

Space News Update – December 2014

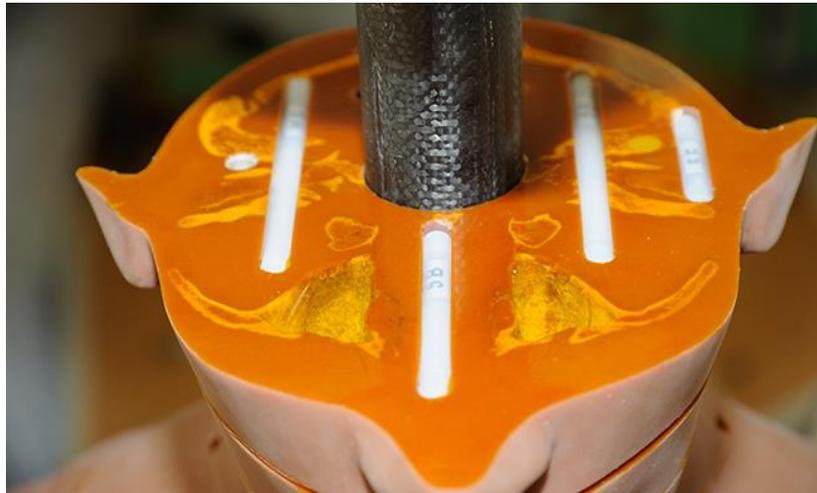
By Pat Williams

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Disclaimer - I claim no authorship for the printed material; except where noted.

SPACE TRAVEL IS A BIT SAFER THAN EXPECTED



Interior structure of the phantom used in the experiment MATROSHKA. White tubes contain sets of thermoluminescent detectors. Half of these detectors were manufactured by the Institute of Nuclear Physics of the Polish Academy of Sciences in Kraków, Poland. (Source: DLR)

[Space travel is a bit safer than expected](#) (3 December 2014)

Analysis of data from the MATROSHKA experiment, the first comprehensive measurements of long-term exposure of astronauts to cosmic radiation, has now been completed. This experiment, carried out on board and outside of the International Space Station, showed that the cosmos may be less hostile to space travellers than expected. A phantom, with real human bones, closely mimicking the human body was fitted with several thousand detectors. These detectors recorded the doses from cosmic radiation inside the International Space Station and outside – in open space – over a few years, yielding somewhat unexpected results.

The main hazard to the astronaut's health due to exposure to cosmic radiation is the increased probability of developing cancer. This probability, however, is quite dependent on the type of radiation the astronaut is exposed to. Most of the natural sources of ionising radiation on Earth produce electromagnetic radiation of high energy – gamma rays. On the other hand, in cosmic rays, energetic protons or heavier ions dominate, which are much more effective in creating cancer cells. Thermoluminescent detectors are unable to distinguish between gamma rays or ions, therefore the phantom was also equipped with plastic track detectors in which tracks of protons or heavier ions could be measured.

The mannequin on board of the International Space Station (ISS), with thermoluminescent and plastic detectors inside its “body”, was also dressed in a “poncho” with additional detectors, simulating the personal dosimeters worn by astronauts. Thus, doses recorded by individual dosimeters of the ISS crew could be compared with those actually absorbed inside their bodies.

Over the years 2004-2009 the MATROSHKA mannequin underwent three exposures to cosmic radiation, each lasting a year or more. Two of these exposures occurred inside the Russian modules of the space station and for one exposure the phantom, in a container imitating the shielding properties of a spacesuit, was placed in open space outside the ISS. Such measurements have never been done before.

The overall conclusion was that the individual dosimeters worn by the crew inside the ISS overestimated the actual dose measured inside the phantom by about 15%. However, in open space this overestimation exceeded 200%.

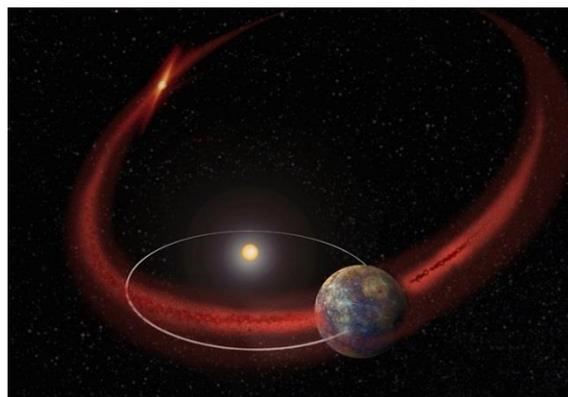
“We must remember that measurements within the MATROSHKA experiment were performed at low Earth orbit where the Earth’s magnetosphere significantly reduces the number of charged particles from cosmic radiation. In interplanetary space there is no such shielding”, notices Dr. Bilski.

