XMM−Newton reveals X−rays from gas streams around young stars (Forwarded)

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XMM−Newton reveals X−rays from gas streams around young stars

XMM−Newton has surveyed nearly two hundred stars under formation to reveal, contrary to expectations, how streams of matter fall onto the young stars' magnetic atmospheres and radiate X−rays.

The results defy astronomers' expectations, as the streams of falling matter interact with the hot corona, cooling it, while the ejected streams of gas heat up in shocks as they are ejected from the star.

The new XMM−Newton results paint a dramatic picture of the role magnetic fields play in star formation. "Star formation is a battle between gravity and everything else," says Manuel Guedel, Paul Scherrer Institut, Villigen, Switzerland, who leads a large project addressing magnetic activity in young stars within the constellation of Taurus.

Star formation results in a complicated system in which the young star is surrounded by a disc of gas and dust. This matter then follows one of three different routes. It finds its way onto the star through magnetic funnels, or stays in the disc to form planets, or is thrown clear of the system in a wind or jet created by the overall magnetic field.

With the help of ESA's X−ray observatory XMM−Newton, Guedel and his 25 international colleagues are now ready to report new details from the front line.

They used XMM−Newton to target stars in the nearby Taurus Molecular Cloud. This vast cloud in space is one of the star−forming regions nearest to Earth and contains over 400 young stars.

Most of these stars are still accumulating matter, a process known as accretion. As falling matter strikes the surface of the star, it typically doubles the temperature of the surface from 5000 Kelvin to 10 000 Kelvin.

This produces an excessive amount of ultraviolet radiation emitted by the star and detected by XMM−Newton's Optical Monitor. Astronomers had thought that the same shock waves that caused the emission of the ultraviolet excess should also produce an excess of X−rays.

Confusingly enough, previous observations seemed to show that young stars that still accrete matter give off less X−ray emission. To investigate this mystery, amongst several others, ESA approved a large programme of observations with XMM−Newton. The space−borne observatory investigated the densest regions of the Taurus Molecular Cloud for a total of more than 7 days.

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