


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

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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 ($\sim 100\%$).

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◀ **Previous** article in issue

Next article in issue ▶

1. Introduction

2. Observational Properties of ASASSN-16oh

3. Numerical Calculation of Hydrogen-shell Flashes with No Mass Ejection

4. Search for Novae Having a Short X-Ray Duration with No Mass Ejection

5. Comparison with Hillman et al.'s (2019) Calculation

6. Comparison with Maccarone et al.'s Model

7. Discussion

8. Conclusions
