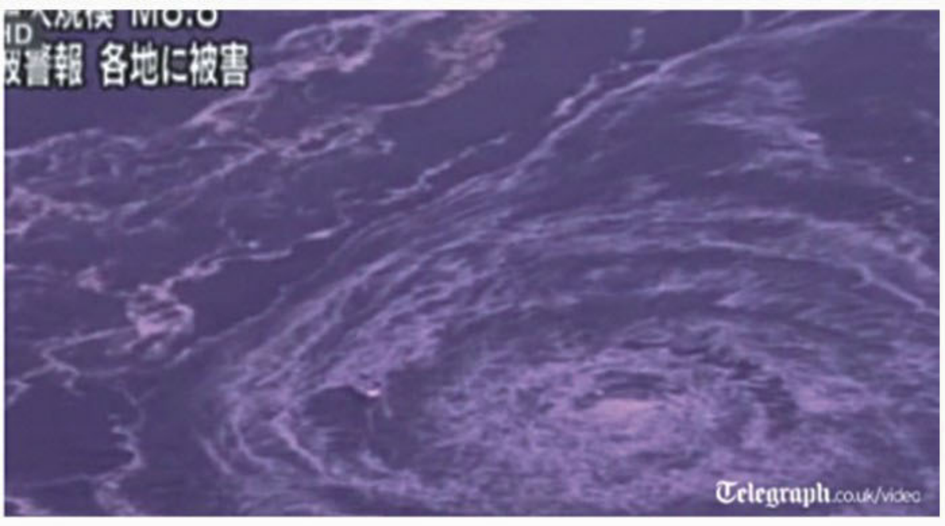
Why tsunami made huge whirlpool?



Whirlpool created by the earthquake off the coast of Japan, March 11, 2011.

The tsunami that hit northern Japan today created an enormous whirlpool in a harbor off the east coast of that country. According to researchers, whirlpools aren't unusual after waves of this size.

The tsunami was triggered by an 8.9-magnitude earthquake that struck off the coast of Japan at 2:46 p.m. Tokyo time. Video footage shows a boat swirling in the massive eddy. It's not known whether anyone was on the vessel.

Based on eye-witness accounts and video in recent years, whirlpools probably occur with some regularity after large tsunamis, said Ruth Ludwin, a retired seismologist at the University of Washington in Seattle.

"Whirlpools have a big impact on the human imagination," Ludwin said.

"They're very notable and very frightening. But from the perspective of the geological record, they don't leave any particular sign that has been recognized so far."

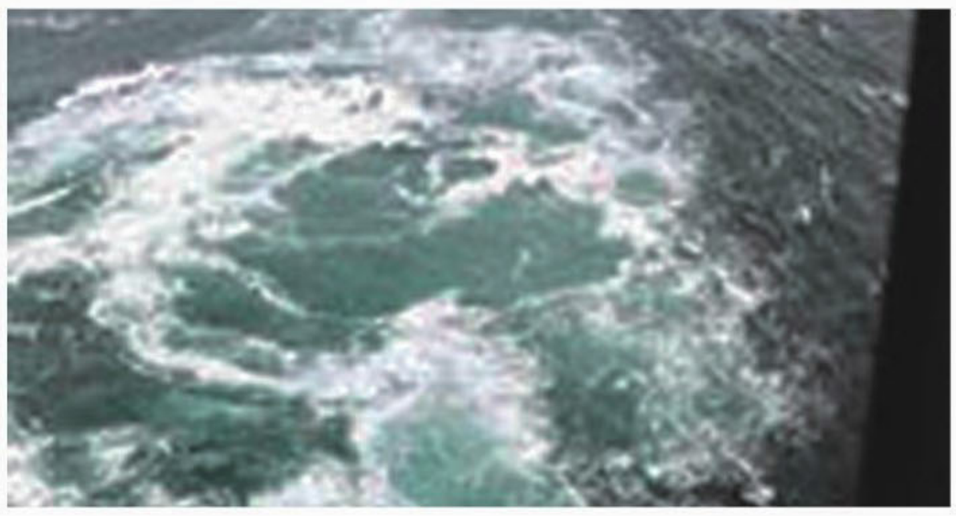
Whirlpools happen because of the interaction between rushing water and the geology of the coastline and seafloor, Ludwin said.

