Large Area Surveys in KASI

- Past, Present, and Future –

Byeong-Gon Park

- supported by KASI researchers in various projects herein -

Contents

- General Information on KASI and its observing facilities
- Past surveys
- Present surveys
- Future survey and possible directions

General Information on KASI

A Brief History

1974 Founded as a government agency, the National Astronomical Observatory of Korea

1978 Sobaeksan Optical Astronomy Observatory (SOAO) with 61cm optical telescope was established.

1985 Taeduk Radio Astronomy Observatory (TRAO) was established in Daejeon

1986 Status was changed to be a government-funded research institute, named as the Institute of Space Science and Astronomy (ISSA)

1996 Bohyunsan Optical Astronomy Observatory (BOAO) was established.

2003 Mt. Lemmon Optical Astronomy Observatory (LOAO) with 1m telescope was established in Arizona, USA

The first Korean Space telescope FIMS (Far-ultraviolet Imaging Spectrograph) onboard STSAT-1

2004 ISSA was renamed as the Korea Astronomy and Space Science Institute (KASI)

2008 The Korea VLBI Network (KVN) was completed

2009 KASI participated in the Giant Magellan Telescope Project

Korea Microlensing Telescope Network Project started

2012 Korea-Japan VLBI Correlation Center open

Mobile Satellite Laser Ranging System (SLR) development completed

2013 Multi-Purpose Infrared Imaging System (MIRIS) satellite launched

2014 Immersion Grating Near Infrared Spectrograph (IGRINS) started science operation at McDonald observatory, USA

2015 KMTNet Science Operation started

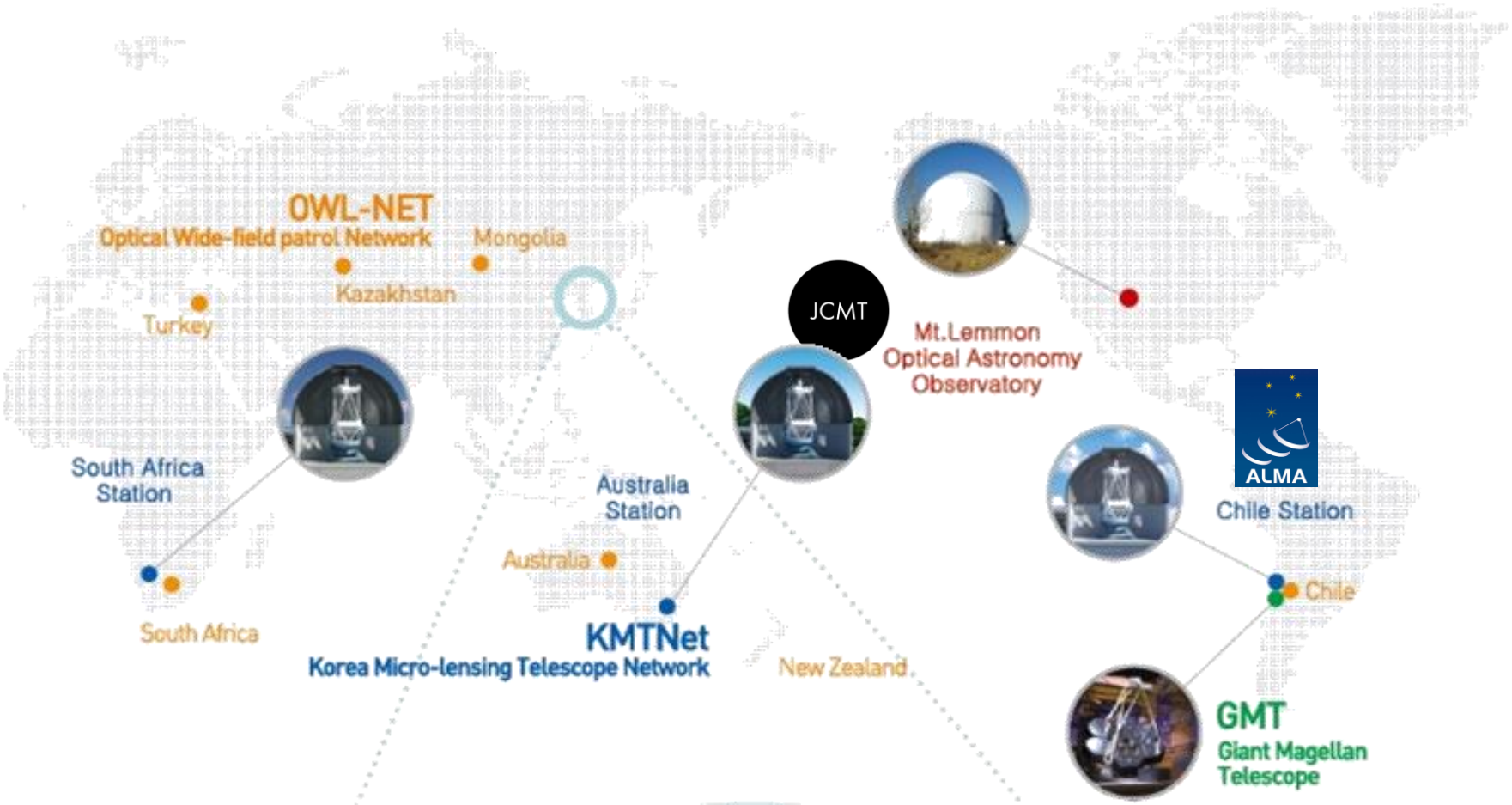
2016 Optical Wide-field Patrol Network (OWLNet) started operation for surveillance on NEOs and PHAs

