

全天データ早見ウェブアプリ ケーションJUDO2の開発

2019年2月15日

ISAS/JAXA

科学衛星運用データ・利用ユニット(C-SODA)

科学データ利用促進ライン

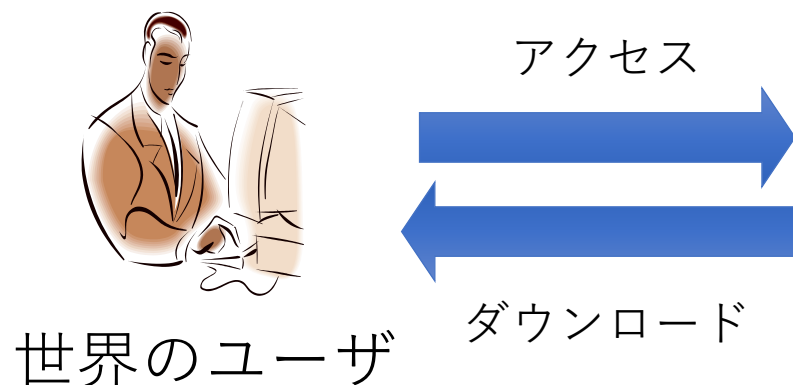
海老沢 研

講演の内容

1. DARTSについて
2. JUDO2について
 - 経緯
 - 要求・機能
 - 技術
 - ユースケース
 - 今後の計画

1.DARTSについて

- JAXAの科学データアーカイブ
 - <http://darts.isas.jaxa.jp>
- JAXAの衛星・探査機による様々な分野の公開データのアーカイブ
- アーカイブデータへのアクセスを簡便化するためのアプリケーションを開発・運用

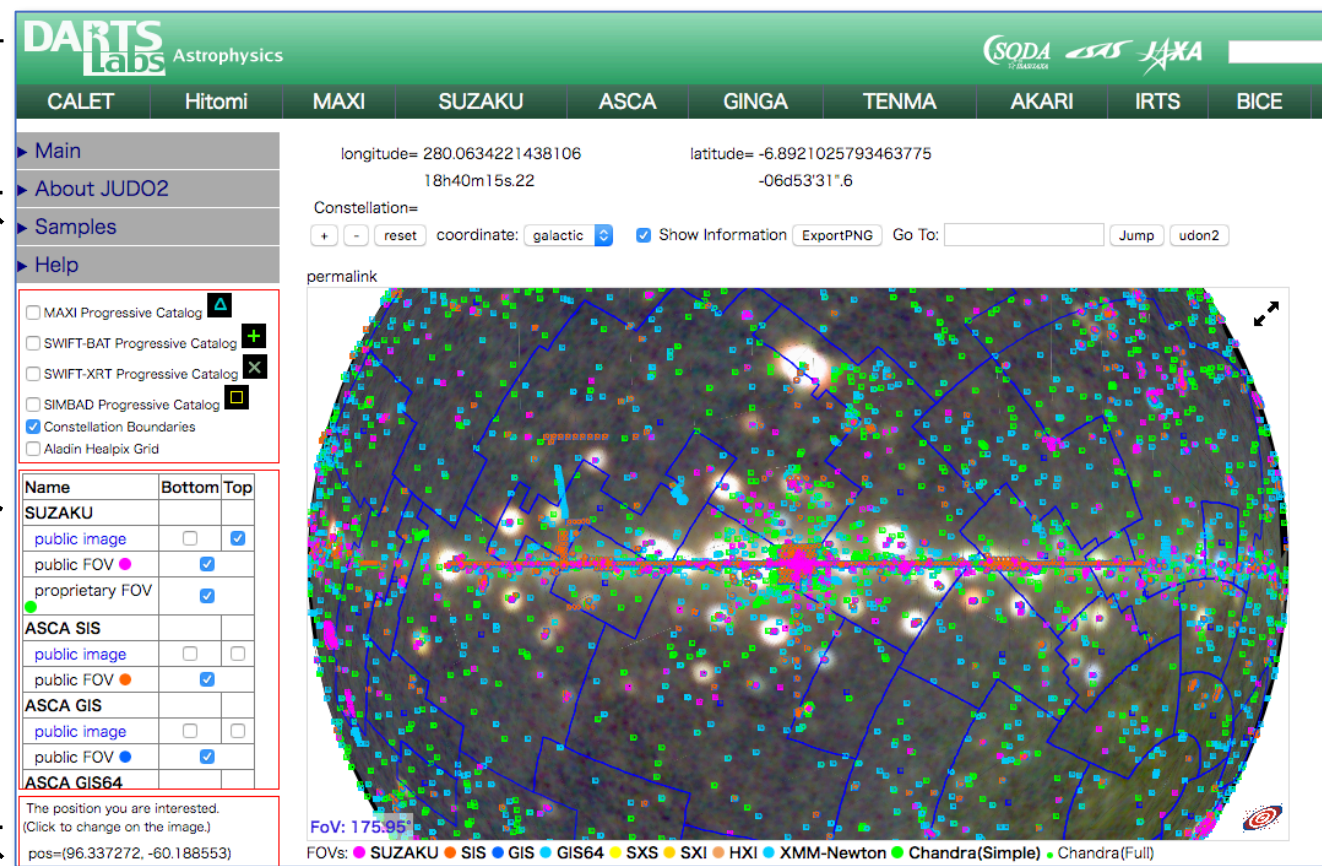


2. JUDO2について — 経緯

- 2006年～
 - Ajax技術の登場、Google Map
 - ウェブブラウザを用いて、地図上で移動・拡大・縮小
 - ウェブブラウザを用いて、多様な天文データを天球上で移動・拡大・縮小したい
 - JAXA Universe Data Oriented (JUDO)を開発・公開
 - FITSイメージをon-the-flyでpngに変換、ブラウザに表示→ 遅い！
- 2014年～
 - HiPS (Hierarchical Progressive Survey) : 全天データ表示のための標準フォーマット
 - Aladin Lite : HiPSをブラウザ上で表示するためのJavaScriptツール
 - HiPS, Aladin Liteを採用して、JUDOを作り直し → JUDO2

2. JUDO2について — 要求・機能

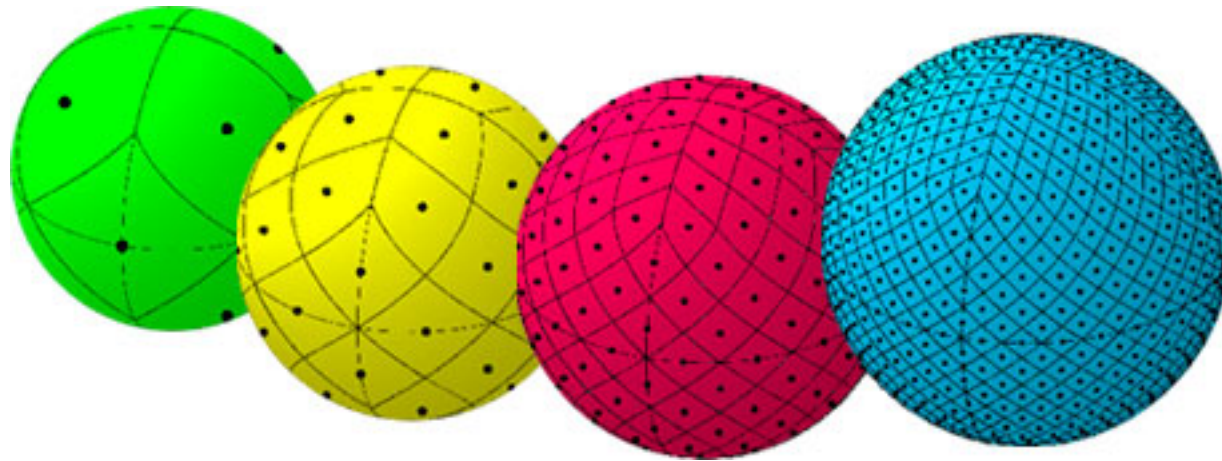
- 波長や性能の異なる天文画像を重ねて表示
- 画像の上に観測ごとの視野を表示
- 画像と視野（観測番号）を対応させる
- 観測視野からアーカイブデータへのリンク
 - DARTS内だけでなく、DARTS外のアーカイブデータへも
- 時系列データ（ムービー）の表示



<http://darts.isas.jaxa.jp/astro/judo2/>

2. JUDO2について — 技術

- HiPS (Hierarchical Progressive Survey)
 - HEALPixで分割された全天画像を各階層ごとに保管
- HEALPix (Hierarchical Equal Area isoLatitude Pixelization)
 - 全天を 12×4^N の等面積に分割 ($N=0, 1, 2, 3, \dots$)



<https://healpix.jpl.nasa.gov/>

HiPSデータの構造

<http://darts.isas.jaxa.jp/pub/judo2/HiPS/suzaku/> [すざく衛星のHiPSデータ](#)

[Norder3](#) [Norder4](#) [Norder5](#) [Norder6](#)

Norder5: 12288分割

Dir0
Dir10000

Norder5/Dir0:
Npix1025.png
Npix1027.png
Npix1028.png

Norder6: 49152分割

Dir0
Dir10000
Dir20000
Dir30000
Dir40000

Norder6/Dir0:
Npix1021.png
Npix1022.png
Npix1023.png
Npix103.png

1万ファイル毎にディレ
クトリを分割

HEALPix階層ごとのすべての画像を保管、
Webで公開

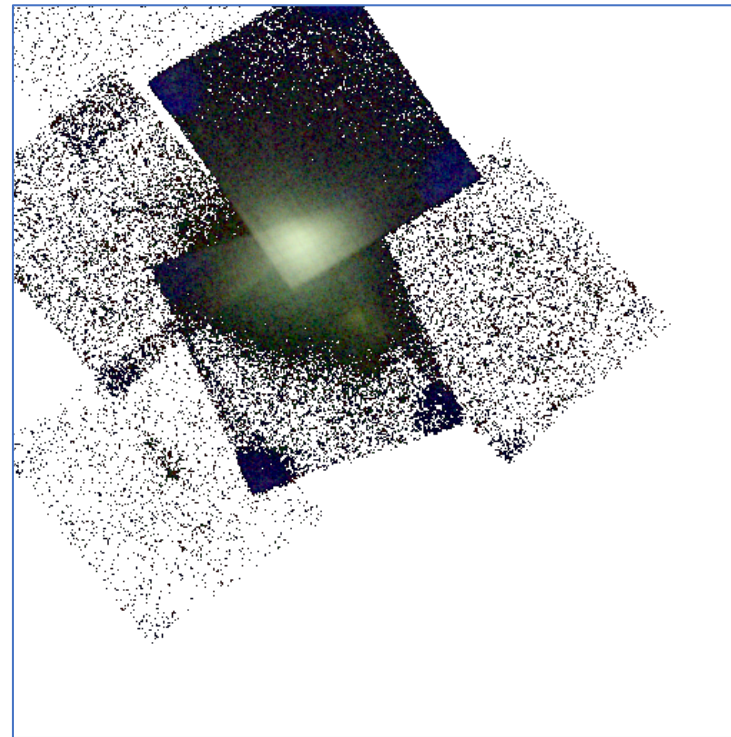
すざく衛星（視野は18'x18'）のHiPSデータの例

N=3、全天を768に分割



<http://darts.isas.jaxa.jp/pub/judo2/HiPS/suzaku/Norder3/Dir0/Npix539.png>

N=6、全天を49152に分割



<http://darts.isas.jaxa.jp/pub/judo2/HiPS/suzaku/Norder6/Dir30000/Npix30946.png>

2. JUDO2について — 技術

- Aladin Lite
 - フランスのデータセンターCDSで開発
 - htmlに組み込んで簡単に使うことができる
 - 世界中の様々なウェブアプリケーションに組み込まれている