"Obviously there is a lot of water that is being pushed around, and it is interacting with the shape, the bathymetry, near the coastline," she said. [Album: Monster Waves]

"When a tsunami impacts the shoreline, some water overtops the shoreline and advances on the dry land in a manner somehow similar to a dam break wave," Hubert Chanson, a professor of hydraulic engineering and applied fluid mechanics at the University of Queensland in Australia, told LiveScience. "This was seen during the December 2004 tsunami in Indonesia and Thailand, as well as on Friday, 11 March 2011 in Japan. At the same time, the impact of the tsunami waters on the coastline induces some very intense turbulent motion, and, with a suitable bathymetry, a large whirlpool may develop."

The first images and videos of post-tsunami whirlpools came out of the 2004 Indian Ocean tsunami, Ludwin said. But eyewitness accounts from previous coastal quakes suggest that tsunami whirlpools are nothing new. One was reported in the great Lisbon earthquake of 1775, Ludwin said. The Haida people of the Queen Charlotte Islands off the coast of British Columbia have myths about a whirling wave of foam. Apela Colorado, Ludwin's colleague with the Worldwide Indigenous Science Network in Hawaii, has identified a petroglyph in southeastern Alaska that seems to show a whirlpool in the body of a sea monster. In an abstract presented at the 2006 meeting of the Seismological Society of America, Colorado and Ludwin describe the native myths about that monster. According to ancient tales, they wrote, the creature "inundates canoes, makes the salt-water boil, swallows fishermen, pushes fish into a cave, and creates a canoe passage by flopping across a spit."

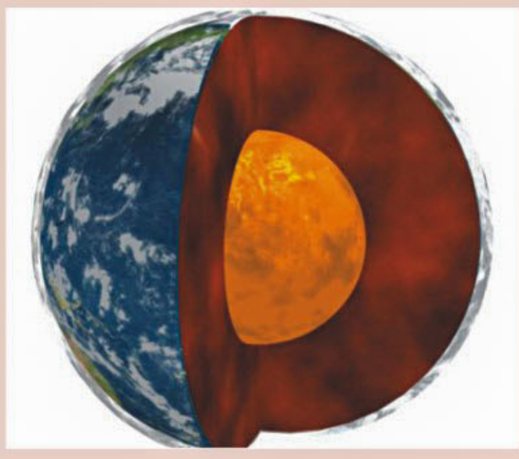
Source: Live Science



The Naruto Strait, between Awaji Island and Shikoku in Japan, is known for its natural whirlpools. Shown here, a whirlpool in the strait on Nov. 17, 2001.

AT HEART

Earth's telltale core



Earth's rotation, movements in Earth's molten core and global surface air temperatures has uncovered interesting correlations

THE latest evidence of the dominant role humans play in changing Earth's climate comes not from observations of Earth's ocean, atmosphere or land surface, but from deep within its molten core.

Scientists have long known that the length of an Earth day -- the time it takes for Earth to make one full rotation -- fluctuates around a 24-hour average. Over the course of a year, the length of a day varies by about 1 millisecond, getting longer in the winter and shorter in the summer. These seasonal changes in Earth's length of day are driven by exchanges of energy between the solid Earth and fluid motions of Earth's atmosphere (blowing winds and changes in atmospheric pressure) and its ocean. Scientists can measure these small changes in Earth's rotation using astronomical observations and very precise geodetic techniques.

But the length of an Earth day also fluctuates over much longer timescales, such as interannual (two to 10 years), decadal (approximately 10 years), or those lasting multiple decades or even longer. A dominant longer timescale mode that ranges from 65 to 80 years was observed to change the length of day by approximately 4 milliseconds at the beginning of the 20th century.

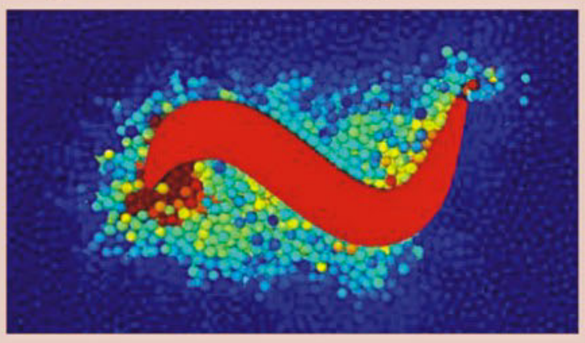
These longer fluctuations are too large to be explained by the motions of Earth's atmosphere and ocean. Instead, they're due to the flow of liquid iron within Earth's outer core, where Earth's magnetic field originates. This fluid interacts with Earth's mantle to affect Earth's rotation. While scientists cannot observe these flows directly, they can deduce their movements by observing Earth's magnetic field at the surface. Previous studies have shown that this flow of liquid iron in Earth's outer core oscillates, in waves of motion that last for decades with timescales that correspond closely to long-duration variations in Earth's length of day.

