it results in giving astronomers a treasure trove of spectacular data, and bringing forth a deeper understanding of the properties and history of the universe."

The newly estimated expansion rate of the universe, known as Hubble's constant, is 67.15 plus or minus 1.2 kilometers/second/megaparsec. A megaparsec is roughly 3 million light-years. This is less than prior estimates derived from space telescopes, such as NASA's Spitzer and Hubble, using a different technique. The new estimate of dark matter content in the universe is 26.8 percent, up from 24 percent, while dark energy falls to 68.3 percent, down from 71.4 percent. Normal matter now is 4.9 percent, up from 4.6 percent.

Complete results from Planck, which still is scanning the skies, will be released in 2014. NASA's Planck Project Office is based at JPL.


Source: NASA
2. Curiosity Triple Sample Set for SAM Before Conjunction

Restarting science operations after 3 weeks of computer problems, the Mars rover Curiosity will be using its robotic arm and the Goddard Sample Analysis at Mars (SAM) laboratory to process a triple-dose of drilled subsurface rock in a more intense search for organic carbon before April 4, when Mars will move behind the Sun blocking communications until May 1.

"We are still looking forward to that run" before solar conjunction, Paul Mahaffy, SAM principal investigator told CuriousMars.

The objective is to find a stronger carbon signature to add to other evidence that has already confirmed that the Yellowknife Bay would have had a habitable environment 3 billion years ago for Martian microorganisms (CuriousMars March 14).

The rover manipulator arm will be used to drop the powdered equivalent of three individual samples into SAM to be heated to about to 1,535 deg. F (835 deg. C). Mahaffy and his team hope this triple dose will boost the signal strength of possible organic carbon molecules contained within the rock powder or provide more insight to the simple organic molecules that they do see.

Since first drilled out of the John Klein bedrock at Yellowknife Bay in mid February, the gray powdered sample material has remained housed in the rover's turret mounted CHIMRA filtering device. The first two SAM processing runs, each using a baby aspirin sized pinch of 150 micron powdered rock, produced a weak wisp of organic carbon measured by the rover's instruments, except for a major spike in carbon dioxide from the material when heated.

The SAM instrument specifically found simple organic molecules, but not a strong organic signal from past Martian life. Curiosity detected the simple carbon-containing compounds chloro- and dichloromethane. These species were detected by the gas chromatograph mass spectrometer (GCMS), one of three instruments that make up SAM.
The rover's CheMin and SAM found within the gray rock sample the elements of carbon, hydrogen, nitrogen, oxygen, phosphors and sulfur, which dominate living cells on Earth.

"There does need to be a source of carbon there somewhere," Mission Scientist John Grotzinger said. "But if it is just carbon dioxide you can have a "Chemolitho autotrophic organism" that literally feeds on rocks. Such organisms will metabolize and generate organic compounds based on carbon in the carbon dioxide."

"The fact that Mahaffy was able to show in the SAM instrument that there was a major carbon dioxide spike" that vented from the subsurface rock powder "is what we are really excited about," Grotzinger said. That is because such a spike indicates a key building block for past life on Mars, he said.

In other Curiosity developments this week:

--The rover's computer problems have been resolved. The A side computer memory that started the difficulty Feb. 28 has been patched and restored enabling it to fully backup the B side now commanding all operations. A minor problem put the rover in an additional Safe Mode early this week, but that difficulty was easily fixed.

--Another major Mars mission development this week is the announcement by Jim Green, NASA's director of planetary science, that for the first time in 25 years the Deptartment of Energy (DOE) has begun producing Plutonium 238 to provide nuclear power for future NASA Mars surface operations and outer solar system missions.

--Also new findings announced by the teams operating Curiosity's Mastcam, its Canadian Alpha Particle X-ray Spectrometer and the Russian DAN neutron spectrometer provide additional evidence for water and past habitable terrain between Curiosity's landing site and its current Yellowknife Bay research area.

Read more about Curiosity at CuriousMars.