<http://darts.isas.jaxa.jp/astro/judo2/index.html>のソース

```
<script type="text/javascript" src="./js/aladin/aladin.min.js" charset="utf-8"></script>
```

- 開発者と密に連絡
 - バグレポート、改善要望など

2. JUDO2について — 技術

- JavaScript
 - JavaScriptで様々な機能を実装
 - judo2.js (約3700行)
- json
 - 各観測の情報をjsonファイルで保存、公開
 - <http://darts.isas.jaxa.jp/pub/judo2/json/>
 - 外部のアプリケーション(ESA-SKY等)からも利用されている

```
{
  "MetaData":
  [
    {
      "Layer": "SUZAKU",
      "Item": "Image",
      "Info":
      [
        {
          "OBS_ID": "100001010",
          "OBJECT": "E0102-72",
          "lng_center": 16.139,
          "lat_center": -72.1205,
          "frame": "SQUARE",
          "fov_ra1": 15.471455,
          "fov_dec1": -72.176391,
          "fov_ra2": 15.955296,
          "fov_dec2": -71.916090,
          "fov_ra3": 16.802439,
          "fov_dec3": -72.062351,
          "fov_ra4": 16.326811,
          "fov_dec4": -72.324734
        }
      ]
    }
  ]
}
```

http://darts.isas.jaxa.jp/pub/judo2/json/suzaku_public_meta_data.json

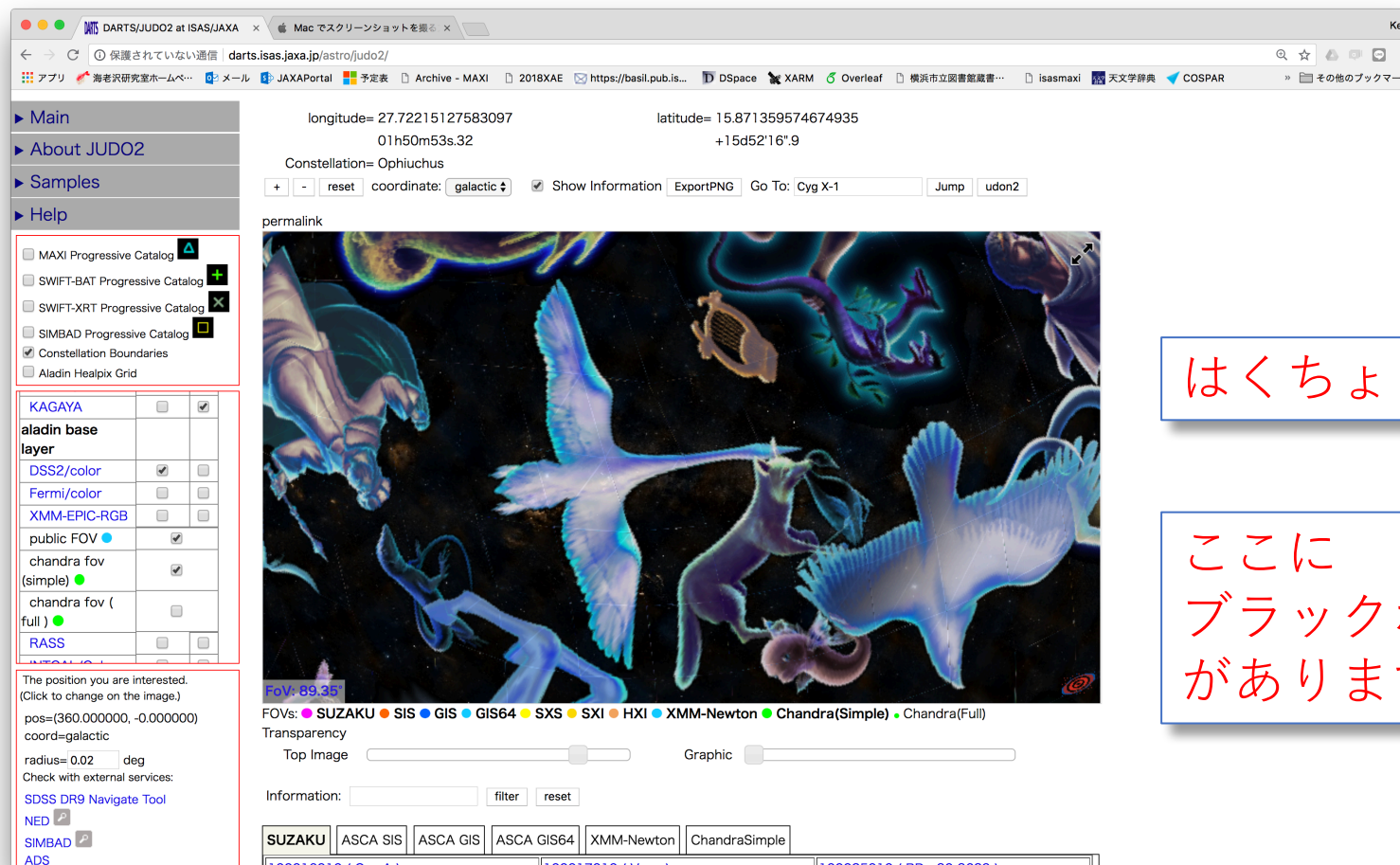
2. JUDO2について — 技術

- 外部との連携
 - Chandra, XMM衛星のTAP (Table Access Protocol)サーバからメタデータ(観測情報を取得)

Chandra衛星 `curl -f -o ${DOWNLOAD_FILE} -L
"http://cda.harvard.edu/cxctap/sync?REQUEST=doQuery&FORMAT=text&QUERY=SELEC
T+dataprodut_type,obs_id,s_ra,s_dec,target_name,s_region,instrument_name+FROM+ivo
a.ObsCore+WHERE+ dataprodut_type='event'&LANG=ADQL"`

XMM衛星 `curl -f -o ${DOWNLOAD_FILE} "http://nxsa.esac.esa.int/tap-
server/tap/sync?REQUEST=doQuery&LANG=ADQL&FORMAT=csv&QUERY=SELECT+obs
ervation_id,target,ra,dec+FROM+v_public_observations+order+by+observation_id"`

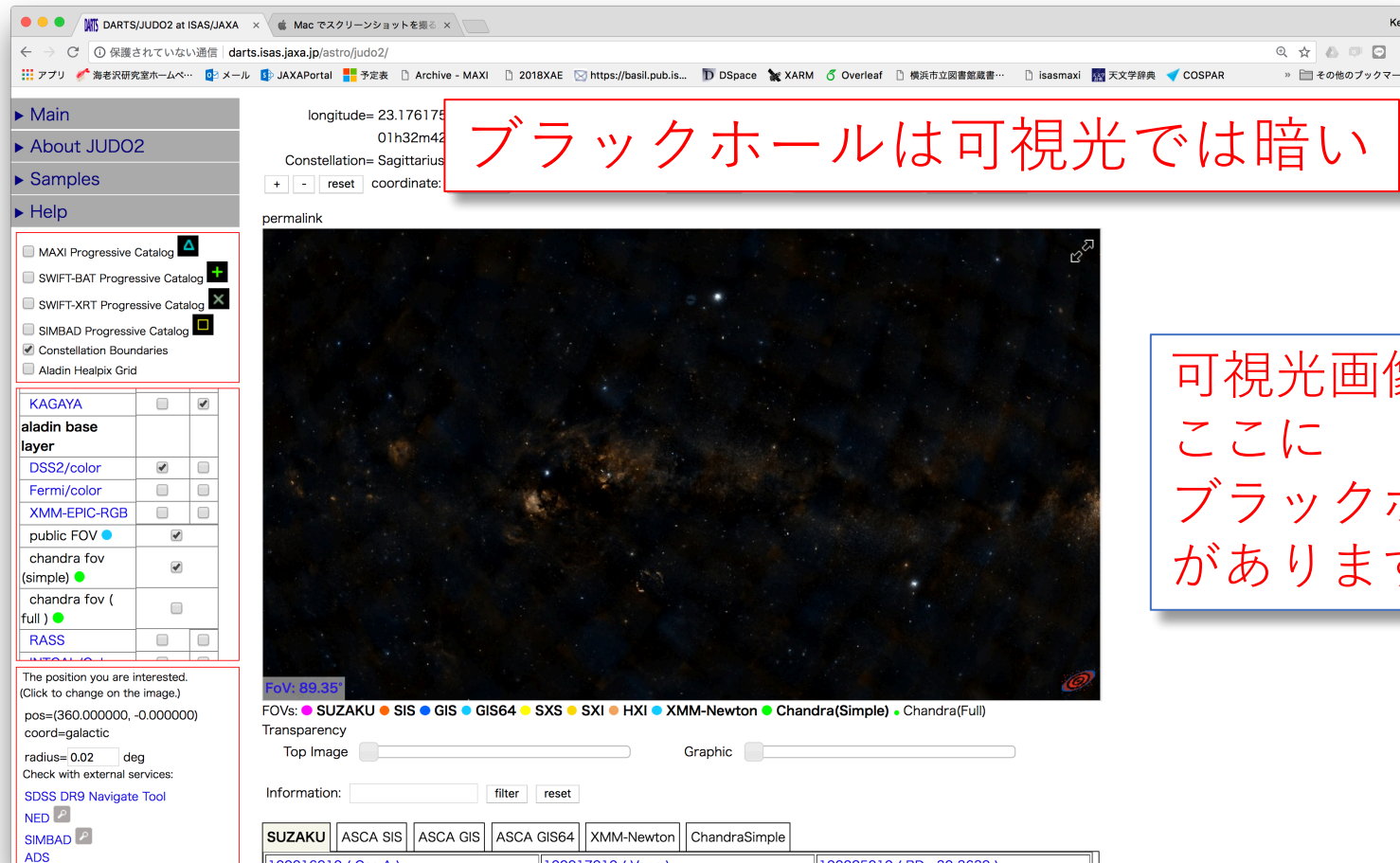
- cronjobで一日一回、メタデータを更新
 - XMM, Chandraの観測視野、データセンターへのリンクを更新