KASI Observing Facilities

Domestic Facilities

KASI Observing Facilities

Overseas Facilities (current and future)

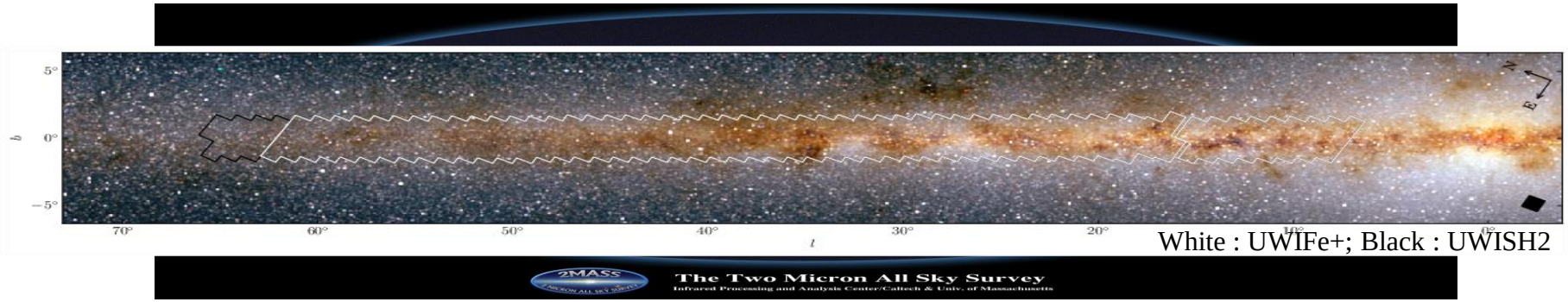


Past Surveys

UWIFe+

The project

- UWIFe+ : UKIRT Wided-field Infrared Survey for Fe+
- Telescope / Instrument : UKIRT / WFCAM
- An unbiased imaging survey of the Galactic plane
  - NIR, narrow-nand (1.64 μm[FeII] / 2.12μm H_2)
  - The first Galactic quadrant ($7 < \ell < 65$, $-1.5 < b < +1.5$)
  - A sister project of UWISH2 (H_2 Survey)
- Observation period: 2012 ~ 2013
  - 220 tiles in the observation field and 1 hour exposure per field