From the results of the MATROSHKA experiment the scientists conclude that travel of astronauts to the Moon or to Mars may be somewhat safer in terms of their radiation hazard than presumed so far. Nevertheless, the doses the space travellers are likely to receive, even though being lower than thought earlier, would still remain dangerously high.



During the exposure in the open space, the MATROSHKA phantom was covered by a container imitating the shielding properties of a spacesuit. (Source: DLR)

METEOR SHOWER ON MERCURY?



Mercury appears to undergo a recurring meteor shower, perhaps when its orbit crosses the debris trail left by comet Encke.

(Artist's concept.) Image Credit: NASA's Goddard Space Flight Center

MESSENGER data suggest recurring meteor shower on Mercury (12 December 2014)

The closest planet to the sun appears to get hit by a periodic meteor shower, possibly associated with a comet that produces multiple events annually on Earth.

The suggested hallmark of a meteor shower on Mercury is a regular surge of calcium in the exosphere. Measurements taken by MESSENGER’s Mercury Atmospheric and Surface Composition Spectrometer have revealed seasonal surges of calcium that occurred regularly over the first nine Mercury years since MESSENGER began orbiting the planet in March 2011.

The suspected cause of these spiking calcium levels is a shower of small dust particles hitting the planet and knocking calcium-bearing molecules free from the surface. This process, called impact vaporization, continually renews the gases in Mercury’s exosphere as interplanetary dust and meteoroids rain down on the planet. However, the general background of interplanetary dust in the inner solar system cannot, by itself, account for the periodic spikes in calcium. This suggests a periodic source of additional dust, for example, a cometary debris field. Examination of the handful of

comets in orbits that would permit their debris to cross Mercury's orbit indicated that the likely source of the planet's event is Encke.

VOYAGER 1 STILL EXPERIENCING 'TSUNAMI WAVE'



This artist's concept shows NASA's Voyager spacecraft against a backdrop of stars. (courtesy: NASA/JPL-Caltech)

'Tsunami wave' still flies through interstellar space (15 December 2014)

The "tsunami wave" that NASA's Voyager 1 spacecraft began experiencing earlier this year is still propagating outward, according to new results. https://www.youtube.com/watch?v=u-RZTwpECg&feature=player_embedded
A "tsunami wave" occurs when the sun emits a coronal mass ejection, throwing out a magnetic cloud of plasma from its surface. This generates a wave of pressure. When the wave runs into the interstellar plasma -- the charged particles found in the space between the stars -- a shock wave results that perturbs the plasma. This is the third shock wave that Voyager 1 has experienced. The first event was in October to November of 2012, and the second wave in April to May of 2013 revealed an even higher plasma density. Voyager 1 detected the most recent event in February, and it is still going on as of November data. The spacecraft has moved outward 250 million miles (400 million kilometers) during the third event. "The density of the plasma is higher the farther Voyager goes. Is that because the interstellar medium is denser as Voyager moves away from the heliosphere, or is it from the shock wave itself? We don't know yet."

ORION SPACECRAFT COMPLETES FIRST SPACEFLIGHT TEST



Photo: Lockheed Martin/United Launch Alliance

The Lockheed Martin-built Orion spacecraft gently splashed down into the waters of the Pacific Ocean at 11:29 a.m. EST this afternoon, completing the first test flight of NASA's deep space exploration capsule.

Orion spacecraft completes first spaceflight test (5 December 2014)

NASA marked a major milestone Friday on its journey to Mars as the Orion spacecraft completed its first voyage to space, traveling farther than any spacecraft designed for astronauts has been in more than 40 years.

[Lockheed Martin-built Orion spacecraft takes first steps on journey to Mars with successful test flight](#)

(5 December 2014)

LASERS SPEED UP COMMUNICATION FROM SPACE



This artist's rendition shows the Optical Payload for Lasercomm Science (OPALS) operating from the International Space Station.