Still other studies have observed a link between the long-duration variations in Earth's length of day and fluctuations of up to 0.2 degrees Celsius (0.4 degree Fahrenheit) in Earth's long-term global average surface air temperature.

Source: Science Daily

SCI-FI MONSTER

Physics of burrowing sandfish



Computer simulations of lizards swimming through buckets of small glass beads

THE sandfish lizard wriggles through desert sands like a sci-fi monster. Now, using computer simulations and bendy robots, researchers at Georgia Tech in Atlanta have taken the most complete look yet at the everyday physics of burrowing animals. And, boy, does this reptile wriggle, the team reports online February 23 in the Journal of the Royal Society Interface. "This particular behavior is built for speed," says physicist Daniel Goldman, one of the study coauthors.

Like the deadly sandworms in the Dune science fiction series, a host of animals from scorpions to snakes haunt subterranean deserts across the planet. It's not easy to study how these creatures careen through their environments, Goldman says. Scientists have a good idea how water behaves in the wake of an undulating eel or how air flows over a bird wing. But shuffling sand grains ping off each other like a wickedly complicated game of pool.

X-ray studies have shown that sandfish lizards (Scincus scincus) navigate such chaos with a wormlike wriggle, Goldman says, tucking in their legs and curling from side to side in S-shaped waves. A fast sandfish lizard dive covers two body lengths per second and the creatures can grow to 4 inches long, he adds. But just how the lizards achieve such speed in a complex sandy environment wasn't clear. For that, Goldman's team turned to a new set of tools.

Source: Science News

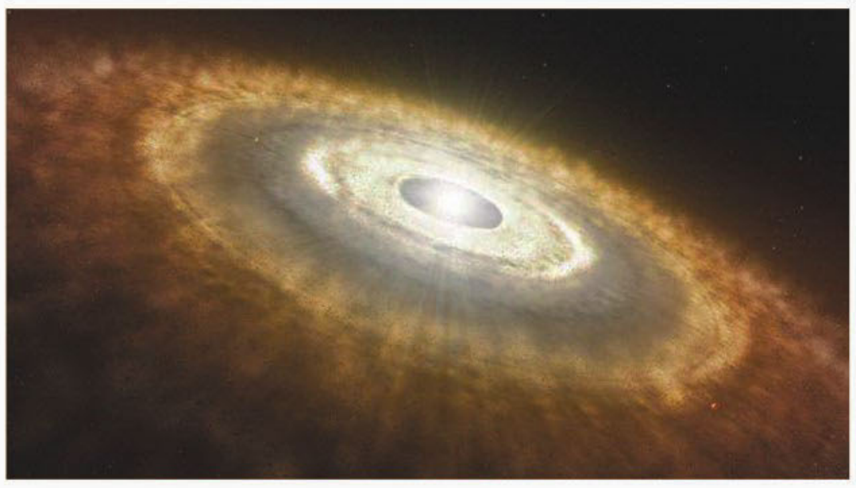
PARTICLE DIARY

Oldest object in solar system

OBAIDUR RAHMAN

Very recently scientists, with the aid of Lawrence Livermore's NanoSIMS-LLNL (nanometer-scale secondary-ion mass spectrometer) found tiny grains of dust of from a meteorite which are proving to be the earliest specimens of the primordial solar system, referring to a time before the Earth was born. It must be mentioned here that LLNL is an instrument that can analyze samples with nanometer-scale spatial resolution. And LLNL scientists in conjunction with NASA Johnson Space Center, University of California, Berkeley and the University of Chicago, have found particles called calcium-aluminium rich inclusions or CAI inside meteoroids which scientists believe is 4.6 billion-year old and acted as tiny travel diaries, tracing their journey through the early solar nebula. The discovery, of which details have been published in the March 4 issue of the journal Science, was led by Dr. Justin Simon, an astro-materials specialist with NASA's Johnson Space Center in Huston. And Dr. Simon chose a pea-size CAI from the Allende meteorite (that crash-landed in Mexico in 1969), the largest carbonaceous ever found on Earth. According to LLNL scientist, Ian Hutcheon, "Allende is this very unusual meteorite with all these wonderful inclusions (CAIs). The isotopic measurements indicate that this CAI was transported among several different nebular oxygen isotopic reservoirs, arguably as it passed through into various regions of the proto-planetary disk".

