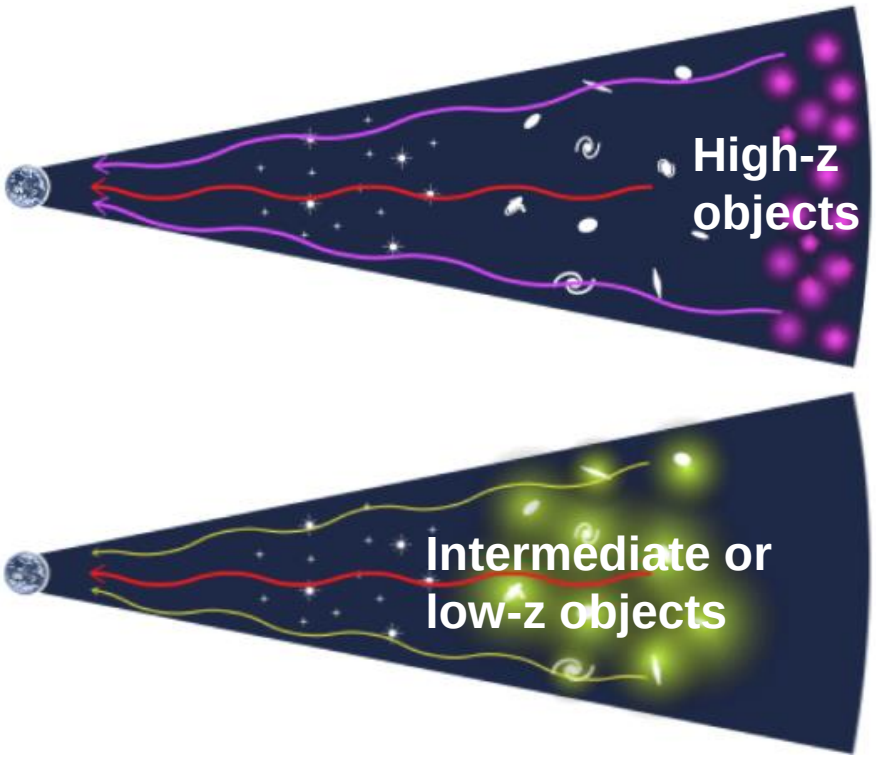
CIB Sciences with MIRIS

Jeonghyun Pyo, MIRIS Team
(KASI)

MIRIS Workshop
Eunhasoo-hall, KASI
2015 January 28

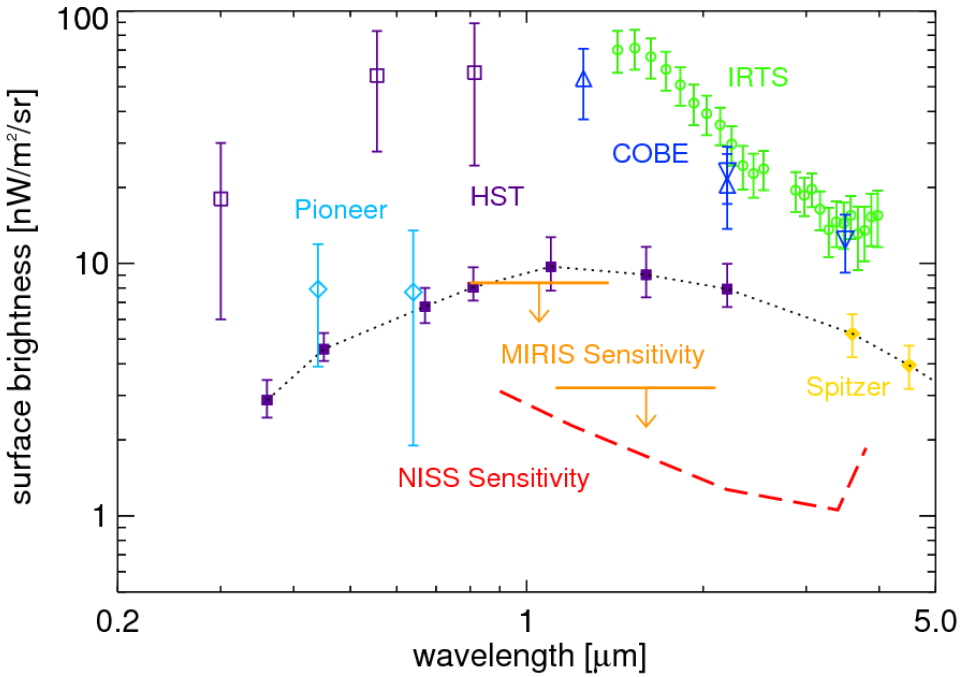
Origin of Near-IR Excess



- Excess emission in near-infrared
  - High-redshift objects
  - Low-redshift objects