White : UWIFe+; Black : UWISH2

UWIFe+

The Data

- Data processing
  - CASU pipeline
  - A sophisticated continuum subtraction using PSF photometry
- All the data are open for public along with continuum subtracted images.
- Use sftp (gems0.kasi.re.kr/uwife/data.html) :

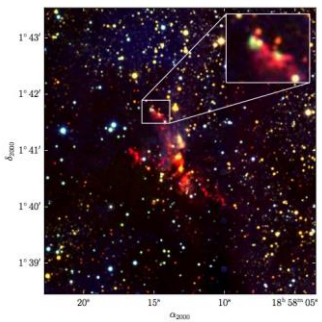
UWIFE Preliminary Data Access

The observed [Fe II] images (products of CASU pipeline) are available from the following location. Also available are continuum subtracted (H-band subtracted) images.

You should connect via "sftp".

- ip : 103.8.230.113
- port : 7774
- login name : gems0_public

The password is gems0. For easy access to the server, send me (lee.j.joon@gmail.com) your public ssh key.



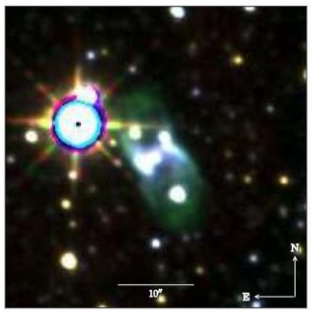


Figure 13. RGB composite image of PN M 1-51. The color scheme is same as in Figure 10. This is one of the PN showing [Fe II] emission without H_2.

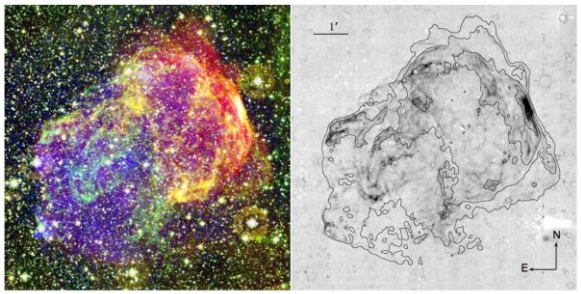
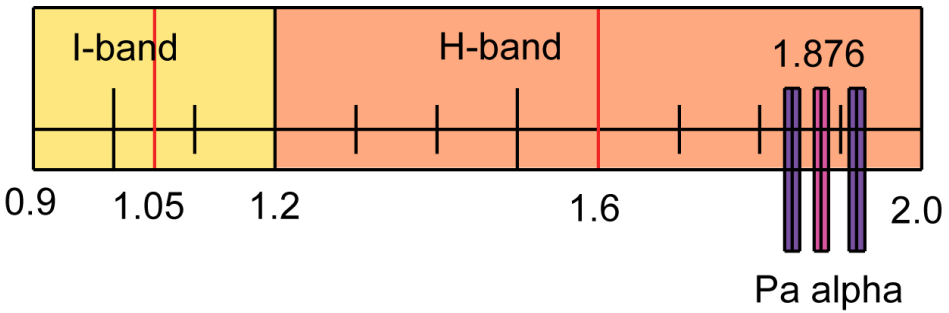


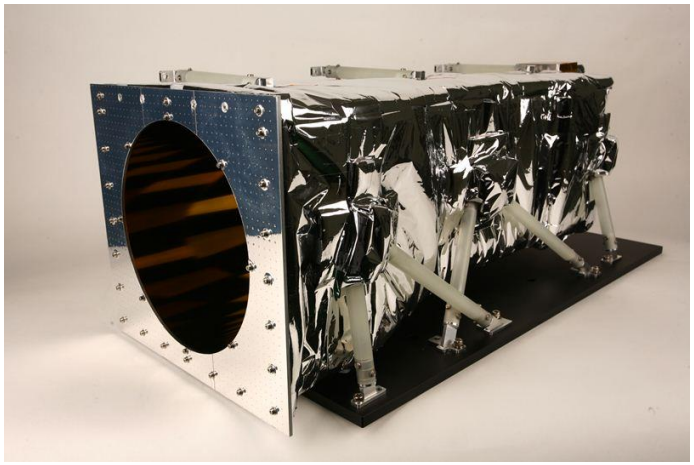
Figure 15. *Left:* Color composite figure of 3C 391, composed of 1.4 GHz radio continuum (red), H_2 2.122 μm (yellow), [Fe II] 1.644 μm (green), and Chandra X-ray (blue) images (Helfand et al. 2006; Froebrich et al. 2011; Chen et al. 2004). *Right:* Continuum-subtracted [Fe II] image. Superimposed are VLA 1.4 GHz radio contours with intensity levels of 2.0, 5.6, 17, 35, and 60 mJy beam^{-1} and the beam size of 6″.2 × 5″.4.