(courtesy: NASA/JPL-Caltech)

OPALS: light beams let data rates soar (9 December 2014)

On the International Space Station, the Optical Payload for Lasercomm Science (OPALS) is demonstrating how laser communications can speed up the flow of information between Earth and space, compared to radio signals.

Laser communication science has Earth benefits, too. Faster downlinks from space could mean people receive higher-definition video from both satellites orbiting our planet and spacecraft farther into space, including NASA's Mars rovers. Laser communication technology also has the potential to provide faster Internet connections in remote areas on Earth. Anyone with an interest in high-speed, high-quality downloads may benefit from this technology -- including researchers, engineers and consumers.

Four lasers from the ground station travel through the sky toward the space station. Under clear, dark background conditions, it's very easy for the payload to acquire the ground beacon. Daylight conditions have proven more challenging.

LINKS TO OTHER SPACE AND ASTRONOMY NEWS PUBLISHED IN DECEMBER 2014

ASTERIODS

MASCOT en route to Asteroid 1999 JU3 (3 December 2014)

Philae landed on a comet just three weeks ago; now, another German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) lander mission has been launched – the Mobile Asteroid Surface Scout (MASCOT) is already on its way to Asteroid 1999 JU3

European astronomers spot faint asteroid (4 December 2014)

European experts have spotted one of the faintest asteroids ever found – a chunk of space rock thought to be about 100 m in diameter beyond the orbit of Mars.

Preparing for an asteroid strike (18 December 2014)

ESA and national disaster response offices recently rehearsed how to react if a threatening space rock is ever discovered to be on a collision course with Earth.

BLACK HOLES

'Perfect storm' quenching star formation around a supermassive black hole (17 December 2014)

High-energy jets powered by supermassive black holes can blast away a galaxy's star-forming fuel, resulting in so-called "red and dead" galaxies: those brimming with ancient red stars yet containing little or no hydrogen gas to create new ones.

XMM-Newton spots monster black hole hidden in tiny galaxy (19 December 2014)

First impressions can be deceptive – astronomers have used ESA's X-ray satellite XMM-Newton to find a massive black hole hungrily feeding within a tiny dwarf galaxy, despite there being no hint of this black hole from optical observations.

COMET

[Rosetta fuels debate on origin of Earth's oceans](#) (10 December 2014)

ESA's Rosetta spacecraft has found the water vapour from its target comet to be significantly different to that found on Earth.

DARK MATTER

[New revelations on dark matter and relic neutrinos](#) (4 December 2014)

The Planck collaboration, which notably includes the CNRS, CEA, CNES and several French universities, has disclosed, at a conference in Ferrara, Italy, the results of four years of observations from the ESA's Planck satellite.

¹ Polarisation is a property of light on the same level as colour or direction of travel. This property is invisible to the human eye, but remains familiar (sunglasses with polarised lenses and cinema 3D glasses, for instance). A travelling photon is associated with an electrical field (E) and a magnetic field (B), at right angles to each other and to their direction of travel. If the electrical field remains in the same plane, the photon is said to be linearly polarised, as is the case for relic radiation.

[Researchers detect possible signal from dark matter](#) (11 December 2014)

EPFL scientists have picked up an atypical photon emission in X-rays coming from space, and say it could be evidence for the existence of a particle of dark matter.

EARTH

[Crude oil cargo for ESA's first flight with China](#) (11 December 2014)

ESA is finalising its first experiment on a Chinese space mission: small containers of crude oil will help to improve our understanding of oil reservoirs buried kilometres underground.

[Cryosat extends its reach on the arctic](#) (15 December 2014)

CryoSat has delivered this year's map of autumn sea-ice thickness in the Arctic, revealing a small decrease in ice volume. Launched in 2010, CryoSat has long surpassed its planned three-year life. At the mission's recent mid-term review, it was further extended until February 2017.

[Fermi mission brings deeper focus to thunderstorm gamma-rays](#) (15 December 2014)

Each day, thunderstorms around the world produce about a thousand quick bursts of gamma rays, some of the highest-energy light naturally found on Earth.

[Salinity matters](#) (18 December 2014)

Measurements of salt held in surface seawater are becoming ever-more important for us to understand ocean circulation and Earth's water cycle. ESA's SMOS mission is proving essential to the quest.