はくちょう座領域

ここに
ブラックホール
があります！

<http://darts.isas.jaxa.jp/astro/judo2>



longitude= 23.176175
01h32m42s
Constellation= Sagittarius
coordinate: [reset]
permalink

MAXI Progressive Catalog
SWIFT-BAT Progressive Catalog
SWIFT-XRT Progressive Catalog
SIMBAD Progressive Catalog
Constellation Boundaries
Aladin Healpix Grid

KAGAYA
aladin base layer
DSS2/color
Fermi/color
XMM-EPIC-RGB
public FOV
chandra fov (simple)
chandra fov (full)
RASS

The position you are interested.
(Click to change on the image.)
pos=(360.000000, -0.000000)
coord=galactic
radius= 0.02 deg
Check with external services:
SDSS DR9 Navigate Tool
NED
SIMBAD
ADS

FOV: 89.35°
FOVs: SUZAKU SIS GIS GIS64 XSX SXI HXI XMM-Newton Chandra(Simple) Chandra(Full)
Transparency
Top Image Graphic
Information: [filter] [reset]

SUZAKU	ASCA SIS	ASCA GIS	ASCA GIS64	XMM-Newton	ChandraSimple
100016010 (Cas A)					
100017010 (Vega)					
100025010 (BD +30 3630)					

ブラックホールは可視光では暗い

可視光画像
ここに
ブラックホール
があります！

<http://darts.isas.jaxa.jp/astro/judo2>

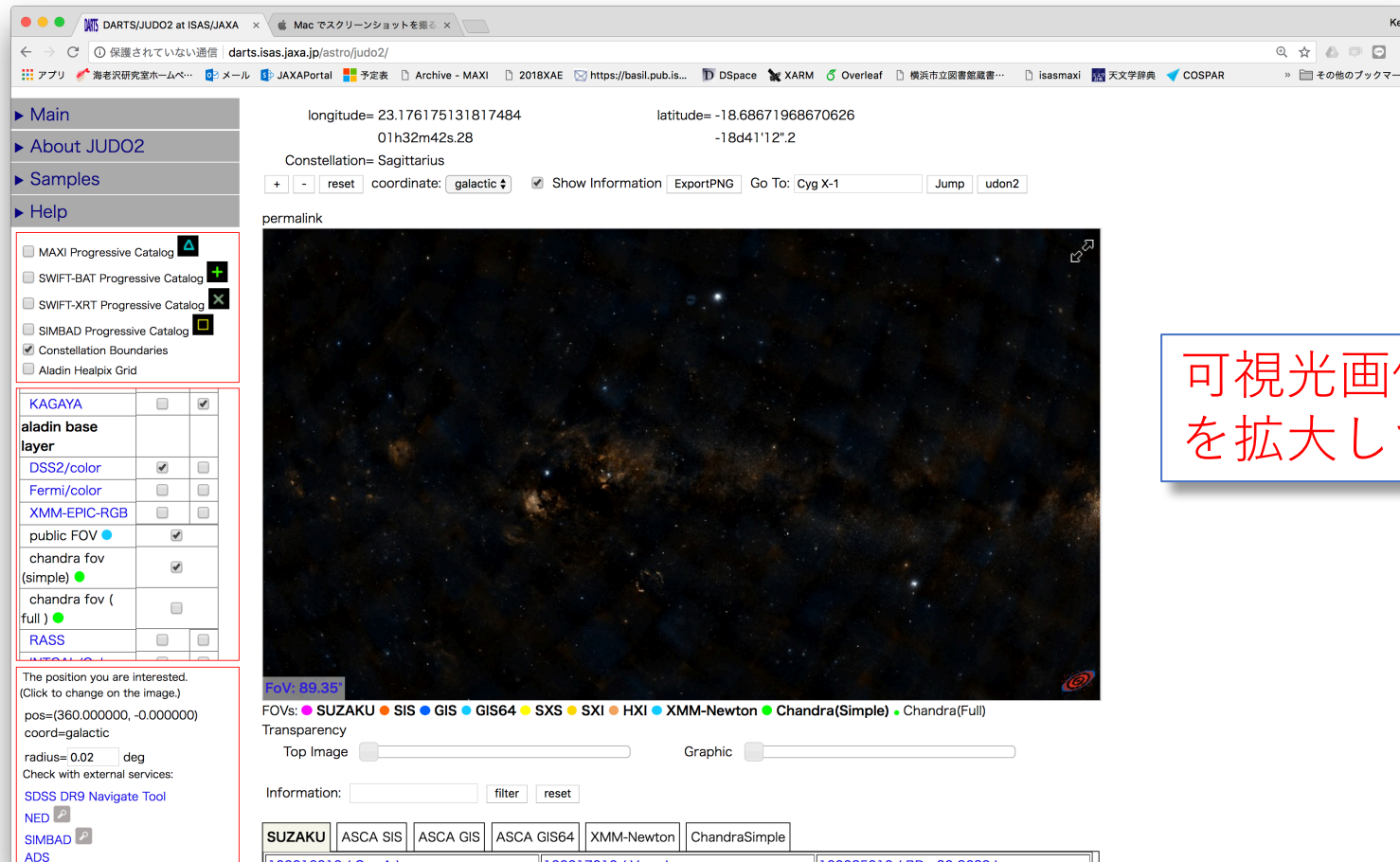


ブラックホールはX線で明るく光っている

MAXIによる
X線画像

はくちょうざX-1
ブラックホール天体

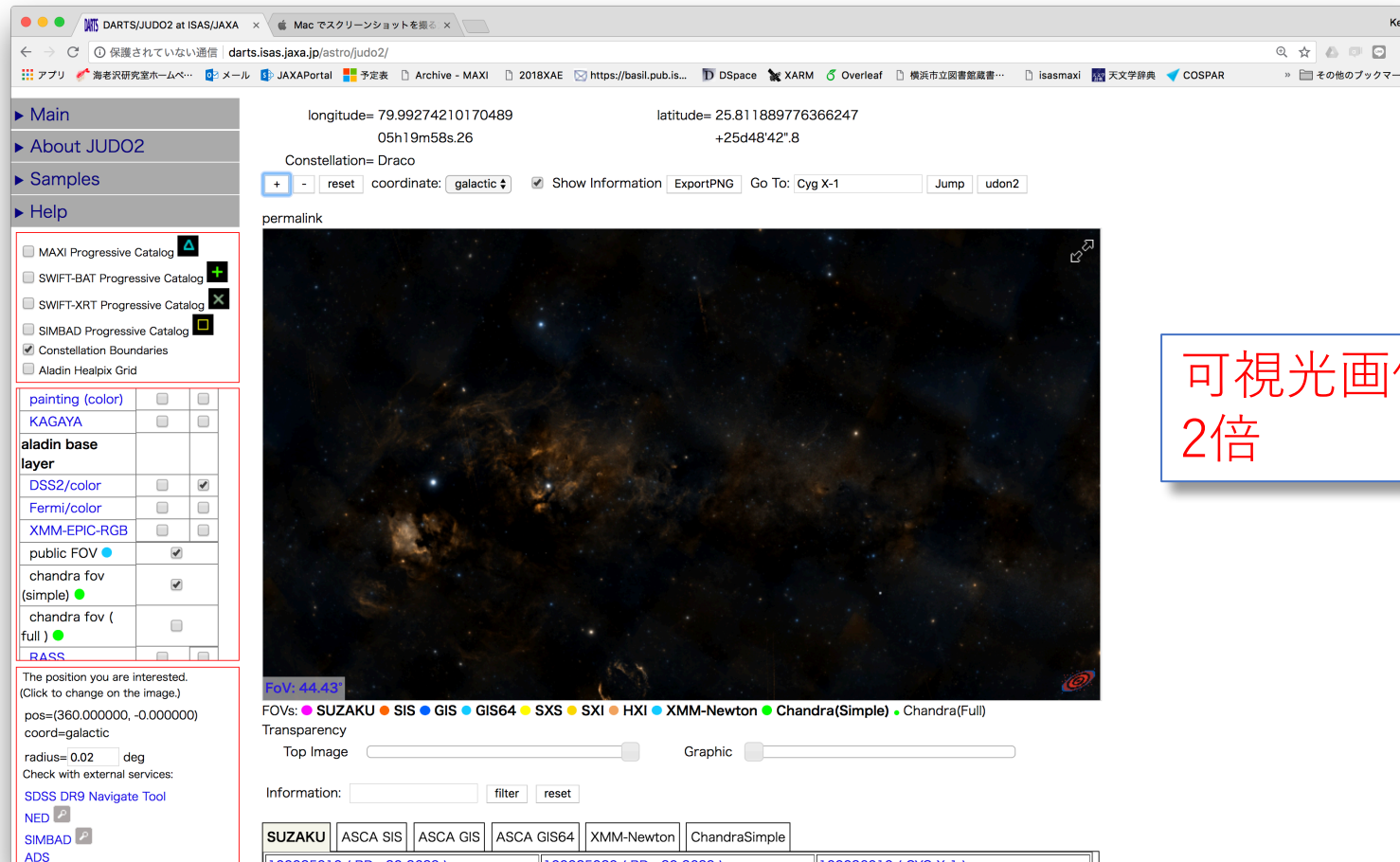
<http://darts.isas.jaxa.jp/astro/judo2>



The screenshot shows the DARTS/JUDO2 web interface. The main display is a deep space image of the Sagittarius constellation. The interface includes a sidebar with navigation links (Main, About JUDO2, Samples, Help) and a list of astronomical catalogs (MAXI, SWIFT-BAT, SWIFT-XRT, SIMBAD, Constellation Boundaries, Aladin Healpix Grid). Below this is a table of layers (KAGAYA, aladin base, layer, DSS2/color, Fermi/color, XMM-EPIC-RGB, public FOV, chandra fov (simple), chandra fov (full), RASS) with checkboxes for each. The main panel displays coordinates (longitude=23.176175131817484, latitude=-18.68671968670626), constellation (Sagittarius), and a large image of the constellation. The image is labeled 'permalink' and 'FoV: 89.35°'. Below the image are controls for FOVs (SUZAKU, SIS, GIS, GIS64, XMM-Newton, Chandra(Simple), Chandra(Full)), transparency, and a filter button. The bottom of the interface shows a table of astronomical objects with columns for SUZAKU, ASCA SIS, ASCA GIS, ASCA GIS64, XMM-Newton, and ChandraSimple.