MIRIS

Project and the Specifications

- MIRIS – A **m**ultiple purpose **i**nfra**r**ed **i**maging **s**ystem
- Specifications
  - Aperture = 80mm
  - Detector FOV = 3.67^{o} x 3.67^{o} (51″.6/pix)
  - Wavelength range = 0.9 ~ 2μm
  - 5 Filters : I, H, Pa α (1.876μm), Pa α Cont.
- ISAS/JAXA Collaboration
- Launched in Nov. 2013



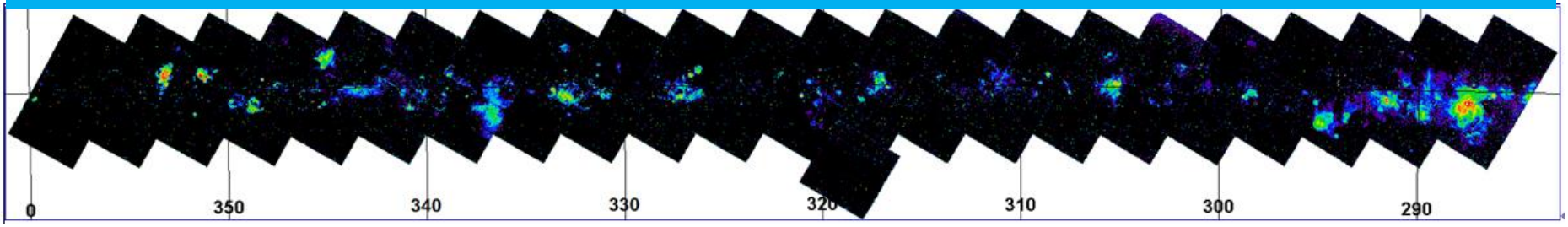


MIRIS

Sciences

- Pa α Emission line survey for GP and WIM
  - Origin of warm ionized medium
  - Physical properties of interstellar turbulence
- Observation of Cosmic Infrared Background
- Observations
  - Phase 1 : CIB
  - Phase 2 : Pa α survey for GP
- Survey data almost ready for public access in 2017

MIRIS Workshop 2017
Today (Apr. 19, 2017) 14:00-17:30 at Large Conference Room in Sejong Hall 1F.

