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Periodic X-ray Modulations in Supersoft X-ray Sources

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Abstract content
   (Max 300 words)

Supersoft X-ray Sources (SSS) form a highly luminous class of objects that emit more than ˜90% of their energy in the supersoft X-ray band, i.e. below 0.5 keV. These sources are believed to consist of a white dwarf (WD) accreting material from a binary companion. The high accretion rate is sufficient to drive nuclear burning and accompanying supersoft X-ray emission on the WD surface. CAL 83 in the Large Magellanic Cloud was one of the first SSS discovered and is often considered to be the prototype of this class. We report the discovery of consistent modulations at a period of ˜68 s in X-ray data of CAL 83, which is concluded to be the spin period of a highly spun-up white dwarf. This newly discovered spin period is highly significant and can also provide information about the evolution of the source. Its detection signifies that the WD possesses a substantial magnetic field, which is supported by evidence for magnetically driven mass outflow in optical spectra obtained with SALT. The widths of the spectral lines support the presence of an accretion disc around the WD, which can account for the short spin period as a result of spin-up by disc torques. The SSS SMC 13 in the Small Magellanic Cloud has an orbital period of ˜4.1 h. SMC 13 was reported in the literature to exhibit orbital modulation in its X-ray flux, as inferred from a folded ROSAT light curve. We report the confirmation of this orbital modulation from 3 Chandra data sets, each providing continuous coverage of ˜2.7 complete orbital cycles. The derived X-ray period agrees with the orbital period, and the spectral energy distribution supports the presence of a low-mass WD in SMC 13.

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Yes

Level for award
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PhD

Main supervisor (name and email)
and his / her institution

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