突発天体の増光前データによる型の判別

清田誠一郎

VSOLJ・ASASSN

突発天体の初期同定

- 突発天体の発見報告があった際に、その性質を早期に見分けることは、その後の追跡観測にとって重要
- でも、(特にアマチュア発見の場合)わかりづらいのもある
  ＞どうしたらよいか
- 増光前天体の情報でどうにかならないか

- 若干と言うか、かなり、サイエンス未満の話です
- 突発天体の型同定のみでなく、新天体かどうかの判定も含んだ話をします。
- 問題提起

2017年CBAT TOCPに報告された銀河系内の突発天体

PNV J18580379+1701265 2017 01 20.857 * 18 58 03.79 +17 01 26.5 12.1 U Aql 9 0

PNV J16521887-3754189 2017 02 01.862 * 16 52 18.87 -37 54 18.9 11.7 U Sco 9 0

TCP J18205224-2822121 2017 02 18.8479* 18 20 52.24 -28 22 12.1 10.8 U Sgr N 0

PNV J05323331+6247497 2017 03 17.494 * 05 32 33.31 +62 47 49.7 11.9 U Cam 0 1

PNV J18593500-0819370 2017 03 30.776 * 18 59 35.00 -08 19 37.0 11.5 U Aql 9 0

PNV J17250160-1708345 2017 04 02.732 * 17 25 01.60 -17 08 34.5 11.5 U Oph 7 0

PNV J20422233+2712111 2017 04 13.736 * 20 42 22.33 +27 12 11.1 11.1 U Vul 9 0

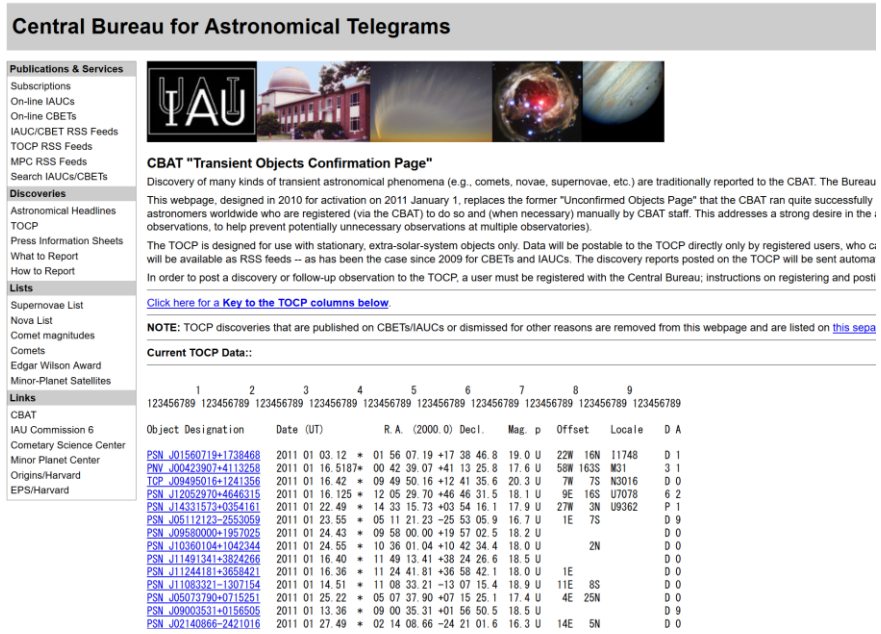
PNV J17345432-1423182 2017 05 19.633 * 17 34 54.32 -14 23 18.2 12.5 U Ser 0 2

TCP J18154219+3515598 2017 06 04.31 * 18 15 42.19 +35 15 59.8 11.8 U 9 0

PNV J18380817-1545534 2017 06 19.6509* 18 38 08.17 -15 45 53.4 12.8 U Sct 5 0

TCP J20100517+1303006 2017 06 19.7028* 20 10 05.17 +13 03 00.6 12.6 U Aql 5 3

TCP J00332502-3518565 2017 08 05.7854* 00 33 25.02 -35 18 56.5 13.3 U Scl 9 0



Central Bureau for Astronomical Telegrams

Publications & Services
Subscriptions
On-line IAUCs
On-line CBETs
IAUC/CBET RSS Feeds
TOCP RSS Feeds
MPC RSS Feeds
Search IAUCs/CBETs
Discoveries
Astronomical Headlines
TOCP
Press Information Sheets
What to Report
How to Report
Lists
Supernovae List
Nova List
Comet magnitudes
Comets
Edgar Wilson Award
Minor-Planet Satellites
Links
CBAT
IAU Commission 6
Cometary Science Center
Minor Planet Center
Origins/Harvard
EPS/Harvard