Source: Spaceref.com
3. Why Voyager 1’s Solar System Exit Is So Hard to Predict

NASA’s Voyager 1 probe is tantalizingly close to the edge of the solar system, but predicting when it will finally pop free into interstellar space is a challenging proposition, mission team members say.

Voyager 1 is plying new and exotic terrain at the limits of the sun’s sphere of influence, and scientists simply don’t know what to expect from these unexplored regions.

"We've never been there before," said Voyager project manager Suzanne Dodd of NASA's Jet Propulsion Laboratory in Pasadena, Calif. "That's what makes it very hard. It's not unlike the first explorers sailing across the Atlantic Ocean to the New World. They thought they might know what they would see, but they saw things that were quite a bit different."

Voyager 1 and its twin, Voyager 2, launched a few weeks apart in 1977 to study the giant planets Saturn, Jupiter, Uranus and Neptune. After completing this unprecedented “grand tour,” the two probes kept flying, streaking through unexplored realms on their way to interstellar space. [Voyager: Humanity’s Farthest Journey (Video)]

It looks like Voyager 1 will get there first. The probe is now more than 11.3 billion miles (18.2 billion kilometers) from Earth, making it the most farflung manmade object in the universe.

Voyager 1 has also encountered strange new conditions in the outer layers of the heliosphere — the huge bubble of charged particles and magnetic fields surrounding the sun — suggesting that the probe may be about to leave the solar system forever.

Specifically, Voyager 1 has seen a spike in the levels of ultrafast cosmic rays that originate in interstellar space, along with a big drop in the number of lower-energy particles coming from the sun. But the probe has yet to
measure a shift in magnetic field orientation, another phenomenon that mission scientists expect to observe outside the solar system.

"The particle data very clearly state that we're in a new region of the heliosphere," Dodd told SPACE.com. "But the Voyager spacecraft still senses the same magnetic field that we've always sensed — in the same direction. It's increasing slightly in strength, but basically it's the same as it's been for several years."

If and when Voyager 1 tells its handlers that the magnetic field has flipped from the solar system's roughly east-west orientation to a north-south one, then humanity will probably have reached beyond its own backyard for the first time ever.

But forecasting when that historic moment will come is difficult, Dodd and other mission team members have stressed, because scientists don't know for sure how far the heliosphere extends, or what conditions are like in its extreme outer reaches.

Voyager mission chief scientist Ed Stone, a physicist at Caltech in Pasadena, has estimated that the probe won't pop free for another two years or so, though he stressed that this is just an educated guess. "That's not science — that's just saying scaling sort of suggests that," Stone told SPACE.com this past December.

The Voyager team is prepared for the unexpected, as both spacecraft have delivered plenty of surprises in their 35-year space journeys. "Every discovery that we've made has really been things that were not predicted before we got there," Dodd said. "So this is just a continuation of Voyager's travels of discovery."

But Stone, Dodd and the rest of the Voyager team are doubtless hoping Voyager 1's big moment comes before 2020. A declining power supply will force engineers to shut down the first science instrument that year, and all of them will probably stop working by 2025.

Source: LiveScience
The Night Sky

Friday, March 22

- Now that spring is here, Orion is in the southwest after dark and leaning over to slide soon down to the horizon. Orion's three-star belt is turning nearly horizontal. He is framed by the two brightest starlike points in the sky: Jupiter off to his right and Sirius to his left.

Saturday, March 23

- Left of the Moon this evening are Regulus and the Sickle of Leo. Farther lower right of the Moon is Alphard, the heart of Hydra. To the right or upper right of the Moon, can you make out Hydra's dim head?