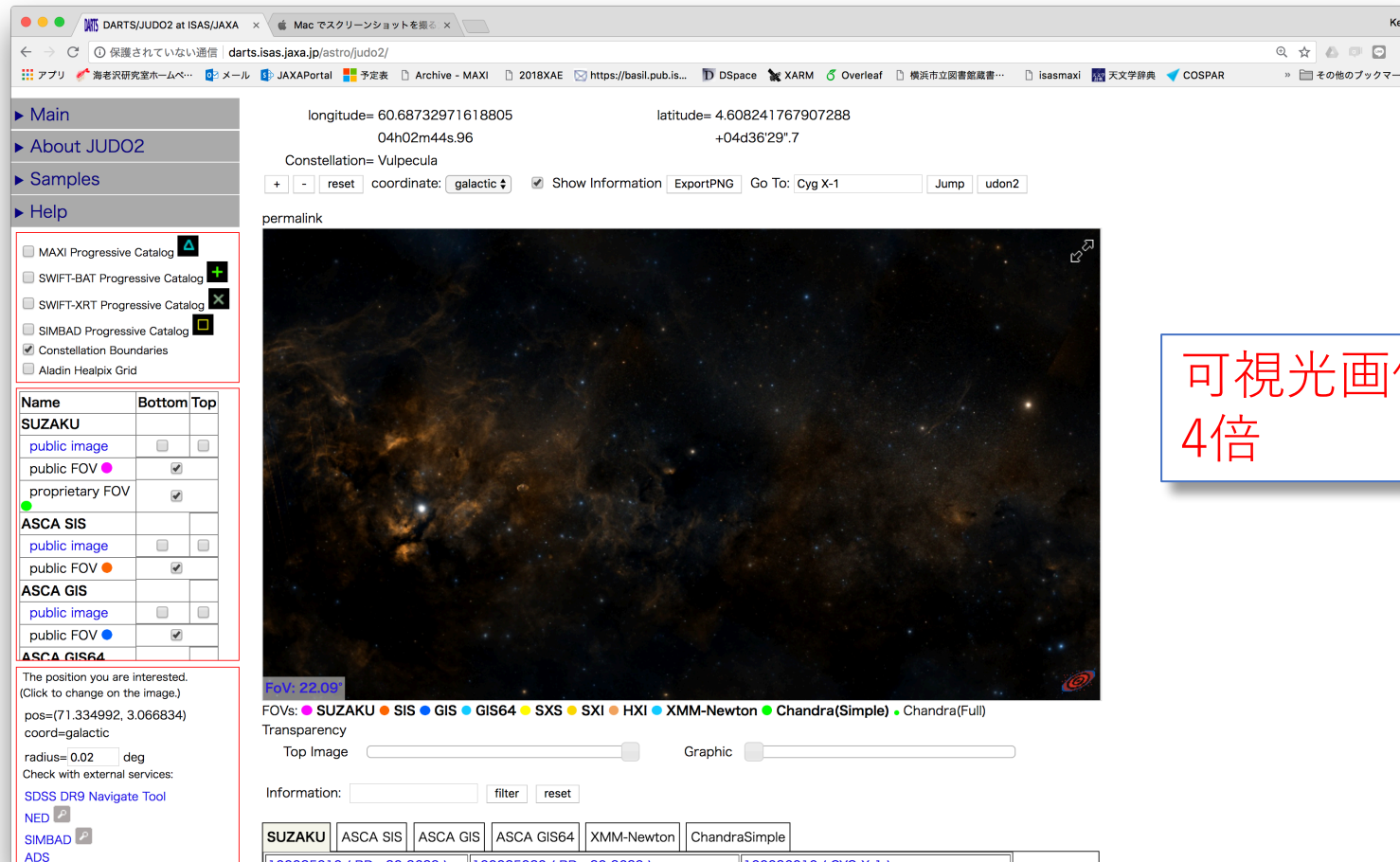
可視光画像
を拡大してみる

<http://darts.isas.jaxa.jp/astro/judo2>



可視光画像
2倍

<http://darts.isas.jaxa.jp/astro/judo2>



longitude= 60.68732971618805 latitude= 4.608241767907288
04h02m44s.96 +04d36'29".7
Constellation= Vulpecula

+ - reset coordinate: galactic Show Information ExportPNG Go To: Cyg X-1 Jump udon2

permalink

MAXI Progressive Catalog
SWIFT-BAT Progressive Catalog
SWIFT-XRT Progressive Catalog
SIMBAD Progressive Catalog
Constellation Boundaries
Aladin Healpix Grid

Name	Bottom	Top
SUZAKU		
public image		
public FOV		
proprietary FOV		
ASCA SIS		
public image		
public FOV		
ASCA GIS		
public image		
public FOV		
ASCA GIS64		

The position you are interested.
(Click to change on the image.)
pos=(71.334992, 3.066834)
coord=galactic
radius= 0.02 deg
Check with external services:
SDSS DR9 Navigate Tool
NED
SIMBAD
ADS

FoV: 22.09'

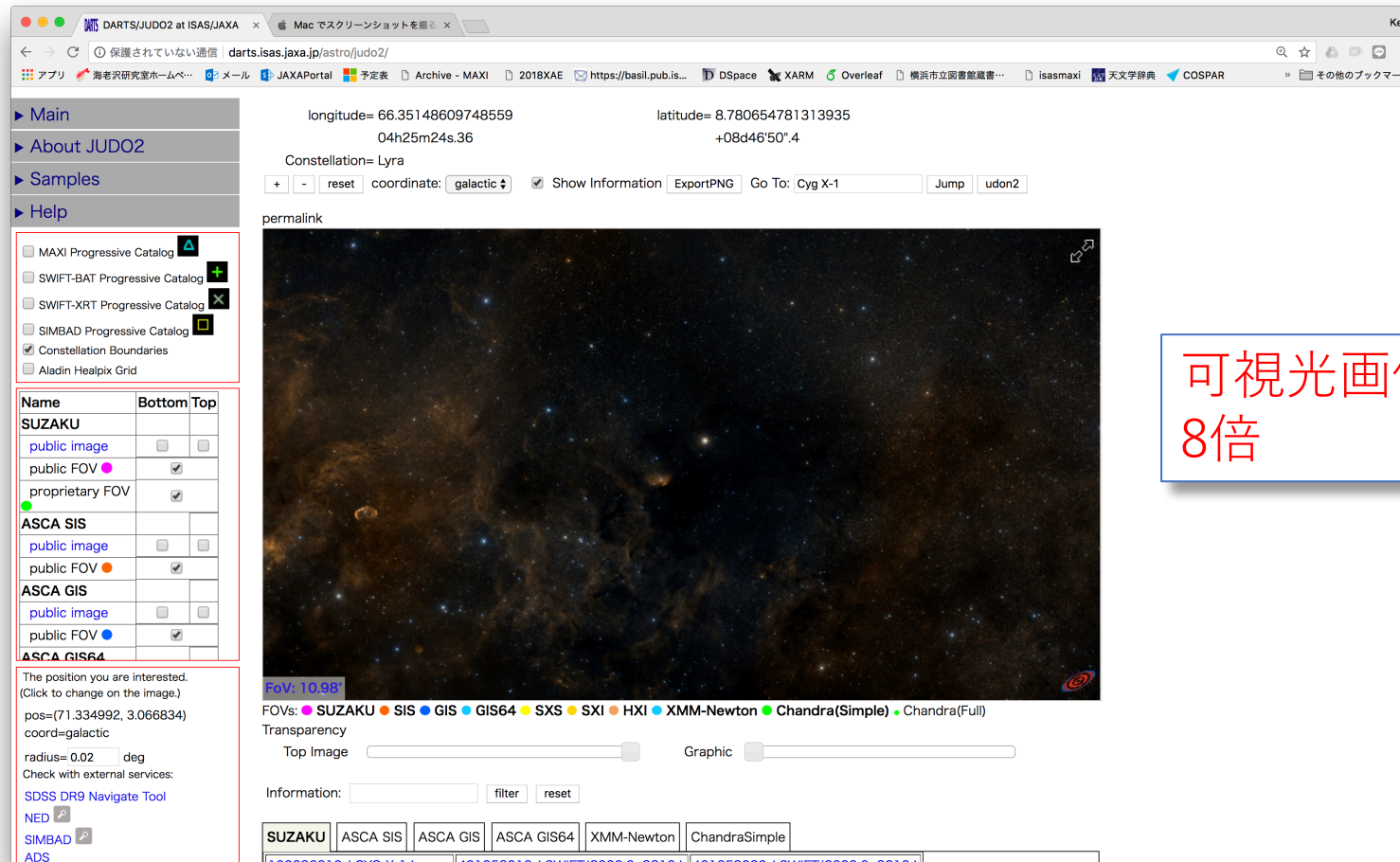
FOVs: SUZAKU SIS GIS GIS64 SXS SXI HXI XMM-Newton Chandra(Simple) Chandra(Full)
Transparency
Top Image Graphic

Information: filter reset

SUZAKU	ASCA SIS	ASCA GIS	ASCA GIS64	XMM-Newton	ChandraSimple
100025010 (RD +30 3639)					
100025020 (RD +30 3639)					
100026010 (Cyg X-1)					

可視光画像
4倍

<http://darts.isas.jaxa.jp/astro/judo2>



longitude= 66.35148609748559 latitude= 8.780654781313935
 04h25m24s.36 +08d46'50".4
 Constellation= Lyra

+ - reset coordinate: galactic ☒ Show Information ExportPNG Go To: Cyg X-1 Jump udon2

permalink

☐ MAXI Progressive Catalog ☒ MAXI
☐ SWIFT-BAT Progressive Catalog ☒ SWIFT-BAT
☐ SWIFT-XRT Progressive Catalog ☒ SWIFT-XRT
☐ SIMBAD Progressive Catalog ☒ SIMBAD
☒ Constellation Boundaries
☐ Aladin Healpix Grid

Name	Bottom	Top
SUZAKU		
public image	<input type="checkbox"/>	<input type="checkbox"/>
public FOV ●		<input checked="" type="checkbox"/>
proprietary FOV ●		<input checked="" type="checkbox"/>
ASCA SIS		
public image	<input type="checkbox"/>	<input type="checkbox"/>
public FOV ●		<input checked="" type="checkbox"/>
ASCA GIS		
public image	<input type="checkbox"/>	<input type="checkbox"/>
public FOV ●		<input checked="" type="checkbox"/>
ASCA GIS64		

The position you are interested.
 (Click to change on the image.)
 pos=(71.334992, 3.066834)
 coord=galactic
 radius= 0.02 deg
 Check with external services:
[SDSS DR9 Navigate Tool](#)
[NED](#)
[SIMBAD](#)
[ADS](#)