CBAT "Transient Objects Confirmation Page"

Discovery of many kinds of transient astronomical phenomena (e.g., comets, novae, supernovae, etc.) are traditionally reported to the CBAT. The Bureau

This webpage, designed in 2010 for activation on 2011 January 1, replaces the former "Unconfirmed Objects Page" that the CBAT ran quite successfully astronomers worldwide who are registered (via the CBAT) to do so and (when necessary) manually by CBAT staff. This addresses a strong desire in the observations, to help prevent potentially unnecessary observations at multiple observatories).

The TOCP is designed for use with stationary, extra-solar-system objects only. Data will be postable to the TOCP directly only by registered users, who c will be available as RSS feeds -- as has been the case since 2009 for CBETs and IAUCs. The discovery reports posted on the TOCP will be sent automa

In order to post a discovery or follow-up observation to the TOCP, a user must be registered with the Central Bureau; instructions on registering and posti

Click here for a **Key to the TOCP columns below**.

NOTE: TOCP discoveries that are published on CBETs/IAUCs or dismissed for other reasons are removed from this webpage and are listed on this sepa

Current TOCP Data::

```
      1         2         3         4         5         6         7         8         9
123456789 123456789 123456789 123456789 123456789 123456789 123456789 123456789 123456789

Object Designation      Date (UT)          R.A. (2000.0) Decl.    Mag. p  Offset    Locale    D A

PSN J01560719+1738468   2011 01 03.12  *  01 56 07.19 +17 38 46.8  19.0 U  22W  16N  I1748     D 1
PNV J00423907+4113258   2011 01 16.5187*  00 42 39.07 +41 13 25.8  17.6 U  58W 163S  M31       3 1
TCP J09495016+1241356   2011 01 16.42  *  09 49 50.16 +12 41 35.6  20.3 U   7W   7S  N3016     D 0
PSN J12052970+4646315   2011 01 16.125 *  12 05 29.70 +46 46 31.5  18.1 U   9E  16S  U7078     6 2
PSN J14331573+0354161   2011 01 22.49  *  14 33 15.73 +03 54 16.1  17.9 U  27W   3N  U9362     P 1
PSN J05112123-2553059   2011 01 23.55  *  05 11 21.23 -25 53 05.9  16.7 U   1E   7S            D 9
PSN J09580000+1957025   2011 01 24.43  *  09 58 00.00 +19 57 02.5  18.2 U                     D 0
PSN J10360104+1042344   2011 01 24.55  *  10 36 01.04 +10 42 34.4  18.0 U        2N           D 0
PSN J11491341+3824266   2011 01 16.40  *  11 49 13.41 +38 24 26.6  18.5 U                     D 0
PSN J11244181+3658421   2011 01 16.36  *  11 24 41.81 +36 58 42.1  18.0 U   1E                D 0
PSN J11083321-1307154   2011 01 14.51  *  11 08 33.21 -13 07 15.4  18.9 U  11E   8S           D 0
PSN J05073790+0715251   2011 01 25.22  *  05 07 37.90 +07 15 25.1  17.4 U   4E  25N           D 0
PSN J09003531+0156505   2011 01 13.36  *  09 00 35.31 +01 56 50.5  18.5 U                     D 9
PSN J02140866-2421016   2011 01 27.49  *  02 14 08.66 -24 21 01.6  16.3 U  14E   5N           D 0
```

