2022/05/12

Physics Topics 02

NASA's InSight lander have been detecting marsquakes instead of earthquakes!?😳 (05/12/2022)

I was reading an article called "NASA's InSight lander detects largest 'marsquake' yet on Red Planet" in The Verge website. Thank you very much.😊This article introduced a story that NASA's InSight lander have been detecting marsquakes instead of earthquakes.😳The following are quotes from this article:

> InSight's mission on the Red Planet has been to probe the interior of Mars, primarily by sensing for tremors from the surface. **Unlike quakes here on Earth, which are typically caused by shifting tectonic plates, "marsquakes" are thought to be caused by the cooling of Mars over time, which causes the planet's crust to become more brittle and crack**. Equipped with an extremely sensitive seismometer built by France's space agency, InSight has detected more than 1,313 quakes since landing three and a half years ago, according to NASA.

> The initial quakes that InSight felt were relatively low-magnitude. Before now, the largest marsquake the spacecraft had detected was a magnitude 4.2. This latest 5-pointer,

> detected on May 4th, is still pretty weak compared to those we sometimes experience on Earth, but NASA says it's close to the strongest kind of quake scientists expected to see on Mars. Now, the InSight team will dive into the data from the quake to learn more about its origin and scope. "Since we set our seismometer down in December 2018, we've been waiting for 'the big one,'" Bruce Banerdt, InSight's principal investigator at NASA, said in a statement. "This quake is sure to provide a view into the planet like no other."

> But InSight has also been having a difficult time of late. **In January, a particularly thick Martian dust storm blocked enough sunlight from reaching InSight's solar panels, decreasing the spacecraft's power supply**. In response, InSight entered safe mode, a type of operating procedure in which the spacecraft ceases all but the most essential tasks it needs to perform to survive. Eventually, InSight exited safe mode and started producing full power again. But dust continues to accumulate on InSight's solar panels, and the vehicle doesn't have a way to significantly clean its hardware (though NASA has tried a few unconventional techniques). Since there hasn't been any particularly strong winds to blow off the dust, InSight will eventually stop producing enough power to continue functioning, which is expected to occur sometime later this year.

> Despite all of this, InSight has performed its major goals as expected. Its primary mission ended in December of 2020, and the lander is currently in its extended mission, which lasts until December of 2022. As of now, there's still time left to detect more marsquakes until the power runs out.

In the explanation above, Marsquakes are thought to be different reason from earthquakes on Earth. It's be helpful.😃

Furthermore, if we know how a marsquake works, we may be able to understand how an earthquake works more and more. 🧐 I assume that a planetary's quake may be triggered depending on a location of a satellite, but I haven't looked into it in detail yet.😅

Keywords: Earthquake, Marsquake, Mars, NASA, InSight

A magic? No, a supercritical fluid!😳 (04/18/2022)

I was listening to the latest episode of the podcast Breaking Math. It was the episode of dialogue with material scientist Chris Cogswell. Thank you very much.😊 I didn't know much about nano materials, so it was very interesting. At the beginning of this episode, there was also an explanation of solids, liquids, and gases, and it was easy to understand.

Also, thanks to🥑@yujitach's Japanese tweet, I was able to get to know an interesting video called "What Happens When a Liquid Turns Supercritical?" on YouTube physics channel "Action Lab" before. Thank you very much.😊 He also tweeted, but this video explained the experiment in the supercritical fluid with Xe in a very easy-to-understand manner when it exceeded the critical point. A phase diagram

shows the difference in the state of matter according to the difference between its pressure and its temperature. The following are screenshots from this video:

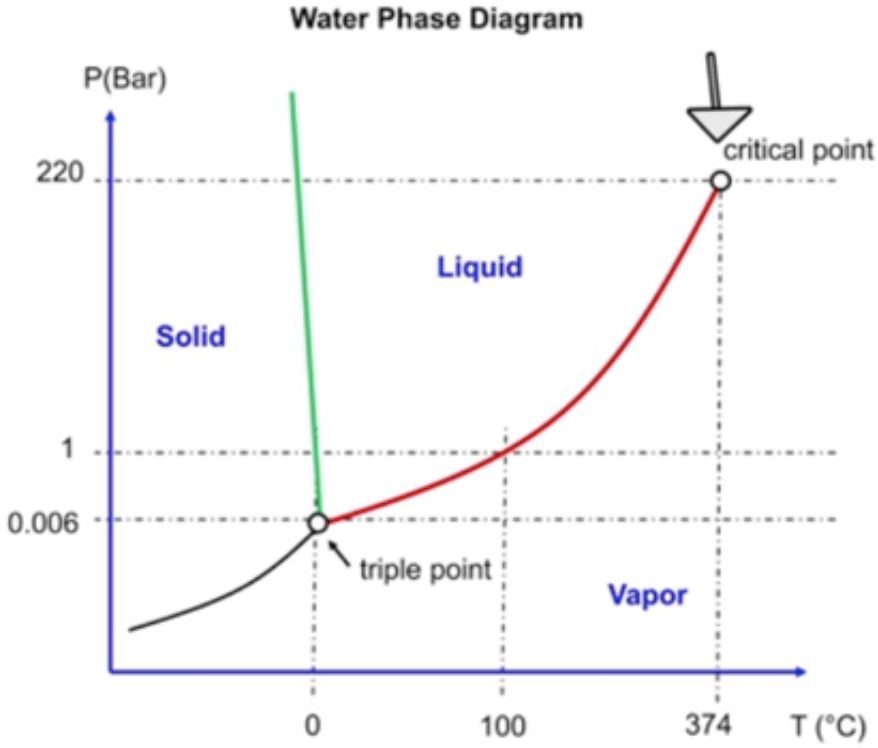

Image: Water phase diagram from "Action Lab"