FoV: 10.98"

FOVs: ● SUZAKU ● SIS ● GIS ● GIS64 ● SXS ● SXI ● HXI ● XMM-Newton ● Chandra(Simple) ● Chandra(Full)

Transparency
 Top Image Graphic

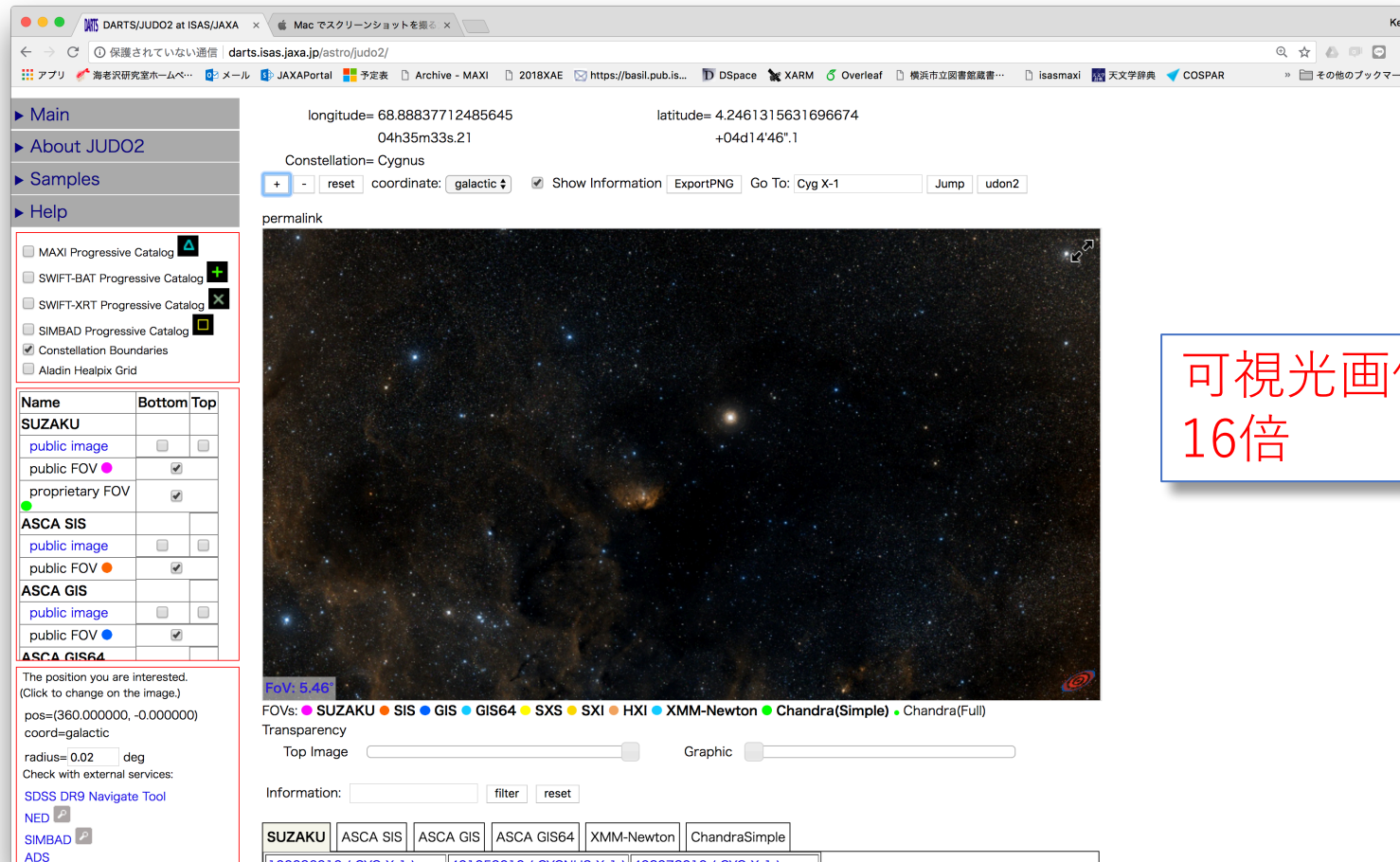
Information: filter reset

SUZAKU ASCA SIS ASCA GIS ASCA GIS64 XMM-Newton ChandraSimple

100036010 (CYG X-1) 101053010 (SWIFT J2000.6+3210) 101053020 (SWIFT J2000.6+3210)

可視光画像
8倍

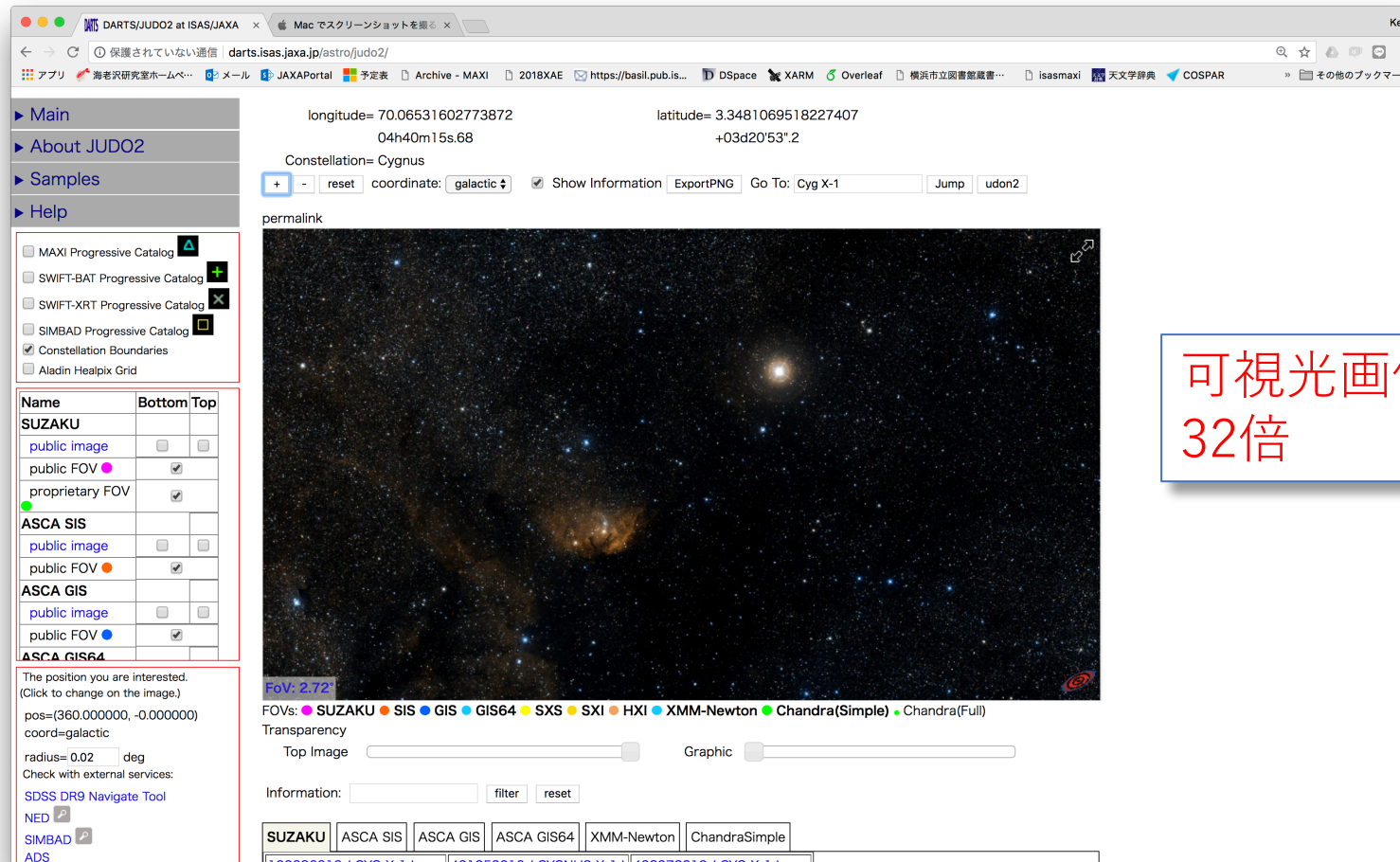
<http://darts.isas.jaxa.jp/astro/judo2>



The screenshot shows the DARTS/JUDO2 web interface. On the left, there is a sidebar with navigation links: Main, About JUDO2, Samples, and Help. Below these are checkboxes for various catalogs: MAXI Progressive Catalog, SWIFT-BAT Progressive Catalog, SWIFT-XRT Progressive Catalog, SIMBAD Progressive Catalog, Constellation Boundaries (checked), and Aladin Healpix Grid. A table lists different astronomical surveys and their public/private image/FOV options. The main area displays a deep space image of the Cygnus constellation, with coordinates (longitude= 68.88837712485645, latitude= 4.2461315631696674) and a constellation name dropdown set to Cygnus. Below the image, there are controls for zooming, coordinate systems, and FOV selection. A legend at the bottom identifies the FOVs for SUZAKU, SIS, GIS, GIS64, SXS, SXI, HXI, XMM-Newton, Chandra(Simple), and Chandra(Full). The interface also includes a 'permalink' section and a 'FoV: 5.46°' label.