Few words on CAI are in order. Roughly millimeter-to-centimeter in size, CAIs are believed to have formed very early in the evolution of the solar system and had contact with nebular gas, either as solid condensates or as molten droplets. And relative to planetary materials, CAIs are enriched with the lightest oxygen isotope and are strongly believed to record the oxygen composition of solar nebular gas where they grew. Also CAIs, at 4.6 billion years old, are in fact millions of years older than more modern objects in the solar system, such as planets, which formed about 10-50 million years after CAIs. And since CAIs were among the very first solids to condense from the swirl of gas and dust as the planets were forming, according to researchers, it is fairly logical to study them in order to yield clues about our solar system's early days.



Scientists believe the particles acted as tiny travel diaries, tracing their journey through the early solar nebula

Measuring the two different oxygen isotopes (oxygen-16 & oxygen-17) in space rock's various layers and by analyzing their relative abundances in the different parts of the CAI, the scientists were able to learn a great deal about its travel pattern and history, which turned out to be quite extensive. The findings of the research led to this conclusion that CAIs formed from several oxygen reservoirs, likely located in distinct regions of the solar nebula. It was also found that CAIs traveled within the nebula by lofting outward away from the sun and then later falling back into the mid-plane of the solar system or by spiraling through shock waves around the sun. According to Dr. Simon, "If you were this grain, you formed near the proto-sun, then likely moved outward to a planet-forming environment, and then back toward the inner solar system or perhaps out of the plane of the disk. Of course, you ended up as part of a meteorite, presumably in the asteroid belt, before you broke up and hit the Earth".

The contributor is a freelance Science writer.

SPEED DEMON

Runaway star creates shock

NASA's Wide-field Infrared Survey Explorer, or WISE, captured this image of the star Alpha Camelopardalis, or Alpha Cam, in astronomer-speak, speeding through the sky like a motorcyclist zipping through rush-hour traffic. The supergiant star Alpha Cam is the bright star in the middle of this image, surrounded on one side by an arc-shaped cloud of dust and gas -- a bow shock -- which is colored red in this infrared view.

Such fast-moving stars are called runaway stars. The distance and speed of Alpha Cam is somewhat uncertain. It is probably somewhere between 1,600 and 6,900 light-years away and moving at an astonishing rate of somewhere between 680 and 4,200 kilometers per second (between 1.5 and 9.4 million mph).

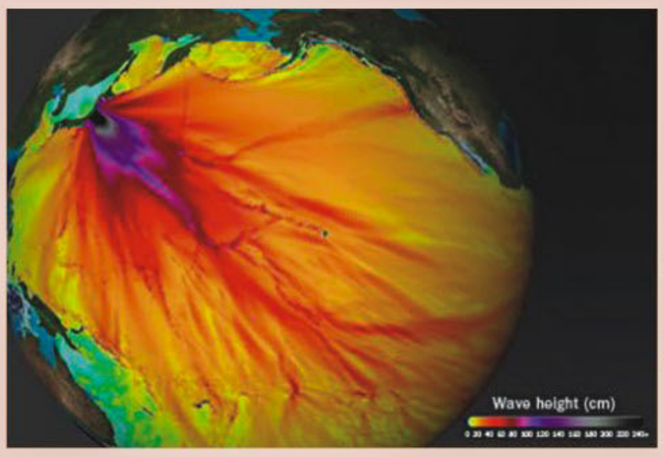
Astronomers believe runaway stars are set into motion either through the supernova explosion of a companion star or through gravitational interactions with other stars in a cluster. Because Alpha Cam is a supergiant star, it gives off a very strong wind. The speed of the wind is boosted in the forward direction the star is moving in space. When this fast-moving wind slams into the slower-moving interstellar material, a bow shock is created, similar to the wake in front of the bow of a ship in water. The stellar wind compresses the interstellar gas and dust, causing it to heat up and glow in infrared. Alpha Cam's bow shock cannot be seen in visible light, but WISE's infrared detectors show us the graceful arc of heated gas and dust around the star.

Source: Science Daily

NASA's Wide-field Infrared Survey Explorer, or WISE, captured this image of the star Alpha Camelopardalis, or Alpha Cam, speeding through the sky

PACIFIC HEIGHTS

The great quake



Source: Science News

Expected wave heights for the tsunami generated by a magnitude-8.9 earthquake in Japan on March 11 are shown in these data from a computer simulation by the U.S. National Oceanic and Atmospheric Administration. The wave decreases in height as it travels across the Pacific Ocean but then gets higher as it hits shallower areas near coasts.

DID YOU KNOW?

What is a tsunami?

A once-exotic word that has now entered the everyday lexicon, a tsunami refers to a shock of water that spreads through the sea, usually after a sub-sea floor quake. A section of seabed is thrust up or driven down by violent movement of the Earth's crust. The rift displaces vast quantities of water that move as waves, able to cover enormous distances over open water, sometimes at the speed of a jet plane.