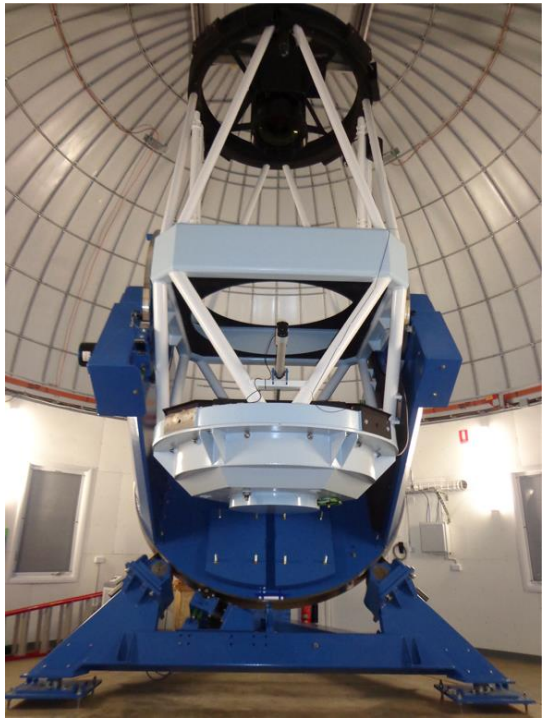


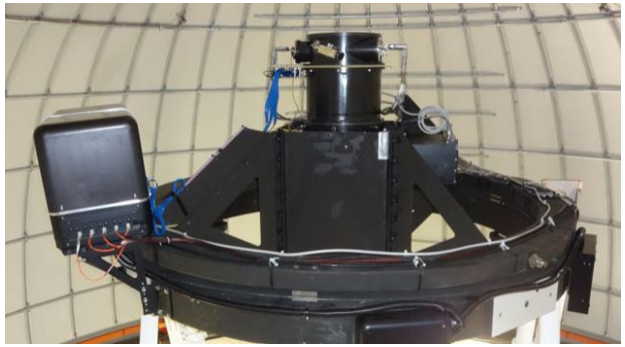
Present Surveys

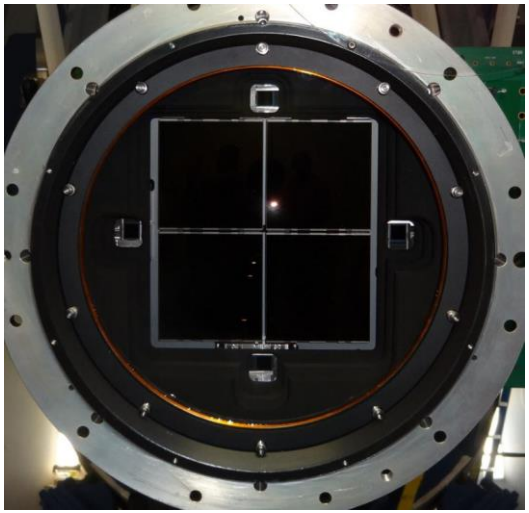
KMTNet : Korea Microlensing Telescope Network

Telescope and Camera

- Telescope
  - 1.6m aperture, prime focus, f/3.2, 0″.4/pix
  - DIQ = 1″.0 FWHM under 0″.75 seeing
- Camera
  - 2 x 2 mosaic configuration of 4 e2v CCD 290-99 chips (9k x 9k, 10 μm pixel size)
  - FOV = 2^{o} x 2^{o}



