Evidence for a complex non-dipole magnetic field on the surface of the accreting neutron star in Hercules X-1

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An analysis of the evolution of X-ray pulse profiles of Her X-1 with the phase of the 35-day period suggests a complex non-dipole structure of the magnetic field near the neutron star surface in this accreting X-ray binary. I will present the latest results of our analysis of X-ray data (Ginga, RXTE, etc.) obtained over last several years. Our basic model for the long-term (35-day) period of X-ray activity in Her X-1 is free precession of the neutron star. If real, this will be the first observational evidence for free precession of a neutron star in a binary system. The complex structure of the surface magnetic field inferred from this model may signal the process of the accretion-induced decay of the neutron-star magnetic field decay in Her X-1.