TCP or PNV

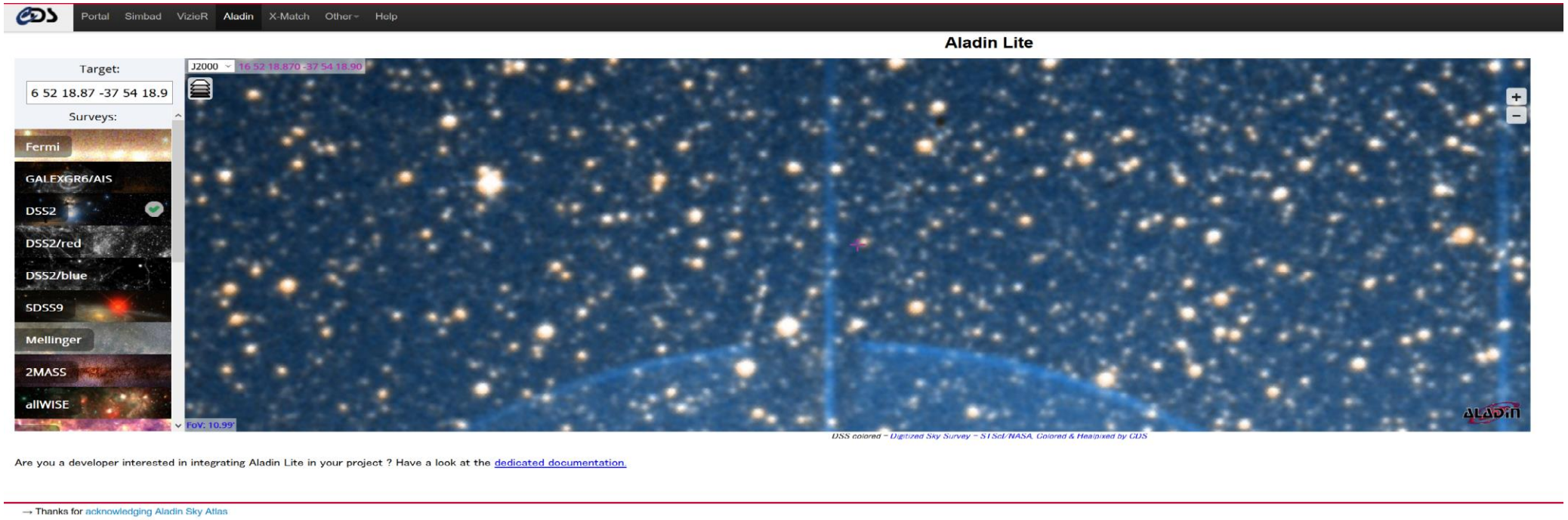
- 大規模サーベイが軌道に乗りつつある現在でも、天候その他の影響で、アマチュアの突発天体捜索は重要
- でも、アマチュアの捜索者は、突発天体については詳しくない

Identification results

PNV J18580379+1701265	DN		
PNV J16521887-3754189	N	V2657 Sco	
TCP J18205224-2822121	既知のN	V5854 Sgr	
PNV J05323331+6247497	既知のDN	V391 Cam	
PNV J18593500-0819370	未検出		
PNV J17250160-1708345	既知のN	V2928　Oph	
PNV J20422233+2712111	DN		
PNV J17345432-1423182	M		
TCP J18154219+3515598	DN	転載	
PNV J18380817-1545534	flear star?		
TCP J20100517+1303006	DN		
TCP J00332502-3518565	DN		

