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[Astronomy] Astrophysicists Capture Growth of Galaxy Clusters, the Largest Cosmic Structures

[Astronomy] Astrophysicists Capture Growth of Galaxy Clusters, the Largest Cosmic Structures (Chinese Version)

Academia Sinica Newsletter (2010/04/07) Galaxy clusters are the largest known gravitationally-bound objects in the Universe. For the first time a team of astrophysicists including Postdoctoral Fellow Dr. Nobuhiro OKABW and Associate Research Fellow Dr. Keiichi UMETSU from the Institute of Astronomy and Astrophysics at Academia Sinica (ASIAA) and Special Postdoctoral Researcher Dr. Madoka KAWAHARADA from the Institute of Physical and Chemical Research (RIKEN, Japan), have mapped the growth of these cosmic structures for the first time. Their research will be published online in The Astrophysical Journal, a leading astrophysics journal, on April 9, 2010.

Galaxy clusters are composed of a few hundred to a few thousand galaxies, as well as X-ray emitting hot gas and dark-matter. The research team has revealed a snapshot of the dramatic growth of a galaxy cluster named Abell 1689. They discovered that the cluster grows through heating triggered by matter falls from a filamentary large-scale structure outside the cluster known as a “cosmic web”.

Using the Suzaku X-ray satellite, the team was able to measure X-ray emission from the hot gas in the outermost regions of Abell 1689. They discovered that the anisotropic temperature distribution of the hot gas is 58 million degrees in one direction and 23 million degrees in the other around the boundary of the cluster. They then compared their X-ray data with a galaxy map made from Sloan Digital Sky Survey (SDSS) data and found that the filamentary large-scale structure of galaxies outside the cluster contacts the hotter realm inside the cluster; in contrast, the other low-density fields, which contain fewer galaxies, contact the cooler gas. The team also compared their X-ray data with gravitational lensing data from the Japanese Subaru telescope and the Hubble Space Telescope, and found that the cooler gas is likely to have sub-sonic motion. Joint analyses of the X-ray, optical and gravitational lensing data have unveiled a clear snapshot of the growth of galaxy clusters being affected by the large-scale structure within which clusters are embedded.

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http://iopscience.iop.org/0004-637X/

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Further Information:
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