可視光画像
16倍

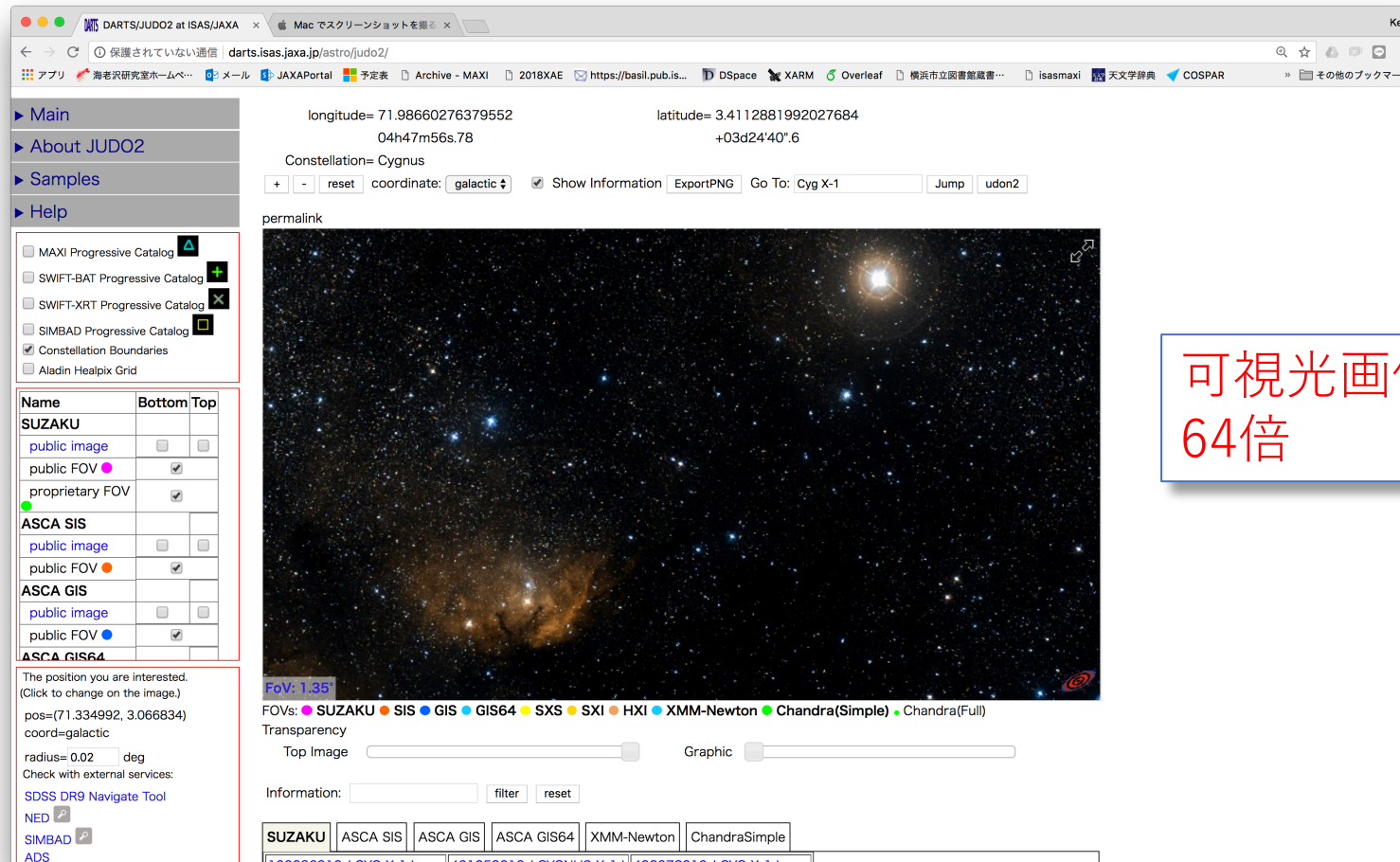
<http://darts.isas.jaxa.jp/astro/judo2>



The screenshot shows the DARTS/JUDO2 web interface. The main display is a deep space image of the Cygnus constellation, showing the bright star Deneb and the V-shaped structure of the constellation. The interface includes a sidebar with navigation links (Main, About JUDO2, Samples, Help) and a list of astronomical catalogs (MAXI, SWIFT-BAT, SWIFT-XRT, SIMBAD, Aladin Healpix Grid). The main panel displays coordinates (longitude=70.06531602773872, latitude=3.3481069518227407) and constellation (Cygnus). It also features a search bar, a 'Show Information' checkbox, and a 'Go To' field. A large image of the Cygnus constellation is shown, with a 'FoV: 2.72°' label. Below the image, there are controls for FOVs (SUZAKU, SIS, GIS, GIS64, SXS, SXI, HXI, XMM-Newton, Chandra(Simple), Chandra(Full)) and transparency. At the bottom, there is a table with columns for different astronomical instruments and their corresponding coordinates.

可視光画像
32倍

<http://darts.isas.jaxa.jp/astro/judo2>



longitude= 71.98660276379552 latitude= 3.4112881992027684
 04h47m56s.78 +03d24'40".6
 Constellation= Cygnus

+ - reset coordinate: galactic ☒ Show Information ExportPNG Go To: Cyg X-1 Jump udon2

permalink

☐ MAXI Progressive Catalog ☒ SWIFT-BAT Progressive Catalog ☒ SWIFT-XRT Progressive Catalog ☒ SIMBAD Progressive Catalog ☒ Constellation Boundaries ☐ Aladin Healpix Grid

Name	Bottom	Top
SUZAKU	<input type="checkbox"/>	<input type="checkbox"/>
public image	<input type="checkbox"/>	<input type="checkbox"/>
public FOV ●	<input checked="" type="checkbox"/>	<input type="checkbox"/>
proprietary FOV ●	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ASCA SIS	<input type="checkbox"/>	<input type="checkbox"/>
public image	<input type="checkbox"/>	<input type="checkbox"/>
public FOV ●	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ASCA GIS	<input type="checkbox"/>	<input type="checkbox"/>
public image	<input type="checkbox"/>	<input type="checkbox"/>
public FOV ●	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ASCA GIS64	<input type="checkbox"/>	<input type="checkbox"/>

The position you are interested.
 (Click to change on the image.)
 pos=(71.334992, 3.066834)
 coord=galactic
 radius= 0.02 deg
 Check with external services:
[SDSS DR9 Navigate Tool](#)
[NED](#)
[SIMBAD](#)
[ADS](#)

FoV: 1.35°

FOVs: ● SUZAKU ● SIS ● GIS ● GIS64 ● SXS ● SXI ● HXI ● XMM-Newton ● Chandra(Simple) ● Chandra(Full)

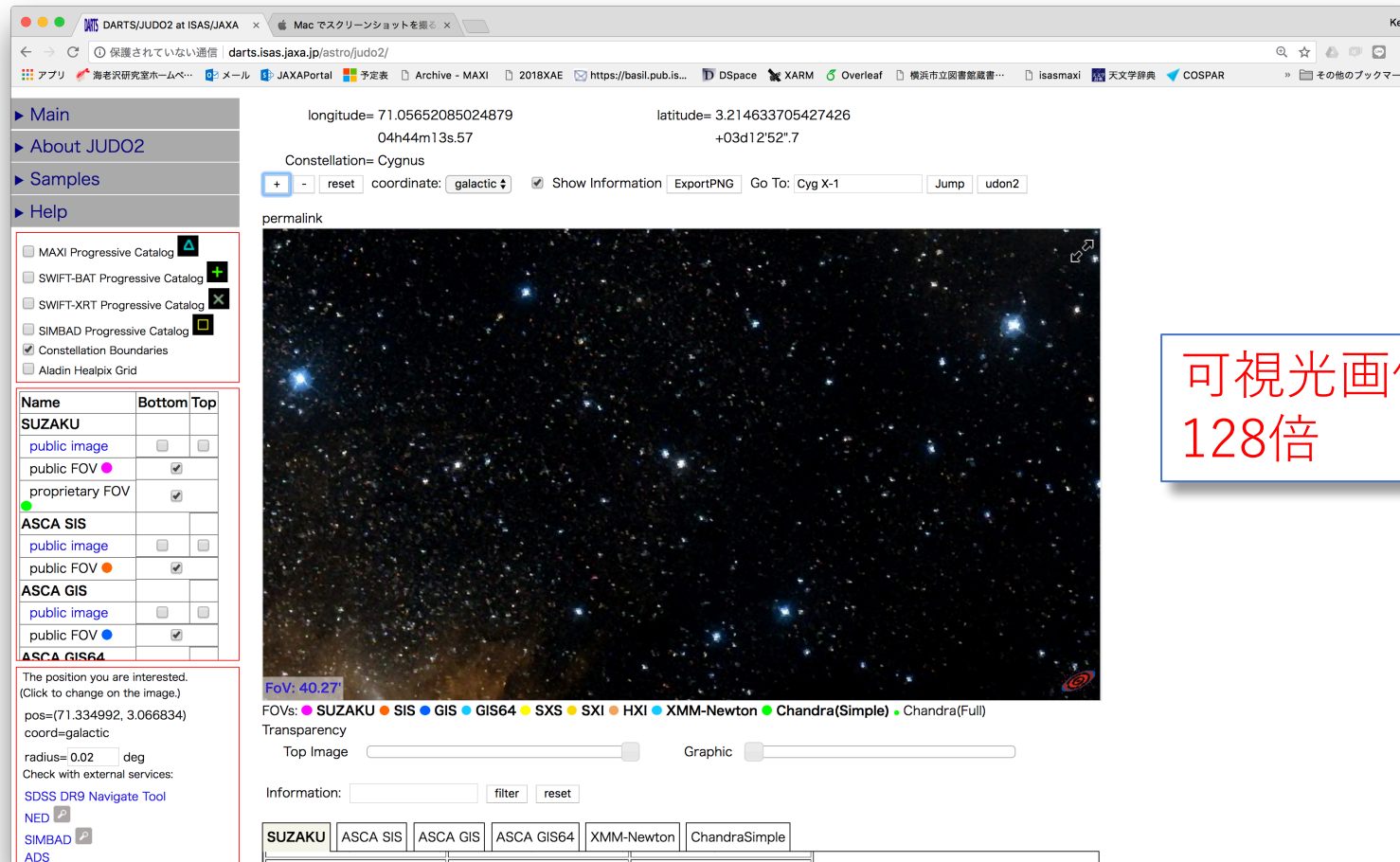
Transparency
 Top Image Graphic

Information: filter reset

SUZAKU	ASCA SIS	ASCA GIS	ASCA GIS64	XMM-Newton	ChandraSimple
100036010 (CYG X-1)	401059010 (CYGNUS X-1)	402072010 (CYG X-1)			