Sky & Telescope
ISS Sighting Opportunities

For Denver:

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Sighting information for other cities can be found at NASA’s Satellite Sighting Information

NASA-TV Highlights

(all times Eastern Daylight Time)

March 23, Saturday
12 a.m., 8 a.m., 2 p.m., 5 p.m., 8 p.m. - Interview with ISS Expedition 35/36 Astronaut Chris Cassidy - HQ (All Channels)
1 a.m., 1 p.m., 9 p.m. - Interview with ISS Expedition 35/36 Cosmonaut Alexander Misurkin - HQ (All Channels)
1:32 a.m., 1:32 p.m., 9:32 p.m. - Replay of ISS Expedition 35/36 Crew Activities in Baikonur and Crew Training Video - HQ (All Channels)
2 a.m., 9 a.m., 4 p.m. - Interview with ISS Expedition 35/36 Cosmonaut Pavel Vinogradov - HQ (All Channels)

March 24, Sunday
12 a.m., 8 a.m., 2 p.m., 5 p.m., 8 p.m. - Interview with ISS Expedition 35/36 Astronaut Chris Cassidy - HQ (All Channels)
1 a.m., 1 p.m., 9 p.m. - Interview with ISS Expedition 35/36 Cosmonaut Alexander Misurkin - HQ (All Channels)
1:32 a.m., 1:32 p.m., 9:32 p.m. - Replay of ISS Expedition 35/36 Crew Activities in Baikonur and Crew Training Video - HQ (All Channels)
2 a.m., 9 a.m., 4 p.m. - Interview with ISS Expedition 35/36 Cosmonaut Pavel Vinogradov - HQ (All Channels)

March 25, Monday
12 p.m. - Video File of the ISS Expedition 35/36 Crew Activities and Soyuz TMA-08M Spacecraft Encapsulation in Baikonur, Kazakhstan - JSC via Baikonur, Kazakhstan (All Channels)

Watch NASA TV on the Net by going to the NASA website.
Space Calendar

- Mar 22 - Mars Passes 0.2 Degrees From Uranus
- Mar 22 - Asteroid 253 Mathilde Occults TYC 5554-01028-1 (8.4 Magnitude Star)
- Mar 22 - Asteroid 2013 ES11 Near-Earth Flyby (0.016 AU)
- Mar 22 - Asteroid 2013 EP89 Near-Earth Flyby (0.060 AU)
- Mar 22 - Asteroid 2013 SE85 Near-Earth Flyby (0.062 AU)
- Mar 22 - Asteroid 2012 FK15 Near-Earth Flyby (0.082 AU)
- Mar 22 - Asteroid 1284 Latvia Closest Approach To Earth (1.906 AU)
- Mar 22 - Asteroid 742 Edisona Closest Approach To Earth (2.387 AU)
- Mar 23 - Comet 280P/Larsen Closest Approach To Earth (2.191 AU)
- Mar 23 - Asteroid 21 Lutetia Occults 2UCAC 40654810 (11.7 Magnitude Star)
- Mar 23 - Asteroid 2003 FY6 Near-Earth Flyby (0.054 AU)
- Mar 23 - Asteroid 2012 FM35 Near-Earth Flyby (0.089 AU)
- Mar 23 - Asteroid 38237 Roche Closest Approach To Earth (1.103 AU)
- Mar 23 - Asteroid 19148 Alaska Closest Approach To Earth (1.754 AU)
- Mar 24 - Comet C/2012 F6 (Lemmon) Perihelion (0.731 AU)
- Mar 24 - Comet 197P/LINEAR Perihelion (1.061 AU)
- Mar 24 - Comet C/2013 D1 (Holvorcem) Closest Approach To Earth (1.494 AU)
- Mar 24 - Comet P/2012 B1 (PANSTARRS) Closest Approach To Earth (2.895 AU)
- Mar 24 - Comet C/2013 E1 (McNaught) Closest Approach To Earth (6.885 AU)
- Mar 24 - Asteroid 2013 FG Near-Earth Flyby (0.010 AU)
- Mar 24 - Asteroid 2013 EB34 Near-Earth Flyby (0.058 AU)
- Mar 24 - Asteroid 3693 Barringer Closest Approach To Earth (2.792 AU)
- Mar 24 - Wilhelm Baade's 120th Birthday (1893)
- Mar 25 - Dragon CRS-2 Returns To Earth
- Mar 25 - Comet P/2011 UA134 (Spacewatch-PANSTARRS) At Opposition (3.345 AU)
- Mar 25 - Asteroid 1 Ceres Occults 2UCAC 41851891 (11.7 Magnitude Star)
- Mar 25 - Asteroid 1000 Piazia Closest Approach To Earth (1.714 AU)

Dr. Wilhelm Heinrich Walter Baade

Source: JPL Space Calendar

Return to Contents
Food for Thought

NASA Begins New Season of Arctic Ice Science Flights

NASA's Operation IceBridge scientists have begun another season of research activity over Arctic ice sheets and sea ice with the first of a series of science flights from Greenland completed on Wednesday.