[Spaceborne carbon counter maps new details](#) (18 December 2014)

The first global maps of atmospheric carbon dioxide from NASA's new Orbiting Carbon Observatory-2 mission demonstrate its performance and promise, showing elevated carbon dioxide concentrations across the Southern Hemisphere from springtime biomass burning.

EXOPLANETS

[Ground-based detection of super-Earth transit paves way to remote sensing of small exoplanets](#)

(1 December 2014)

Astronomers have measured the passing of a super-Earth in front of a bright, nearby Sun-like star using a ground-based telescope for the first time.

['Mirage Earth' exoplanets may have burned away chances for life](#) (2 December 2014)

Planets orbiting close to low-mass stars — easily the most common stars in the universe — are prime targets in the search for extraterrestrial life.

[Stretched-out solid exoplanets](#) (15 December 2014)

Astronomers could soon be able to find rocky planets stretched out by the gravity of the stars they orbit, according to a group of researchers in the United States.

[Kepler reborn, makes first exoplanet find of new mission](#) (18 December 2014)

NASA's planet-hunting Kepler spacecraft makes a comeback with the discovery of the first exoplanet found using its new mission -- K2.

GALAXIES AND GALAXY CLUSTERS

[Strange galaxy perplexes astronomers](#) (2 December 2014)

With the help of citizen scientists, a team of astronomers has found an important new example of a very rare type of galaxy that may yield valuable insight on how galaxies developed in the early Universe.

[Astronomers detect atomic hydrogen emission in galaxies at record breaking distances](#) (3 December 2014)
Using the world's largest radio telescope, two astronomers from Swinburne University of Technology in Australia have detected the faint signal emitted by atomic hydrogen gas in galaxies three billion light years from Earth, breaking the previous record distance by 500 million light years.

[Warm gas pours 'cold water' on galaxy's star-making](#) (5 December 2014)
A new study suggests, a surge of warm gas into a nearby galaxy -- left over from the devouring of a separate galaxy -- has extinguished star formation by agitating the available chilled gas.

[Chandra weighs most massive galaxy cluster in distant universe](#) (18 December 2014)
Using NASA's Chandra X-ray Observatory, astronomers have made the first determination of the mass and other properties of a very young, distant galaxy cluster.

[Herschel's view of the early universe reveals galaxy cluster fireworks](#) (18 December 2014)
Astronomers using ESA's Herschel space observatory have found, for the first time, fireworks of star birth within galaxies at the dense core of a massive early Universe galaxy cluster.

[The Milky Way's new neighbour](#) (22 December 2014)
The Milky Way, the galaxy we live in, is part of a cluster of more than 50 galaxies that make up the 'Local Group', a collection that includes the famous Andromeda galaxy and many other far smaller objects.

INTERNATIONAL SPACE STATION

[Space plants on way back to Earth](#) (17 December 2014)
Farming in deep space is explored in the recent movie "Interstellar," but a University of Mississippi biologist's research program appears to be bringing the sci-fi scenario closer to reality.

INTERSTELLAR MEDIUM

[Interstellar mystery solved by supercomputer simulations](#) (10 December 2014)
An interstellar mystery of why stars form has been solved thanks to the most realistic supercomputer simulations of galaxies yet made.

JUPITER AND MOONS

[Signs of Europa plumes remain elusive in search of Cassini data](#) (18 December 2014)
A fresh look at data collected by NASA's Cassini spacecraft during its 2001 flyby of Jupiter shows that Europa's tenuous atmosphere is even thinner than previously thought and also suggests that the thin, hot gas around the moon does not show evidence of plume activity occurring at the time of the flyby.

MANNED SPACE

[Sierra Nevada successfully tests critical Dream Chaser spacecraft propulsion system](#) (2 December 2014)
Sierra Nevada Corporation (SNC) announces the successful completion of a major milestone relating to the Reaction Control System (RCS) propulsion risk reduction for the Dream Chaser Space System, known as Milestone 15a.

MARS

[Curiosity rover finds clues to how water helped shape Martian landscape](#) (8 December 2014)
Observations by NASA's Curiosity Rover indicate Mars' Mount Sharp was built by sediments deposited in a large lake bed over tens of millions of years.

[First X-ray diffraction measurements on Mars](#) (8 December 2014)
In 2012 the Mars Science Laboratory landed in the fascinating Gale crater.