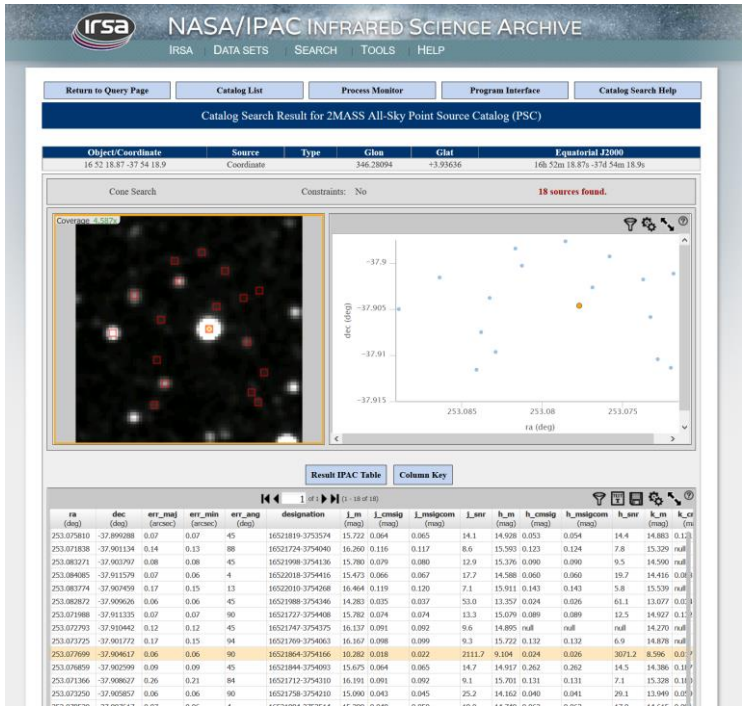
V2657 Oph

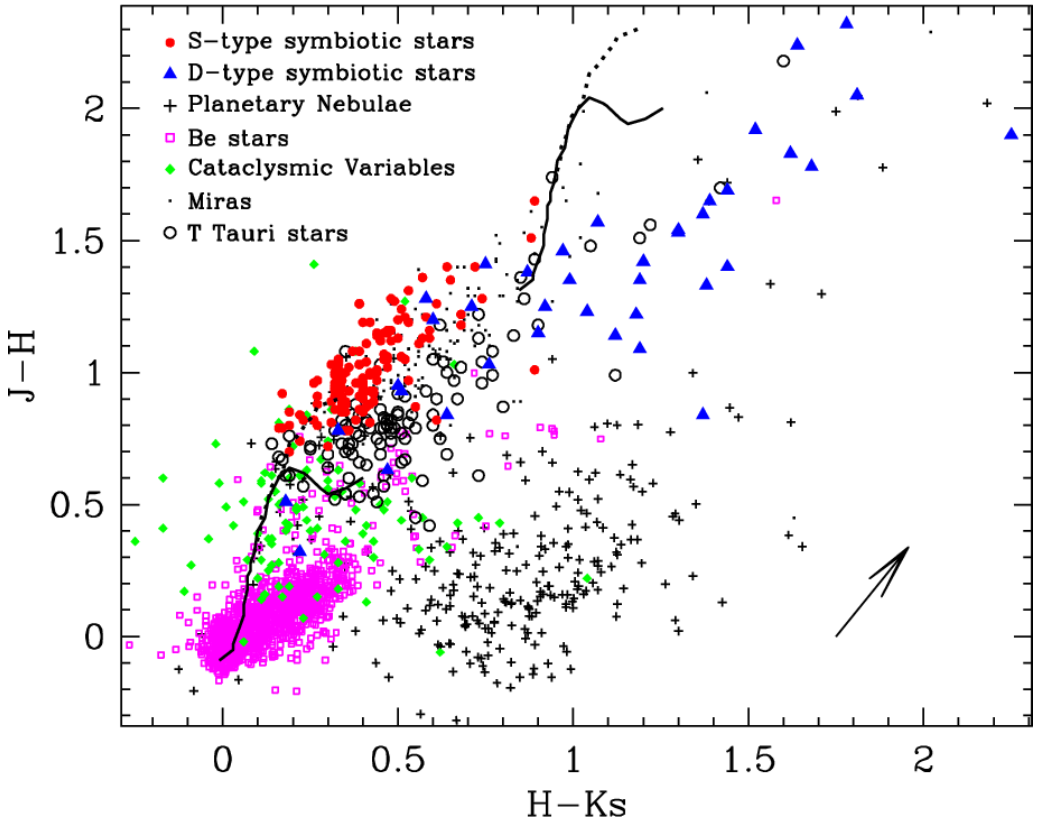
- これが、今回のきっかけ
- 発見位置に既存の赤い星がいた。



2MASS

- 赤色巨星　＞　ミラ型
- 赤色わい星　＞　フレア星？





Corradi（2008）

2色図による判定

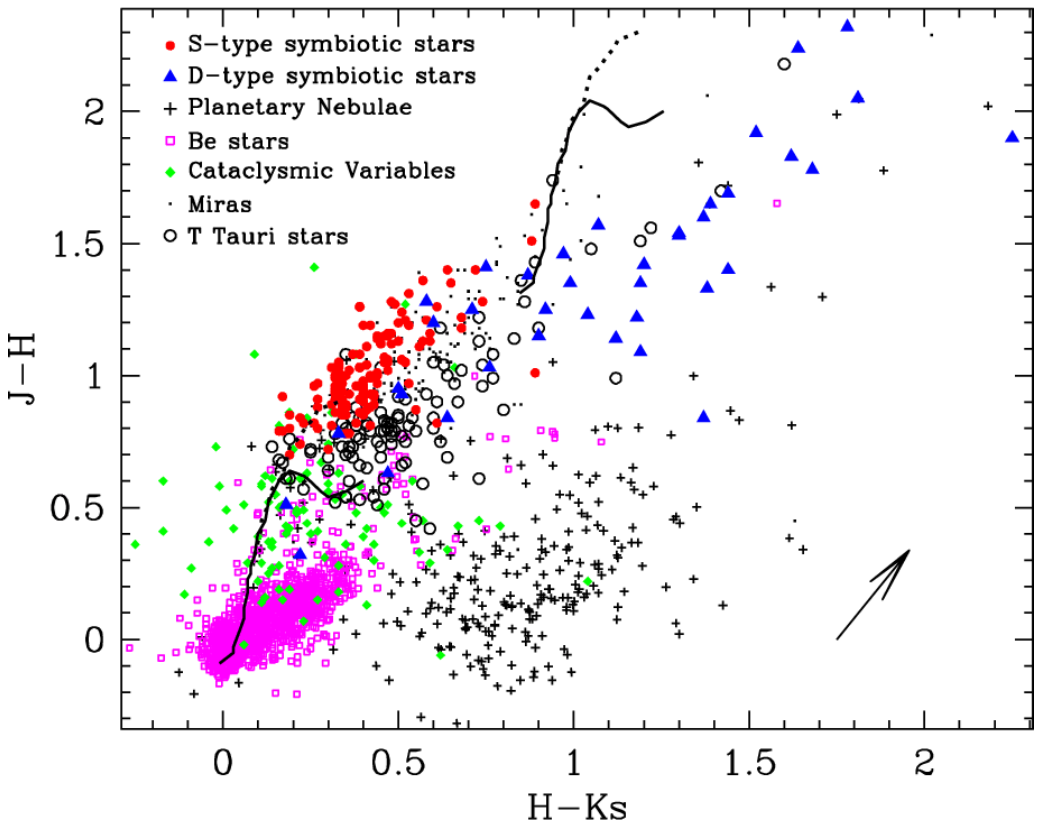
