ASASSN-16oh: A Nova Outburst with No Mass Ejection—A New Type of Supersoft X-Ray Source in Old Populations

Mariko Kato[1], Hideyuki Saio[2], and Izumi Hachisu[3]

Published 2020 March 23 •

The Astrophysical Journal, Volume 892, Number 1

Citation Mariko Kato *et al* 2020 *ApJ* **892** 15

mariko.kato@hc.st.keio.ac.jp
[1] Department of Astronomy, Keio University, Hiyoshi, Yokohama 223-8521, Japan;
mariko.kato@hc.st.keio.ac.jp

[2] Astronomical Institute, Graduate School of Science, Tohoku University, Sendai 980-8578, Japan

[3] Department of Earth Science and Astronomy, College of Arts and Sciences, University of Tokyo, 3-8-1 Komaba, Meguro-ku, Tokyo 153-8902, Japan

Mariko Kato https://orcid.org/0000-0002-8522-8033

Izumi Hachisu https://orcid.org/0000-0002-0884-7404

Received 2019 November 1
Revised 2020 February 17
Accepted 2020 February 23
Published 2020 March 23

https://doi.org/10.3847/1538-4357/ab7996

Novae; Population II stars; Dwarf novae

Abstract

ASASSN-16oh is a peculiar transient supersoft X-ray source without a mass-ejection signature in the field of the Small Magellanic Cloud. Maccarone et al. concluded that ASASSN-16oh is the first dwarf nova with supersoft X-ray that originated from an equatorial accretion belt on a white dwarf (WD). Hillman et al. proposed a thermonuclear runaway model that both the X-rays and *V*/*I* photons are emitted from the hot WD. We propose a nova model induced by a high rate of mass accretion during a dwarf nova outburst, i.e., the X-rays originate from the surface of the hydrogen-burning WD whereas the *V*/*I* photons are from the irradiated disk. Our model explains the main observational properties of ASASSN-16oh. We also obtained thermonuclear runaway models with no mass ejection for a wide range of parameters of the WD mass and mass-accretion rates including both natural and forced novae in low-metal environments of $Z = 0.001$ and $Z = 0.0001$. They are a new type of periodic supersoft X-ray sources with no mass ejection and also a bright transient in *V*/*I* bands if they have a large disk. We suggest that such objects are candidates for Type Ia supernova progenitors because its mass is increasing at a very high efficiency (~100%).

Previous article in issue

Next article in issue