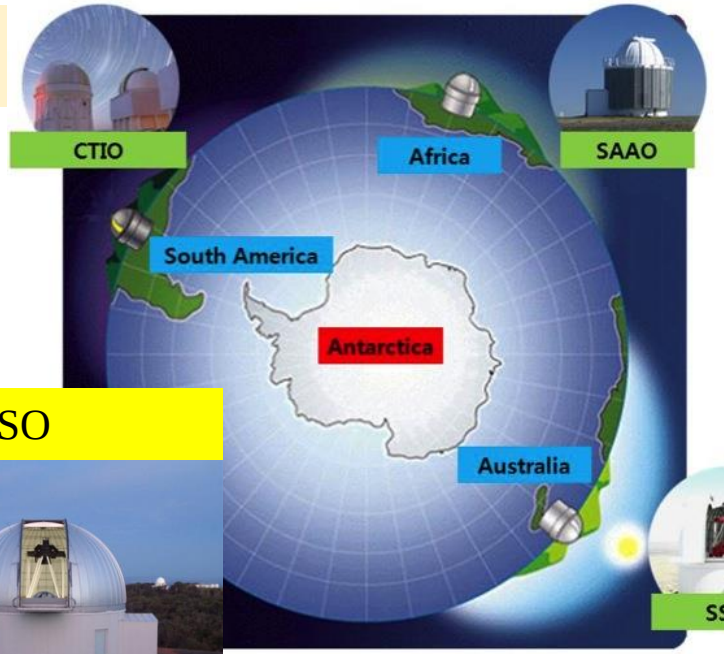


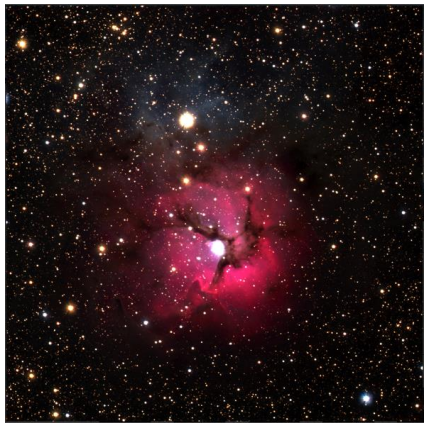


KMTNet : Korea Microlensing Telescope Network

Telescope Locations

- Installation completed in 2014
- Started science operation in 2015



CTIO	SAAO	SSO
		
		

KMTNet : Korea Microlensing Telescope Network

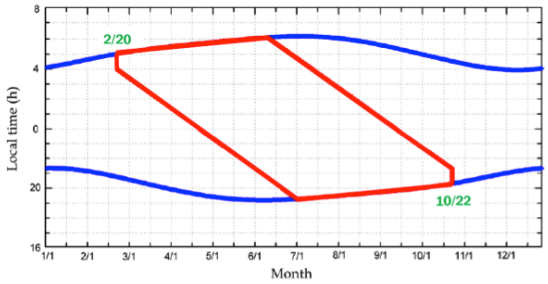
Data

- Data Acquisition
  - Two resident observers (+ visiting observers) perform observation at each site.
- Data Transfer
  - It takes about 2 minutes to transfer a raw image of 680 MB from each site to KASI at a rate >45 Mbps.
- Image processing
  - Preprocessing is done by custom pipeline.
  - Processed data are provided to the PI's within two days after observation.

KMTNet : Korea Microlensing Telescope Network

Science

- Bulge season
  - Exoplanets and Variability search towards GB
    - Round-the clock observation in I-band
    - ~50% of the total time allocated



- Non-bulge season
  - Photometric survey of stars in Magellanic Clouds
  - Exoplanets in Magellanic Clouds
  - Searching for ultra-faint dwarf galaxies
  - Wide-field and Deep Survey of nearby southern clusters of galaxies
  - Deep wide-field imaging of nearby galaxies
  - KMTNet Supernovae project
  - KMTNet DEEP-SOUTH: Deep Ecliptic Patrol of the SOUTHern sky

Participation in International Collaborations

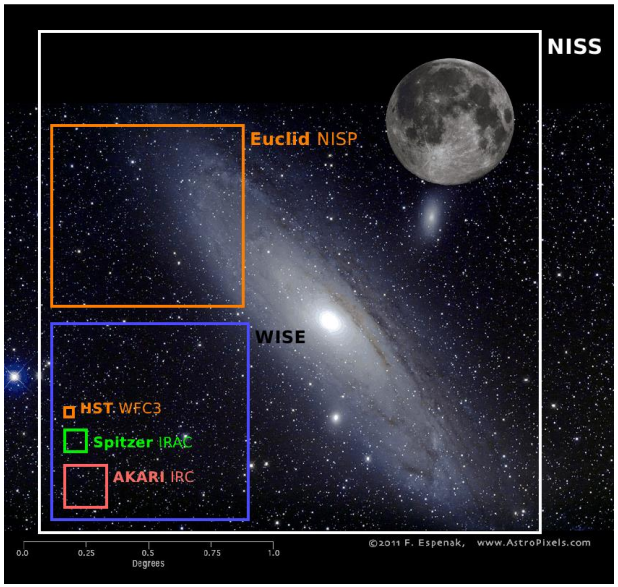
- SDSS4
  - Currently two PI's in KASI
- DESI
  - Cosmology group