- V2657 Ophの場合

  J=10.282、H＝9.104、Ks＝8.596

J-H　　1.178

H-Ks　 0.508

分離が悪い



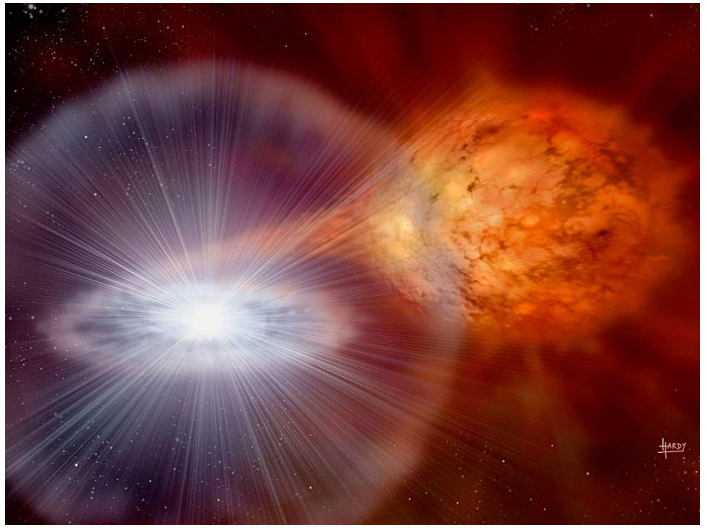
Corradi（2008）

突発天体別の親星の特徴

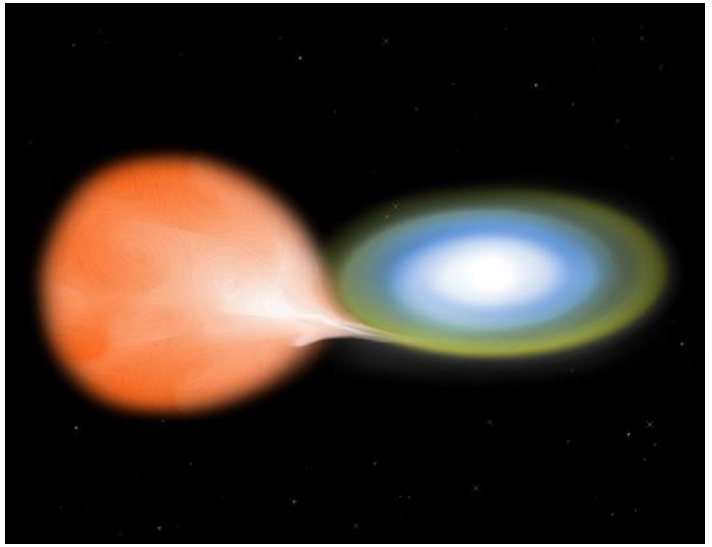
- 新星
  WD＋主系列星
  共生星型新星の場合は、伴星は巨星
  こう着円盤を持っている