可視光画像
64倍

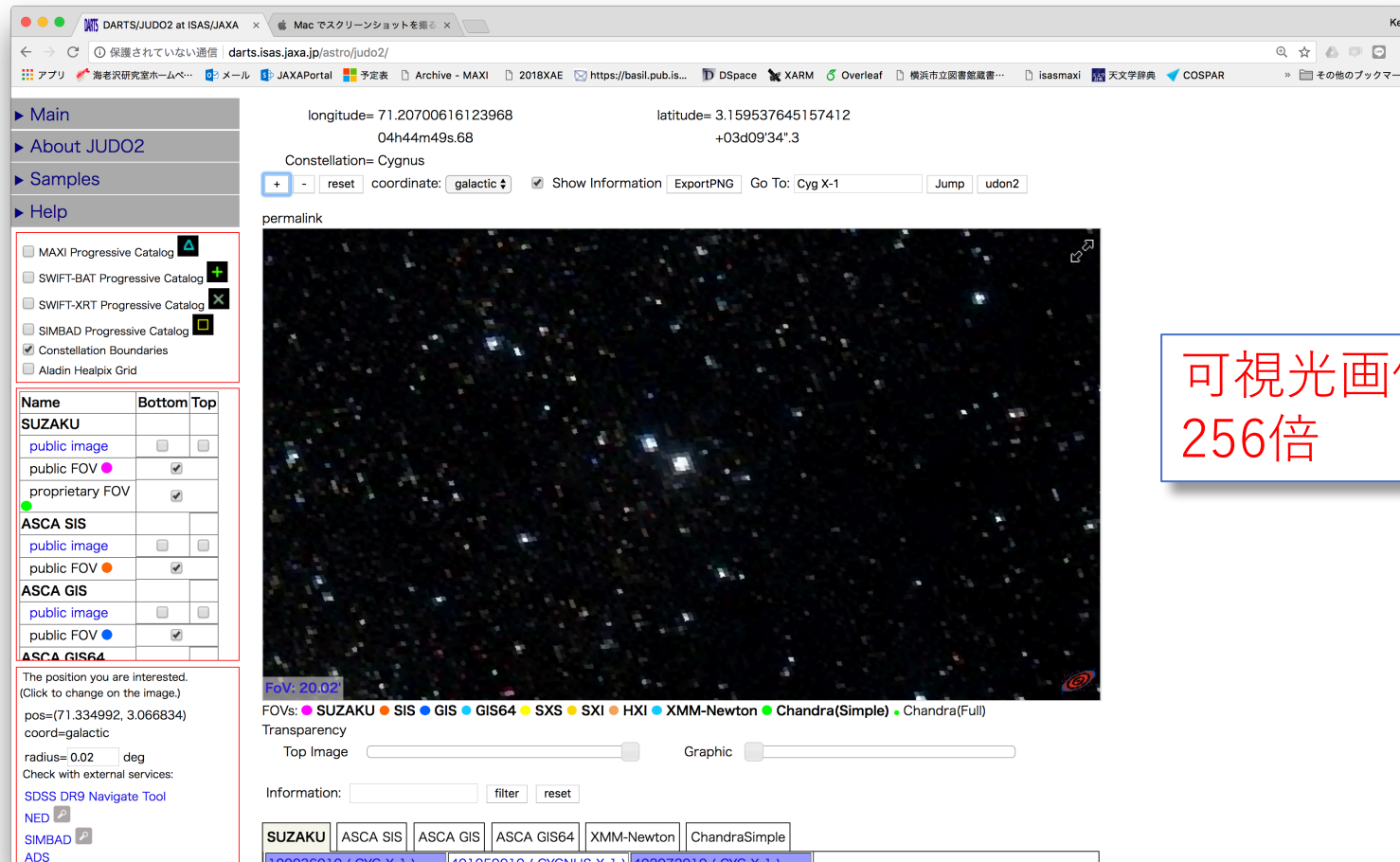
<http://darts.isas.jaxa.jp/astro/judo2>



The screenshot shows the DARTS/JUDO2 web interface. The main display is a deep space image with numerous stars and galaxies. On the left, there is a sidebar with navigation links (Main, About JUDO2, Samples, Help) and a list of catalogs (MAXI Progressive Catalog, SWIFT-BAT Progressive Catalog, SWIFT-XRT Progressive Catalog, SIMBAD Progressive Catalog, Constellation Boundaries, Aladin Healpix Grid). Below this is a table with columns 'Name', 'Bottom', and 'Top'. The table lists various astronomical sources and their coordinates. The main area displays coordinates (longitude= 71.05652085024879, latitude= 3.214633705427426) and a constellation (Cygnus). There are controls for zooming, panning, and displaying information. A large text box on the right indicates '可視光画像 128倍' (Visible light image 128x magnification).

Name	Bottom	Top
SUZAKU		
public image	<input type="checkbox"/>	<input type="checkbox"/>
public FOV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
proprietary FOV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ASCA SIS		
public image	<input type="checkbox"/>	<input type="checkbox"/>
public FOV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ASCA GIS		
public image	<input type="checkbox"/>	<input type="checkbox"/>
public FOV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ASCA GIS64		

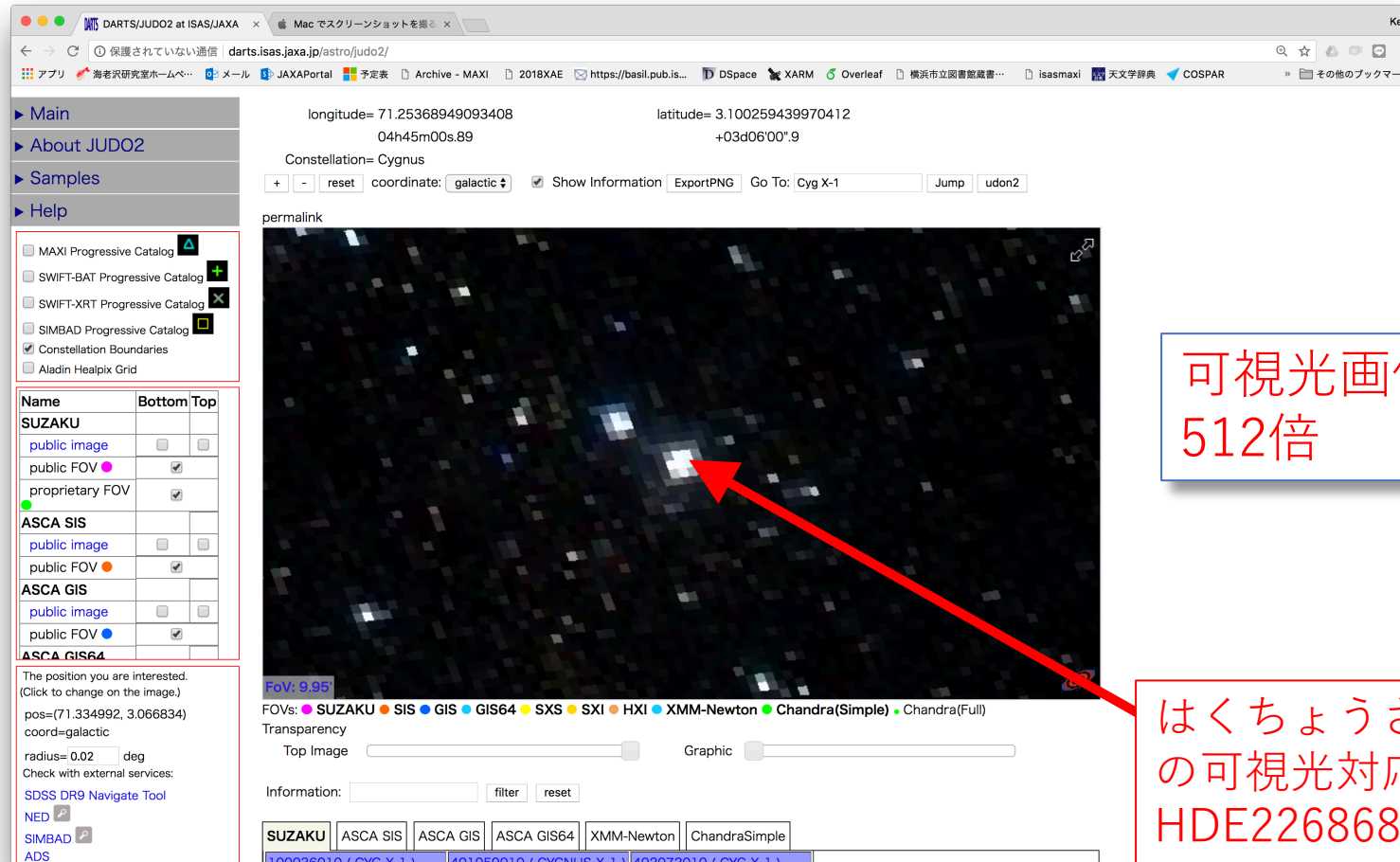
<http://darts.isas.jaxa.jp/astro/judo2>



The screenshot shows the DARTS/JUDO2 web interface. On the left is a sidebar with navigation links (Main, About JUDO2, Samples, Help) and a list of catalogs (MAXI, SWIFT-BAT, SWIFT-XRT, SIMBAD, Aladin Healpix Grid) with checkboxes. Below this is a table with columns 'Name', 'Bottom', and 'Top' listing various astronomical surveys like SUZAKU, ASCA SIS, ASCA GIS, and ASCA GIS64. The main area displays a deep space image of the Cygnus constellation. Above the image, coordinates (longitude, latitude) and constellation name are shown. Below the image, there are controls for FOV (Field of View) and transparency, and a list of FOVs (SUZAKU, SIS, GIS, GIS64, SXS, SXI, HXI, XMM-Newton, Chandra(Simple), Chandra(Full)). At the bottom, there is a table with columns for different surveys and their corresponding coordinates.

可視光画像
256倍

<http://darts.isas.jaxa.jp/astro/judo2>



longitude= 71.25368949093408 latitude= 3.100259439970412
04h45m00s.89 +03d06'00".9
Constellation= Cygnus

+ - reset coordinate: galactic ☒ Show Information ExportPNG Go To: Cyg X-1 Jump udon2

permalink

MAXI Progressive Catalog ☒
SWIFT-BAT Progressive Catalog ☒
SWIFT-XRT Progressive Catalog ☒
SIMBAD Progressive Catalog ☒
☒ Constellation Boundaries
☐ Aladin Healpix Grid

Name	Bottom	Top
SUZAKU	<input type="checkbox"/>	<input type="checkbox"/>
public image	<input type="checkbox"/>	<input type="checkbox"/>
public FOV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
proprietary FOV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ASCA SIS	<input type="checkbox"/>	<input type="checkbox"/>
public image	<input type="checkbox"/>	<input type="checkbox"/>
public FOV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ASCA GIS	<input type="checkbox"/>	<input type="checkbox"/>
public image	<input type="checkbox"/>	<input type="checkbox"/>
public FOV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ASCA GIS64	<input type="checkbox"/>	<input type="checkbox"/>

The position you are interested.
(Click to change on the image.)
pos=(71.334992, 3.066834)
coord=galactic
radius= 0.02 deg
Check with external services:
[SDSS DR9 Navigate Tool](#)
[NED](#)
[SIMBAD](#)
[ADS](#)

FoV: 9.95
FOVs: SUZAKU SIS GIS GIS64 SXS SXI HXI XMM-Newton Chandra(Simple) Chandra(Full)
Transparency
Top Image Graphic
Information: filter reset
SUZAKU ASCA SIS ASCA GIS ASCA GIS64 XMM-Newton ChandraSimple
00036010 (CYG X-1) 401059010 (CYGNUS X-1) 402072010 (CYG X-1)

