Background information

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Scientific findings from the ROSAT mission

In 1975 we thought of building a highly sensitive X-ray satellite, equipped with an imaging telescope, which we could use to observe more than 100,000 X-ray sources. The ROSAT mission began when I proposed the concept as a national, large-scale project to the German Federal Ministry of Research and Technology. The satellite was launched on June 1st 1990. ROSAT was stabilised by three axes so we could direct it at a specific point in the sky using stellar sensors and a positioning monitoring system, to then carry out our observations.

X-rays are emitted by plasmas or bodies with very high temperatures, up to millions or billions of degrees. X-ray astronomy has taught us that there are a vast number of objects with such high temperatures.

ROSAT was special because it would be the first time we used an imaging X-ray telescope to look into the skies. We could survey the sky by simply putting it in space– in six months we had covered it all.

For me personally, one of the biggest surprises came in 1996 when we discovered X-rays from comets for the first time. After all, comets are dirty balls of snow made from ice, which is cold. And X-rays are emitted from very high temperatures or high energy processes. So you may well ask how on earth a comet can emit X-rays. This came as a surprise to a number of people.

Another example that kept me very busy was the discovery of neutron stars – stellar remnants resulting from the collapses of massive stars, and that have a radius of about 10 kilometres. Among these neutron stars we found some that only give out thermal emissions, which you can only see because they are so hot. We can determine the radius of a neutron star by measuring its temperature; this was the first time this had ever been possible. For example, we came across a previously undiscovered, very light-coloured source when we were observing the Large and Small Magellanic Clouds – these are close companions to the Milky Way, small galaxies that orbit our galaxy. These sources turned out to be what we know refer to as White Dwarfs. White Dwarfs are like neutron stars at the final stages of star development, only a little bigger – they are about the same size as Earth, so not with a radius of 10 or 14 kilometres, but a few thousand kilometres. These very hot White Dwarfs had been predicted by many theories but were only observed when ROSAT came along. It was a big surprise for the theorists.

In the beginning, we decided that the mission would last between 18 months and 2 years, and that was what was set out in the international agreements, but in the end it became 8 and a half years. We made a total of 9000 different single observations and the number of scientists involved grew to the thousands. ROSAT's scientific yield has become colossal. To date, 8500 publications in scientific journals are based on ROSAT findings. And even today, 21 years after we started, 2 or 3 per week refer to the data collected by ROSAT.