[MAVEN mission identifies links in chain leading to atmospheric loss](#) (15 December 2014)
Early discoveries by NASA's newest Mars orbiter are starting to reveal key features about the loss of the planet's atmosphere to space over time.

[NASA rover finds active, ancient organic chemistry on Mars](#) (16 December 2014)
NASA's Mars Curiosity rover has measured a tenfold spike in methane, an organic chemical, in the atmosphere around it and detected other organic molecules in a rock-powder sample collected by the robotic laboratory's drill.

[Meteoritic evidence of Mars water reservoir](#) (18 December 2014)

NASA and an international team of planetary scientists have found evidence in meteorites on Earth that indicates Mars has a distinct and global reservoir of water or ice near its surface.

[Spinning up a storm on Mars](#) (18 December 2014)

Spinning up a dust devil in the thin air of Mars requires a stronger updraft than is needed to create a similar vortex on Earth, according to research at The University of Alabama in Huntsville (UAH).

[Tales from a Martian rock](#) (22 December 2014)

A new analysis of a Martian rock that meteorite hunters plucked from an Antarctic ice field 30 years ago this month reveals a record of the planet's climate billions of years ago, back when water likely washed across its surface and any life that ever formed there might have emerged.

[Mapping water vapour in Martian atmosphere](#) (19 December 2014)

Russian scientists from the Space Research Institute of the Russian Academy of Sciences and the Moscow Institute of Physics and Technology (MIPT), together with their French and American colleagues, have created a "map" of the distribution of water vapour in Mars' atmosphere.

METEORITES

[Traces of possible Martian biological activity inside a meteorite](#) (2 December 2014)

An international team that includes scientists from EPFL has published a paper in the scientific journal Meteoritics and Planetary Sciences, showing that Martian life is more probable than previously thought.

PLUTO

[New Horizons spacecraft awakens for Pluto encounter](#) (6 December 2014)

After a voyage of nearly nine years and three billion miles – the farthest any space mission has ever travelled to reach its primary target – NASA's New Horizons spacecraft came out of hibernation today for its long-awaited 2015 encounter with the Pluto system.

SATELLITE APPLICATIONS

[Satellites helping to assess risk of epidemics](#) (1 December 2014)

Learning about our enemy through satellites is helping us to combat diseases spread by insects and other pests.

http://www.esa.int/Our_Activities/Telecommunications_Integrated_Applications/ARTES/ARTES_programme_overview

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SATURN AND MOONS

[Explanation for Titan dune puzzle](#) (8 November 2014)

Titan, Saturn's largest moon, is a peculiar place. Unlike any other moon, it has a dense atmosphere.

STARS AND STAR CLUSTERS

[Stellar winds blast fuel for future stars far beyond galaxies](#) (3 December 2014)

Stars igniting at rates rarely seen in a distant, massive galaxy are blowing cold, dense gas tens of thousands of light years into space, depleting the galaxy's supply of stellar fuel.

[Two stars so close to each other that they will end up merging into a supermassive star](#) (5 December 2014)

A study of "MY Camelopardalis" binary system shows that the most massive stars are made up by merging with other smaller stars, as predicted by theoretical models.

[Swarms of Pluto-size objects kick up dust around adolescent sun-like star](#) (11 December 2014)

Astronomers using the Atacama Large Millimeter/submillimeter Array (ALMA) may have detected the dusty hallmarks of an entire family of Pluto-size objects swarming around an adolescent version of our own Sun.

[Surprising theorists, stars within middle-aged clusters are of similar age](#) (17 December 2014)

A close look at the night sky reveals that stars don't like to be alone; instead, they congregate in clusters, in some cases containing as many as several million stars.

SUN

[FOXSI to observe X-rays from Sun](#) (8 December 2014)

An enormous spectrum of light streams from the sun. We're most familiar with the conventional visible white light we see with our eyes from Earth, but that's just a fraction of what our closest star emits.

[New observational solar weather model](#) (8 December 2014)

Scientists now have an observational framework to help predict solar weather and how it will affect Earth.

[Solar observatory for use on suborbital manned space missions](#) (11 December 2014)

Southwest Research Institute (SwRI) is preparing to unveil a new, miniature portable solar observatory for use on board a commercial, manned suborbital spacecraft.

[Origin of high-latitude auroras revealed](#) (18 December 2014)

Auroras are the most visible manifestation of the Sun's effect on Earth, but many aspects of these spectacular displays are still poorly understood.