A specially equipped P-3B research aircraft from NASA's Wallops Flight Facility in Wallops Island, Va., is operating out of airfields in Thule and Kangerlussuaq, Greenland, and Fairbanks, Alaska. The flights will carry out survey flights over land and sea ice in and around Greenland and the Arctic Ocean through early May.

NASA began the Operation IceBridge airborne campaign in 2009 as a way to continue the record of polar ice measurements made by NASA's Ice, Cloud and Land Elevation Satellite's (ICESat) after the satellite stopped gathering data. By flying campaigns in the Arctic and Antarctic each year, IceBridge is maintaining a continuous record of change until the launch of ICESat-2 in 2016.

This year's IceBridge campaign will continue closely monitoring Arctic sea ice and key areas of the Greenland ice sheet, while expanding coverage in Antarctica.
"Our long term plan, beginning with the Arctic 2013 campaign, is to scale back the land ice portion of the campaign while maintaining the same coverage of sea ice as in previous campaigns," said Michael Studinger, IceBridge project scientist at NASA's Goddard Space Flight Center in Greenbelt, Md.

Dramatic changes to Arctic sea ice, such as the record-breaking minimum levels reached in 2012, and the potential societal effects of ice loss in the region are driving the demand for sea ice measurements. The mission will survey areas of Arctic sea ice near Greenland with flights out of the U.S. airbase in Thule. IceBridge also will carry out a series of flights from Fairbanks to measure ice in the Beaufort and Chukchi seas north of Alaska. Researcher will gather critical data during their flights between Greenland and Alaska.

In addition to sea ice, IceBridge will survey the Greenland Ice Sheet in the interior of the country and in rapidly changing areas along the coast, such as the Jakobshavn Glacier. "We're starting to see how the whole ice sheet is changing," Studinger said. "Thinning at the margins is now propagating to the interior."

IceBridge scientists will collaborate with researchers on the ground, such as a group with the U.S. Army Corps of Engineers Cold Regions Engineering Laboratory in Hanover, N.H., who are collecting snow depth measurements on Elson Lagoon near Barrow, Alaska.

Joining the IceBridge team are three teachers who will spend time working with the researchers to learn about polar science. High school science teachers from Libertyville, Illinois; Aalborg, Denmark; and Sisimiut, Greenland, will spend time aboard the P-3B during IceBridge survey flights.

IceBridge is providing these teachers with a research experience they can use to better teach science and inspire their students to study scientific fields. The teachers' involvement is the result of a partnership with the U.S. State Department, the governments of Denmark and Greenland, and the National Science Foundation-funded Polar Teachers and Researchers Exploring and Collaborating (PolarTREC) program.

For more about Operation IceBridge and to follow this year's campaign, visit:

http://www.nasa.gov/icebridge

For more about PolarTREC and the IceBridge teacher research experience, visit:


Source: NASA
A Closer Look at LDCM's First Scene

Explanation: Turning on new satellite instruments is like opening new eyes. This week, the Landsat Data Continuity Mission (LDCM) released its first images of Earth, collected at 1:40 p.m. EDT on March 18. The first image shows the meeting of the Great Plains with the Front Ranges of the Rocky Mountains in Wyoming and Colorado. The natural-color image shows the green coniferous forest of the mountains coming down to the dormant brown plains. The cities of Cheyenne, Fort Collins, Loveland, Longmont, Boulder and Denver string out from north to south. Popcorn clouds dot the plains while more complete cloud cover obscures the mountains.

Credit: USGS/NASA Earth Observatory

Source: NASA

Return to Contents