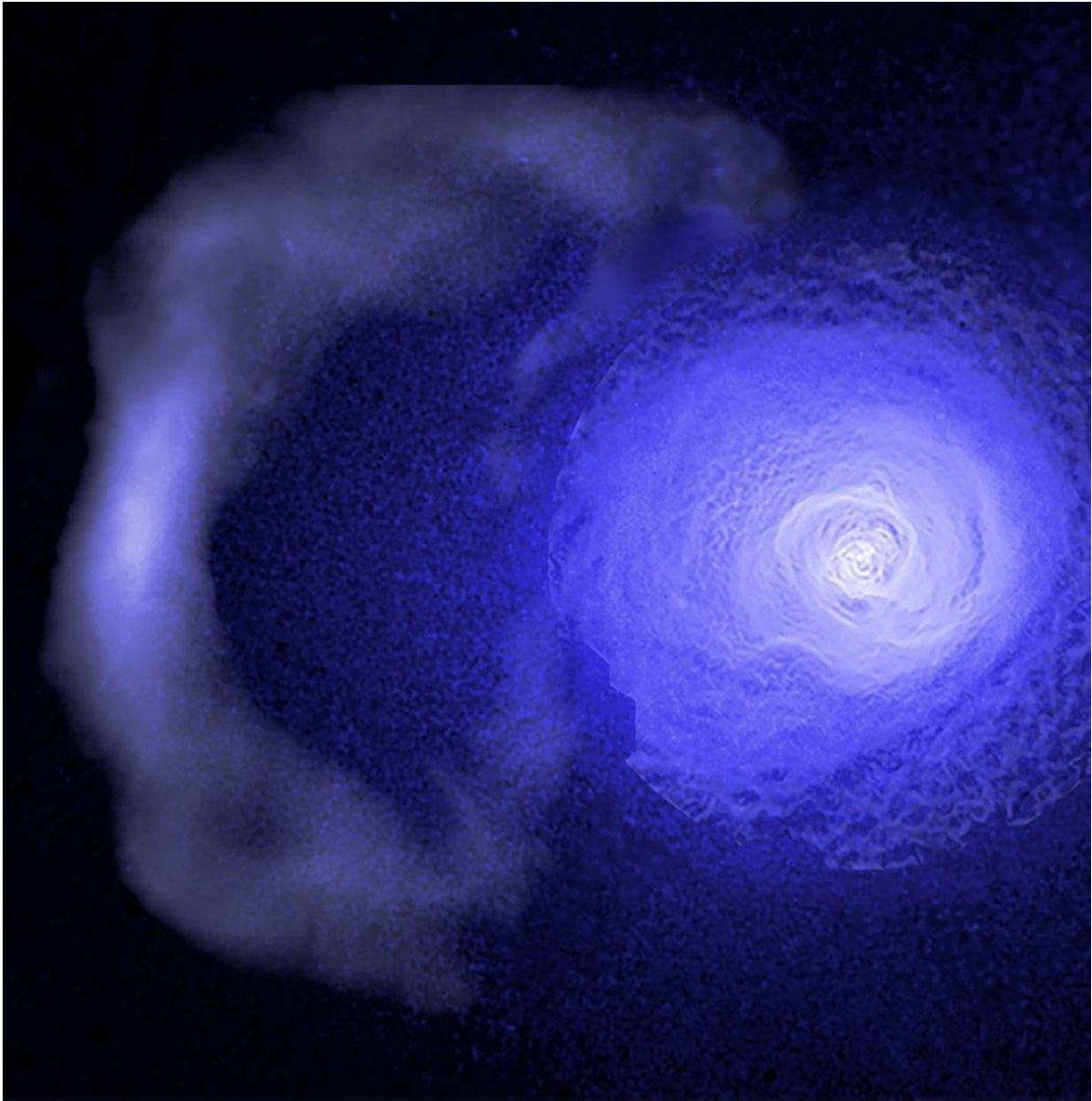


Image: Ancient cold front in Perseus

October 29 2018



Credit: NASA/CXC/GSFC/S. Walker, ESA/XMM, ROSAT

A gigantic cold front in the Perseus galaxy cluster has been observed by a trio of X-ray telescopes.

The ancient cold front can be seen at the left of the image, drifting away from the much inner, younger front closer to the centre. Galactic cold fronts are nothing like the cold fronts we experience on Earth – instead they are caused by galaxy clusters colliding into one another. The gravitational pull of a larger [cluster](#) tugs a smaller cluster closer, resulting in gas in the core of the cluster being sloshed around like liquid in a glass. This creates a cold front in a spiral pattern moving outwards from the core and these sloshing [cold fronts](#) can provide a probe of the intercluster medium.

Cold fronts are the oldest coherent structures in cool core clusters and this one has been moving away from the centre of the cluster for over five billion years – longer than our Solar System has been in existence. The long curving structure spans around two million light years and is travelling at around 50 kilometres per second.

The image combines data from NASA's Chandra X-Ray observatory, ESA's XMM-Newton and the German Aerospace Centre-led ROSAT satellite. Chandra also took a separate close-up of the upper left of the cold front, revealing some unexpected details.

The Perseus galaxy cluster contains thousands of [galaxies](#) and a supermassive black hole at the centre. The black hole is responsible for creating a harsh environment of sound waves and turbulence that should erode a cold front over time, smoothing out the previously sharp edges and creating gradual changes in density and temperature. Instead, the high-resolution Chandra image showed a surprisingly sharp edge on the cold front, and a temperature map revealed that the upper left of the cold

front is split in two.

The sharpness of the cold front suggests it has been preserved by strong magnetic fields wrapped around it, essentially acting as a shield against the harsh environment. This magnetic "draping" prevents the cold front from diffusing and is what has allowed it to survive so well for over five billion years as it drifts away from the centre of the cluster.

Provided by European Space Agency

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