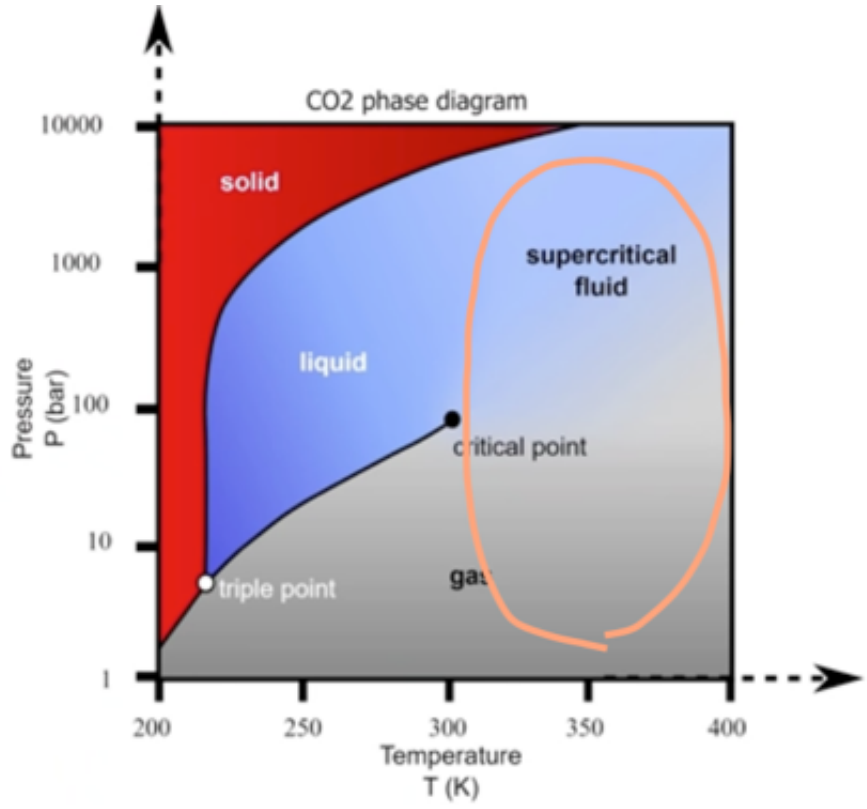

Image: Carbon dioxide phase diagram from "Action Lab"

I didn't know about the supercritical fluid.😳 I felt I can do magic with it.😃

Keywords: Supercritical Fluid, Nano Material, Solid, Liquid, Gas, Critical Point, Phase Diagram

A meteorite from another solar system is on the bottom of the sea!?😳(04/13/2022)

I was reading an article called "An interstellar object exploded over Earth in 2014, declassified government data reveal" on Live Science's website via Nature. Thank you very much.😊 This article introduced what the U.S. Space Command (USSC) announced that the fireball that ran over Papua New Guinea in 2014 was a fast-moving object from another solar system. The following are quotes from this article:

> The object, a small meteorite measuring just 1.5 feet (0.45 meter) across, slammed into Earth's atmosphere on Jan. 8, 2014, after traveling through space at more than 130,000 mph (210,000 km/h) — a speed that far exceeds the average velocity of meteors that orbit within the solar system, according to a 2019 study of the object published in the preprint database arXiv.

> Amir Siraj, a theoretical astrophysicist at Harvard University

> and the lead author of the 2019 paper, told Vice that he still intends to get the original study published, so that the scientific community can pick up where he and his colleagues left off. Because the meteorite ignited over the South Pacific Ocean, it's possible that shards of the object landed in the water and have since nestled on the seafloor, he added.

> While locating these scraps of interstellar debris might be a nigh-impossible task, Siraj said he is already consulting with experts about the possibility of mounting an expedition to recover them.

> "The possibility of getting the first piece of interstellar material is exciting enough to check this very thoroughly and talk to all the world experts on ocean expeditions to recover meteorites," Siraj told Vice.

Its component analysis of the meteorite from another solar system is very interesting.😀

Related topics:
Automation of meteorite recovery work!🧐🥹 (03/13/2022)

Keywords: Solar System, Meteorite, U.S. Space Command, USSC, Interstellar Object

When sound waves are injected into magnets, electromous power is generated by Einstein–de Haas effect! 😳(02/28/2022)

I was reading an article called "Spin Elastodynamic Motive Force" via Mynavi News. Thank you very much.😊Sound waves are also used in this research. This study theoretically shows that when sound waves are injected into a simple ferromagnetic monolayer, the spin-motive force (SMF) in it is generated via spin-vorticity coupling (SVC). 😳👏 The following are quotes from this article:

> Einstein–de Haas effect is a historically important phenomenon that shows that the origin of magnetism of matter is an electron rotation motion called spin, but its effect is very small, It was impossible to apply it to spintronics devices where magnetic control of substances is essential. However, by using a sound wave called a surface elastic wave, it has been demonstrated that the crystal lattice point rotates more than 1 billion times per second to create a spin flow using Einstein–de Haas effect. In addition, a way to convert this spin flow into electromotive power was discovered, but it required a complex device structure including rare metals.

> Therefore, this research group has built a theory describing the intertwining of the three magnetic metal thin monolayer that induces the rotational motion of the lattice by injecting surface elastic waves, and generates electromotive power. This does not require precious metals and complex device structures, so it is expected to pave the way for spin device applications with Einstein–de Haas effect that have been

> difficult so far.

I also wanted to use a low-cost microchip device to generate high-frequency sound waves. 😃It looks interesting.

Keywords: Magnet, Sonic Wave, Einstein–de Haas Effect, Electromous power, Spintronics, Spin