

## ACTIVITY OF *IRSF* FOR 14 YEARS

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### ABSTRACT

The activities of *IRSF*, a 1.4m infrared telescope operated under collaboration between Japan and South Africa, are presented briefly. The dedicated instrument, *SIRIUS*, which sits at the Cassegrain, has produced unique and prosperous science for 14 years. My talk involves; ◦ concept of construction and operation, ◦ publications and education, ◦ the successive upgrading of the instrument, and ◦ future plans.

*Key words:* *IRSF*, *SIRIUS*, International Astronomy

### 1. INTRODUCTION

Small telescopes equipped with dedicated instruments have become of crucial importance in big astronomy. A number of great discoveries have been produced from telescopes as small as 1 m sizes; Kuiper objects, microlens, brown dwarf, 51 Peg etc. Persistent and/or extensive work with a sophisticated instrument will sometimes bring the worlds.

### 2. LOCATION

*IRSF* (InfraRed Survey Facility), is located at the Sutherland station, South Africa. The site (Lat.  $-32^\circ$  Lon.  $+20^\circ$ ) is an an important location, sharing the Southern Hemisphere sky with a separation of longitude  $\sim 120^\circ$  with Australia and Chile.

### 3. HISTORY

The project started in 1998 under an agreement between Japan and SA, Nagoya University on behalf of the Japanese university consortium. *SIRIUS* (Simultaneous InfraRed Imager for Unbiased Survey) is a 3-color JHKs imagery dedicated to *IRSF*.

Since commissioning in November 15, 2000, we have been upgrading the performance by adding various capabilities to the original *SIRIUS* step-by-step:

- 2003 : Speed-up of Readout electronics a factor of 20
- 2005/06 : Linear and circular polarization
- 2009 : Density-filter to expand the dynamic range up to Ks  $\sim 3$ mag
- 2010 : Narrow-band filters tuned to Fe[II], H<sub>2</sub> lines
- 2011 : TRIPOL(g,r,i) on the SAAO 0.75m.

<http://pkas.kas.org>

Further developments are planned in near future (see Section 7).



### 4. FACILITY

*IRSF* is an infrared telescope with an aperture of 1.4m and an F10 focal length, belonging to the telescope complex at Sutherland station, SA (photo).

At the Cassegrain focus of the telescope, you can see *SIRIUS*, a unique infrared imager in SAAO. *SIRIUS* sits

at the Cassegrain focus at all times.

## 5. ACHIEVEMENTS

So far, more than one hundred papers have been published over 14 years, many of which are highly cited ( $\sim 30$  citations per paper as in 2002~2010).

It is noteworthy that twenty Japanese and African graduate students were awarded as PhD based on *IRSF* data. We list highlights from the past 14 years.

- Lupus 3, a shining dark cloud
- Interstellar Extinction Law
- Survey of the Magellanic clouds
- Monitoring of variables in the Magellanic clouds
- Polarization–Scattering Nebulae, Interstellar Dichroism, circular and linear
- Monitoring of Exo-planets, microlenses,  $\gamma$  ray bursts, Binaries

See <http://www.z.phys.nagoya-u.ac.jp/>

## 6. COLLABORATION

*IRSF* contributes to international exchange and interchange both in research and personnel: From European, Asian and African countries, astronomers/students visit the facility and/or use data.

## 7. FUTURE

We plan to add more capabilities to *IRSF* in near future, such as;

- i) 7 color photo/polarimetric simultaneous imagery by adding 4 colors (g,r,i,z).
- ii) Low-Resolution Spectrometer covering 1 to  $2.5\mu\text{m}$ .

In 2015, we will celebrate our 15<sup>th</sup> year.

iii) Therefore, we hope to construct a moderate class telescope as large as 2~3 m size dedicated to spectroscopy at the station. Combined with the imaging of *IRSF*, it would work powerfully.

We are now preparing the funding. I would share both operation and costs among partners who are interested in the activities of the spectroscopy as well as 7-color photo/polarimetric imagery in the Southern Hemisphere.

## 8. CONCLUSIONS

As a final note, *IRSF/SIRIUS* is operated under collaboration between SAAO and Japan with a flexible allocation system, and is open to astronomers all over the world at various levels, such as proposals or collaboration or even requested observations.