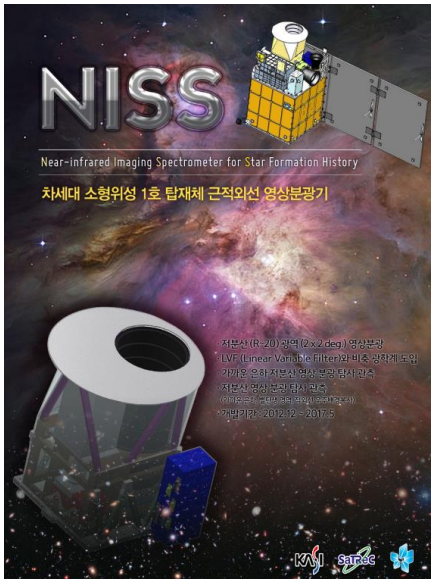
Future Surveys

NISS

Project and Specifications

- NISS : **N**ear **I**nfrared **S**pectrometer for **S**tar formation History
- H/W Specifications
  - Aperture : 200mm
  - FOV : 2^o x 2^o (7″/pix)
  - Wavelength range : 0.9 ~ 3.8 μm (continuous)
  - Imaging & Low (R~20) resolution spectroscopy
- Launch
  - Jul. 2017 (planned)

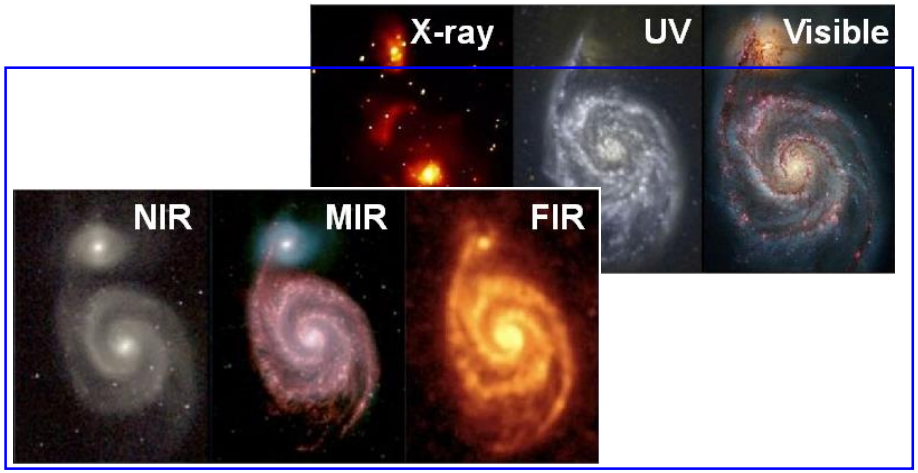




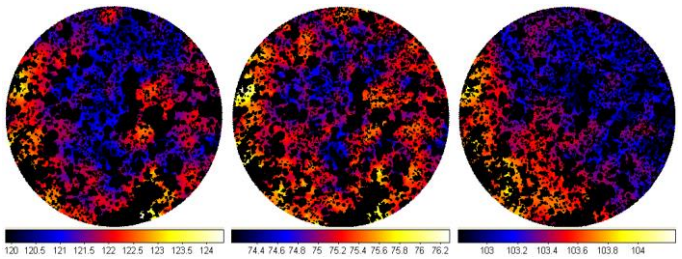
NISS

Sciences

- Star formation in local Universe
  - Large nearby galaxies / cluster of galaxies
  - Star forming regions
- Star formation in high-z
  - Cosmic Near-Infrared background



Multi-wavelength observation for M55
NISS: Complementary information in NIR



Detection of Cosmic Near-Infrared Background (2~4μm)

Others

- LSST
  - KASI signed an MOA in 2016
  - Currently 15 potential PI's are working
  - Science operation expected in 2021 ~ 2030
- KMTNet
  - Initial surveys will last about 5 years : 2016 ~ 2020
    - Future surveys using the system is not determined yet.
- Possible directions
  - spectroscopic surveys using KMTNet facilities?
  - possible collaboration with space missions such as TESS and/or WFIRST
  - possible surveys based on radio and optical/IR facilities?