Title:	The Remarkable Spin-down and Ultrafast Outflows of the Highly Pulsed Supersoft Source of Nova Herculis 2021
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Keywords:	Stellar winds White dwarf stars Cataclysmic variable stars
Issue Date:	2021
Publisher:	IOP Publishing
Citation:	Astrophysical Journal Letters, 922(2).
Abstract:	Nova Her 2021 (V1674 Her), which erupted on 2021 June 12, reached naked-eye brightness and has been detected from radio to γ-rays. An extremely fast optical decline of 2 magnitudes in 1.2 days and strong Ne lines imply a high-mass white dwarf. The optical pre-outburst detection of a 501.42 s oscillation suggests a magnetic white dwarf. This is the first time that an oscillation of this magnitude has been detected in a classical nova prior to outburst. We report X-ray outburst observations from Swift and Chandra that uniquely show (1) a very strong modulation of supersoft X-rays at a different period from reported optical periods, (2) strong pulse profile variations and the possible presence of period variations of the order of 0.1–0.3 s, and (3) rich grating spectra that vary with modulation phase and show P Cygni–type emission lines with two dominant blueshifted absorption components at ∼3000 and 9000 km s−1 indicating expansion velocities up to 11,000 km s−1. X-ray oscillations most likely arise from inhomogeneous photospheric emission related to the magnetic field. Period differences between reported pre- and post-outburst optical observations, if not due to other period drift mechanisms, suggest a large ejected mass for such a fast nova, in the range 2 × 10−5–2 × 10−4 M⊙. A difference between the period found in the Chandra data and a reported contemporaneous post-outburst optical period, as well as the presence of period drifts, could be due to weakly nonrigid photospheric rotation.
Description:	Only IISERM authors are available in the record.
URI:	http://dx.doi.org/10.3847/2041-8213/ac34fd (http://dx.doi.org/10.3847/2041-8213/ac34fd) http://hdl.handle.net/123456789/4626 (http://hdl.handle.net/123456789/4626)
Appears in Collections:	Research Articles (/jspui/handle/123456789/9)

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