



UNIVERSITY OF JAÉN

Vice-chancellorship of Communication and Institutional Relations

The Office of Communication *Press Release*

Friday, April 8th 2011

Professors at the University of Jaén participate in a joined investigation in which they have detected X-ray emissions in supernova remnants

Members of the group "Sources of High Energies of the Galaxy" (FAEG) of the University of Jaén, together with investigators of the Argentinean Institute of Radio Astronomy, the University of Comahue (Argentina) and the Complutense University of Madrid, have detected X-ray emissions in five new supernova remnants (SNRs) belonging to our galaxy.

These remnants are the result of the violent death of the most massive stars of the galaxy, by way of "gaseous remains" of the explosion that puts an end to the existence of other stars. This phenomenon is commonly known as a supernova (SN).

The work was led by the members of the FAEG group **Jorge Ariel Combi** and **Estrella Sánchez Avaso**, the latter in her doctoral thesis work as a FPI scholarship recipient within the area of Astronomy and Astrophysics of UJA, guided by the professor **Josep Martí** who also participated in the work.

Jorge Ariel Combi explains this work was made possible "thanks to the significant advance of the instrument operating in space that has permitted a much better resolution in relation to spatial and spectral morphology". Specifically, it refers to the evolution of the observational capabilities of the state of the art X-Ray telescopes, aboard of the satellites XMM-Newton (<http://xmm.esac.esa.int/>) and Chandra (<http://cxc.harvard.edu/>), which have permitted to achieve progress in the detection of SNRs. These types of instruments are precisely the ones that have made possible the discovery of the X-Ray emissions from several of these celestial objects by the research team. In addition to its scientific studies published in international magazines such as *Astronomy and Astrophysics*, the beauty of the imagery resembles genuine postcards of the universe at high energies.

The SNRs form as a consequence of the propagations of a shock wave originated at the same time of the explosion of a massive, dying star. This shock wave spreads quickly through the middle, sweep and compressed surrounding interstellar material. For this



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reason, the SNRs can have a morphology that generally depends on the characteristics of the environment in which the dying star was immersed at the time of death. If the environment in which it evolves is relatively homogenous, the morphology of the SNR would be approximately circular (or a three dimensional sphere). In return, if the environment is not homogenous, (if atomic or molecular clouds are present) its morphology would be, generally, of an irregular shape, with an infinity of different structures as reflected in the imagery.

The SNRs provide an important fraction of mechanical energy that heats, compresses and also chemically enriches the interstellar environment. They are places of origin, acceleration and propagation of cosmic rays, or subatomic particles with incredibly high energies. “Therefore, these celestial bodies represent true natural laboratories that could be used to investigate the global properties of the galaxy, study the physics of the particles and also to know the characteristics of the interstellar environment in which they evolve,” affirms Josep Martí.

During the past years the Astrophysics group from UJA has discovered and studied five SNRs from the southern hemisphere. The objects in question are known by the scientific names G304.6+0.1 (“Kes 17”), a representative case of the sample and whose picture is included with this note. “Kes 17” presents emissions of X-rays of thermal origin and belongs to the subclass of SNRs with a mixed morphology (outer-edge with radio emission and interior region with X-ray emission).

Finally, it important to emphasize that the possibility to study objects of this type (things like stars, binary systems, regions of star formation, galaxies or accumulations of galaxies, among other objects) with the new generation of orbiting observatories, opens up great possibilities for research in a field of astronomy that naturally connects with other parts of the electromagnetic spectrum. The data of the XMM and Chandra satellites analyzed for this work are available to the entire astronomical community for scientific exploitation and the FAEG from UJA contributes with its work to this task in the context of international collaboration.

The multiple and diverse investigative facets of this work have been received with the support of the Ministry of Science and Business Innovation (FQM322 and FQM2009-5418), of the Ministry of Science and Technology (AYA2010-21782-C03-03) and FEDER funds.