- わい新星（DN)
  WD＋主系列星
  UGWZ型の場合は伴星はわい星
  こう着円盤を持ってる

- フレア星
  可視光で増光幅の大きなフレアを起こす星は、しばしば赤色わい星



David A. Hardy / PPARC



NASA/CXC/M.Weiss

SDSS color

- 型判定ができる
- 起動周期が推定できる

PASJ: Publ. Astron. Soc. Japan , 1–??,

Characterization of Dwarf Novae Using SDSS Colors

Taichi KATO
Department of Astronomy, Kyoto University, Sakyo-ku, Kyoto 606-8502
tkato@kusastro.kyoto-u.ac.jp
Hiroyuki MAEHARA
Kwasan and Hida Observatories, Kyoto University, Yamashina, Kyoto 607-8471
and
Makoto UEMURA
Astrophysical Science Center, Hiroshima University, Kagamiyama, 1-3-1 Higashi-Hiroshima 739-8526

(Received 201 0; accepted 201 0)

Abstract

We have developed a method for estimating the orbital periods of dwarf novae from the Sloan Digital Sky Survey (SDSS) colors in quiescence using an artificial neural network. For typical objects below the period gap with sufficient photometric accuracy, we were able to estimate the orbital periods with an accuracy to a 1 σ error of 22 %. The error of estimation is worse for systems with longer orbital periods. We have also developed a neural-network-based method for categorical classification. This method has proven to be efficient in classifying objects into three categories (WZ Sge type, SU UMa type and SS Cyg/Z Cam type) and works for very faint objects to a limit of g=21. Using this method, we have investigated the distribution of the orbital periods of dwarf novae from a modern transient survey (Catalina Real-Time Survey). Using Bayesian analysis developed by Uemura et al. (2010), we have found that the present sample tends to give a flatter distribution toward the shortest period and a shorter estimate of the period minimum, which may have resulted from the uncertainties in the neural network analysis and photometric errors. We also provide estimated orbital periods, estimated classifications and supplementary information on known dwarf novae with quiescent SDSS photometry.

Key words: methods: statistical — stars: novae, cataclysmic variables — stars: dwarf novae — stars: evolution — surveys

1. Introduction

Cataclysmic variables (CVs) are close binary systems consisting of a white dwarf (WD) and a red-dwarf secondary transferring matter via the Roche-lobe overflow [for reviews, see Warner (1995); Hellier (2001)]. Dwarf novae (DNe) are a class of CVs characterized by the presence of outbursts, which are generally believed to be a result of thermal instabilities in the accretion disk. Dwarf novae are classified into three major classes: SS Cyg-type, Z Cam-type and SU UMa-type dwarf novae. Among them ondary again fills the Roche lobe at around $P_{\rm orb} \sim 2$ hr and forms the famous "period gap" in the $P_{\rm orb}$ distribution of CVs. After crossing the period gap, $P_{\rm orb}$ further decreases mainly through the loss of angular momentum by gravitational wave radiation until the secondary becomes degenerate. Around the time when this point is reached, the $P_{\rm orb}$ increases due to two reasons: the thermal time-scale of the secondary exceeds the mass-transfer time-scale and the mass-radius relation is reversed for degenerate dwarfs. This mechanism leads to the existence of the minimum period for ordinary CVs (Paczyński, Sienkiewicz 1981).[1]

GALEX

- こう着円盤

- **TCP J00332502-3518565**
- The UV source GALEX J003325.1-351855 (position end figures 25.10s, 55.9"; FUV= 20.46, NUV= 20.29 mag) is only 0.4" from the second position reported by Fujikawa-san. Presumably a dwarf nova outburst with an amplitude of at least 6 magnitudes. --- Patrick Schmeer (Saarbrücken-Bischmisheim, Germany)

判定

- Color（2MASS?、GALEX?)
- 銀緯
- 発見等級
- 増光幅

- 絶対等級がわかると楽？　＞　発見時では無理？

- 機械学習による判定　＞　入力データは？

まとめ

- 発見報告の位置精度は必ずしも高くなく。確認が必要なことも。
- 分光観測が最終的な確認には必須
- 分光観測が報告されるまでのつなぎ

- 自動判定(機械学習)　＞　学習データ不足？