可視光画像
512倍

はくちょうざX-1
の可視光対応天体、
HDE226868という星

<http://darts.isas.jaxa.jp/astro/judo2>

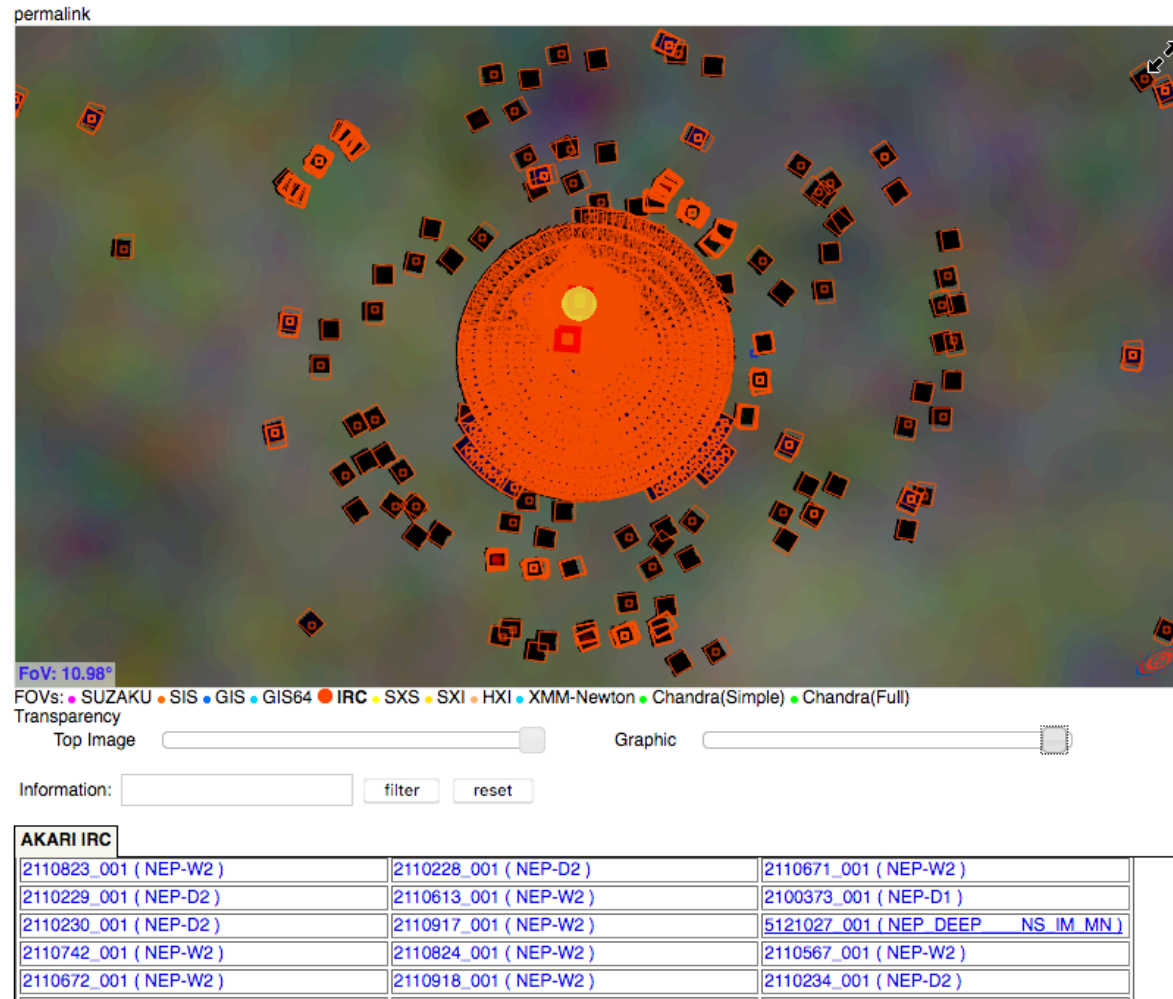
JUDO2の利用例

- <http://www.isas.jaxa.jp/home/ebisawalab/ebisawa/judo2.html> より
- 複雑な視野の表示、外部アーカイブへのアクセス (XMM, Chandraの例)

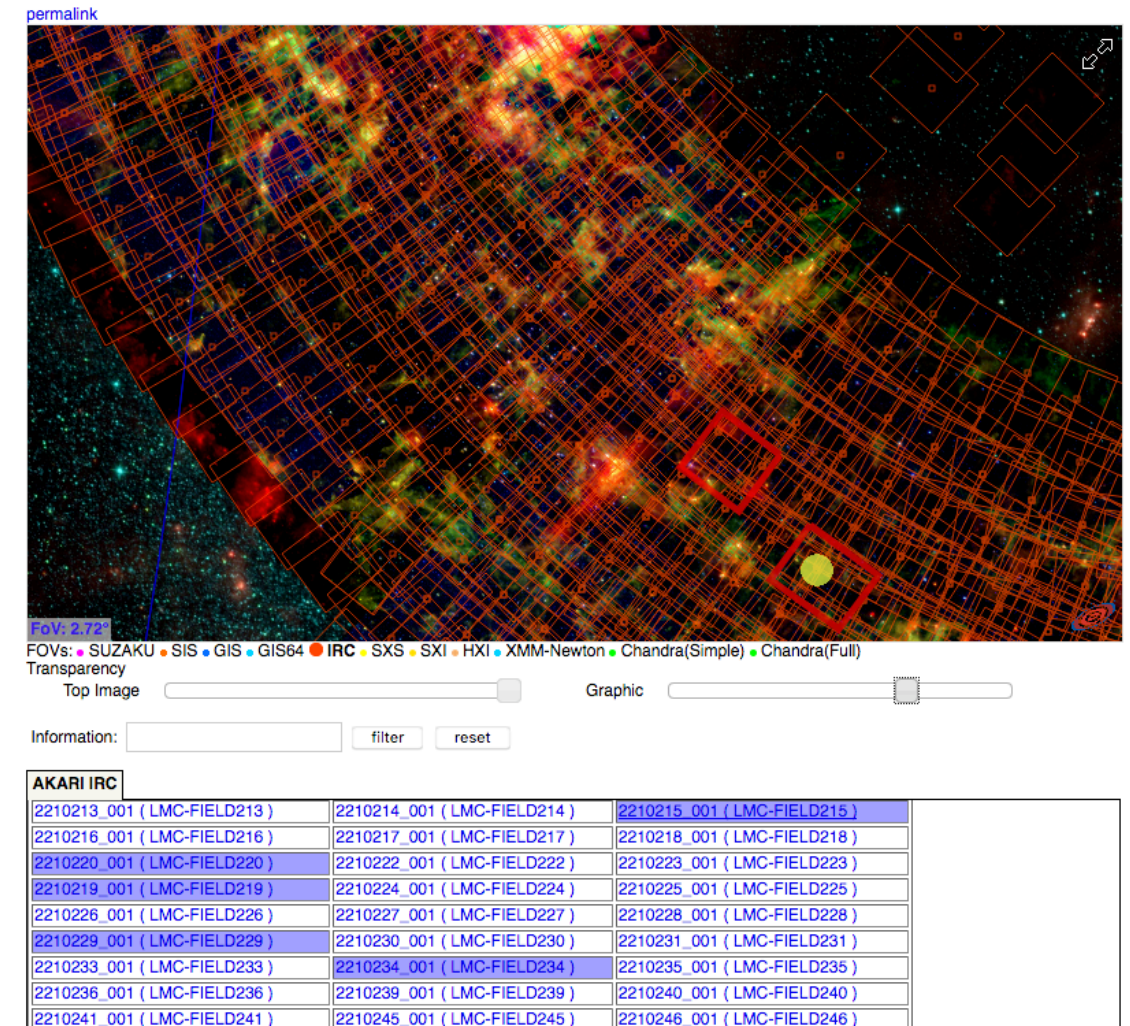
2. JUDO2について — 今後の計画

- DARTS AstroのすべてのデータをJUDO2からアクセス可能に
 - 今年度はAkari (IRC)データ、NuSTAR視野の追加

Akri 近赤外線カメラによる黄北極(NEP)領域



LMC領域



2. JUDO2について — 今後の計画

- DARTS AstroのすべてデータをJUDO2からアクセス可能に
 - 今年度はAkari (IRC)データ、NuSTAR視野の追加
- HiPSが天文データのデファクトスタンダードになりつつある

← → ↻ <https://aladin.u-strasbg.fr/hips/list>

HiPS servers (list of HiPS HTTP servers - required a VO registration)

<http://aladin.unistra.fr/hips/registry>

#	Origin	Type	HiPS list URL
1	wfau.roe.ac.uk	<i>image,catalog</i>	http://surveys.roe.ac.uk/hips71/hipslist
2	CASDA	<i>image</i>	https://casda.csiro.au/hips/hipslist
3	PADC	<i>image</i>	http://voparis-srv-paris.obspm.fr/vo/planeto/hips/perl_hipslist.pl
4	IPAC	<i>image</i>	http://irsa.ipac.caltech.edu/data/hips/list
5	ANU	<i>image</i>	http://skymapper.anu.edu.au/_HiPS/hipslist.txt
6	Leiden	<i>image,catalog</i>	http://tgssadr.strw.leidenuniv.nl/hips_list
7	IRAP	<i>image</i>	http://cade.irap.omp.eu/documents/Ancillary/4Aladin/hipslist-IRAP.txt
8	SSC	<i>image</i>	http://saada.unistra.fr/cgi-bin/hipslist
9	CDS	<i>image,cube</i>	http://alasky.unistra.fr/hipslist
10	CDS	<i>image,cube</i>	http://alaskybis.unistra.fr/hipslist
11	CDS	<i>image,cube</i>	https://alaskybis.unistra.fr/hipslist
12	CDS	<i>catalog</i>	http://axel.u-strasbg.fr/HiPSCatService/hiplist
13	AMIGA		http://amiga.iaa.es/hipslist
14	svo.cab	<i>image</i>	http://gtc.sdc.cab.inta-csic.es/hips/hipslist
15	IAS	<i>image</i>	http://healpix.ias.u-psud.fr/hipslist
16	ESAC	<i>image</i>	http://skies.esac.esa.int/hipslist
17	JAXA	<i>image,catalog</i>	http://darts.isas.jaxa.jp/pub/judo2/HiPS/hipslist.txt
18	CADC	<i>image</i>	http://hips.canfar.net/hipslist.txt
19	CADC	<i>image</i>	http://hips2.canfar.net/hipslist.txt
20	HEASARC	<i>image</i>	https://skyview.gsfc.nasa.gov/hips/skyview.hips
21	China-VO	<i>image</i>	http://hips.china-vo.org/hipslist

<https://alaskybis.unistra.fr/hipslist>

2. JUDO2について — 今後の計画

- DARTS AstroのすべてデータをJUDO2からアクセス可能に
 - 今年度はAkari (IRC)データ、NuSTAR視野の追加
- HiPSが天文データのデファクトスタンダードになりつつある
- 世界中で公開されている膨大なHiPSデータをいかに活用するか
 - 外部との連携促進
 - ユーザーインタフェースの改良