

of the 1990/05/24 flare cannot be solely due to their locations on the disk but partly due to fewer protons produced during the 1991/03/22 flare. In these two events shock waves were clearly seen as bright fronts of H $\alpha$  emission that propagated with a speed of  $\sim 1500\text{km/s}$  and started preceding the maximum of microwaves by 20-30s and that of  $\gamma$  rays by 40-50s. Such a shock speed and its relatively timing indicate that high energy electrons and protons emitting those radiations could have been accelerated by the shock waves.

## ASCA Spectra of the X-ray Faint S0 Galaxy NGC4382

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NGC 4382 is one of the E and S0 galaxies detected with the lowest X-ray to optical luminosity ratio. These galaxies have a peculiar X-ray(0.1-3keV) spectrum, with a significant excess of counts in the lowest spectral channels relative to the spectral count distributions of X-ray brighter E and S0 galaxies. Analyzing the ROSAT PSPC observations of NGC 4382(Fabbiano, kim, and Trinchieri 1994), it was unclear whether this soft excess were due to a real very soft component in a multi-component spectrum, or reflected an extremely low metal abundance in a isothermal hot gas. Our ASCA observations show that the low-abundance single-temperature model does not fit well the X-ray spectrum, in agreement with our previous suggestions. A better explanation is a composite spectrum with a very soft component( $\sim 0.3\text{keV}$ ) in addition to a hard, likely stellar, component( $\sim 5\text{keV}$ ). However, other more complex spectral models cannot be excluded. Simulations and re-analysis of observations of X-ray bright elliptical galaxies also suggest that the recent reports of significantly sub-solar metal abundances in these galaxies may be premature.

### 보현산 천문대 도약망원경

천무영, 장정균, 박병곤, 육인수, 김강민, 전영범, 성현철, 경재만, 문일권, 오병렬  
보현산 천문대/천문대

보현산 천문대 도약망원경(이하 도약망원경이라 칭함)은 구경 1.8m인 국내 최대 관측망원경으로서 보현산 천문대(해발고도 1124m)에 설치되어 시험관측중이다.

도약망원경의 특징으로는

- o 경위대식
- o 2개의 부경(f/8, F/15)과 하나의 초점(카세그레인 초점)
- o i 960을 이용한 one-board controller와 초당 30번을 수행하는 디지털 서보 제어루프
- o 편리하면서 손쉽게 수정할 수 있는 관측자용 망원경 제어 프로그램