[Sun sizzles in high-energy X-rays](#) (22 December 2014)

For the first time, a mission designed to set its eyes on black holes and other objects far from our solar system has turned its gaze back closer to home, capturing images of our sun.

TECHNOLOGY AND TECHNOLOGY UPDATE

['Smart dust' technology could reshape space telescopes](#) (1 December 2014)

Scientists at Rochester Institute of Technology and the NASA Jet Propulsion Laboratory are exploring a new type of space telescope with an aperture made of swarms of particles released from a canister and controlled by a laser.

[Webb telescope ISIM gets cubed for gravity test](#) (2 December 2014)

The James Webb Space Telescope's ISIM structure recently endured a "gravity sag test" as it was rotated in what looked like giant cube in a NASA clean room.

[On solid ground](#) (3 December 2014)

Lovers of architecture and history can rest easy: the stability of historical buildings can now be monitored in real time by a new technique with its roots in space.

[India joins the Thirty Meter Telescope project as a full member](#) (2 December 2014)

Today in New Delhi, officials of the government of India signed documents establishing the country as a full partner in the Thirty Meter Telescope (TMT) project.

[Green light for E-ELT construction](#) (4 December 2014)

At a recent meeting ESO's main governing body, the Council, gave the green light for the construction of the European Extremely Large Telescope (E-ELT) in two phases.

[Airbus Defence and Space assembles most precise "clock ensemble" ever for operation in space](#)

(5 December 2014)

It may not look like a clock, but that's exactly what it is.

[Rosetta tank test available to all space missions](#) (16 December 2014)

A test originally invented to save ESA's Rosetta comet-chaser is today at the disposal of all European space missions, helping to ensure their propellant tanks will not crack up under stress.

[One billion measurements and counting for observatory using Andor cameras](#) (17 December 2014)

A trio of 'off-the-shelf' Andor scientific cameras has made over one billion measurements of the most luminous objects in the universe to help Liverpool John Moore's University stay at the forefront of time domain astrophysics.

UNIVERSE

[Researchers use real data rather than theory to measure the cosmos](#) (12 December 2014)

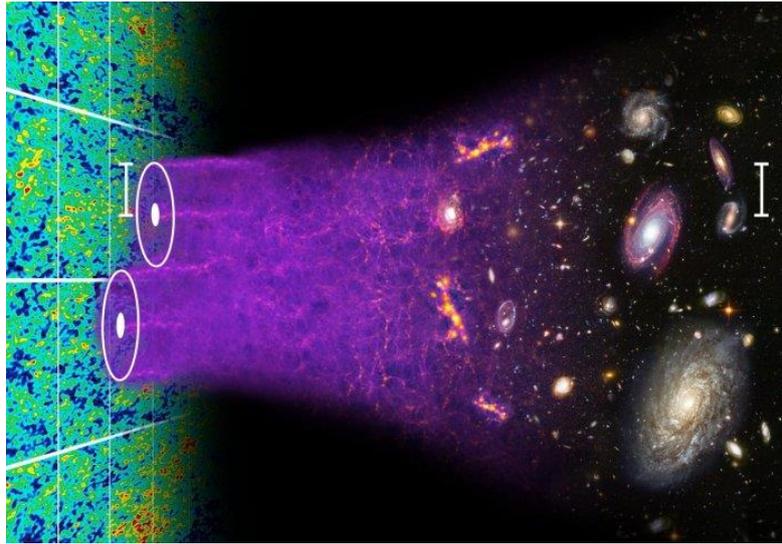


Illustration of the concept of Baryonic Acoustic Oscillations. Credit: Chris Blake & Sam Moorfield

For the first time researchers have measured large distances in the Universe using data, rather than calculations related to general relativity. The standard ruler measured in the research is the baryon acoustic oscillation scale. This is a pattern of a specific length which is imprinted in the clustering of matter created by small variations in density in the very early Universe (about 400,000 years after the Big Bang). The length of this pattern, which is the same today as it was then, is the baryon acoustic oscillation scale. The team calculated the length to be 143 Megaparsecs (nearly 480 million light years) which is similar to accepted predictions for this distance from models based on general relativity.

VENUS

[Venus Express goes gently into the night](#) (16 December 2014)

ESA's Venus Express has ended its eight-year mission after far exceeding its planned life.

Pat Williams. December 2014