Brightness of CIB

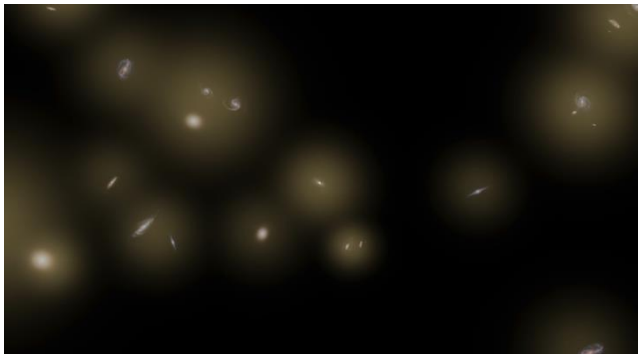
- **Absolute brightness**
  - Resolution & sensitivity
  - Removal of foreground sources
  - Stacking pixels

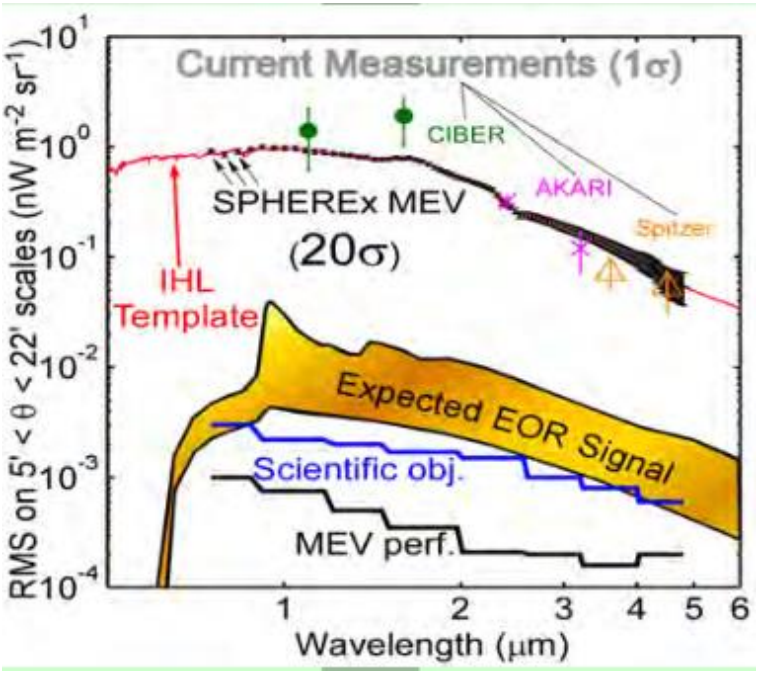


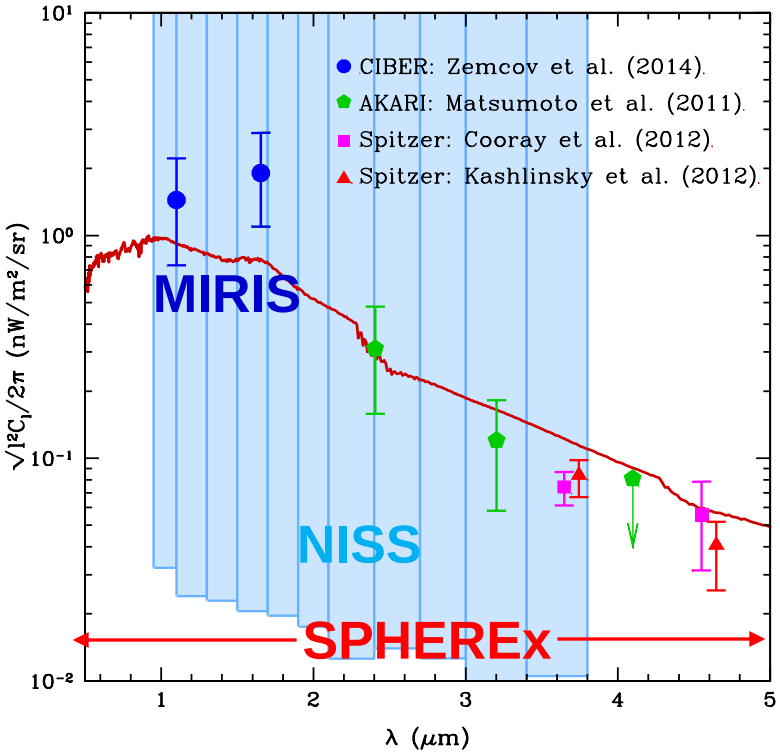
- **Origin?**
  - Zodiacal light
  - Lyman α or Lyman break: drop at λ ~ 1μm
    Pop. III (first) stars or first galaxies
  - TeV Gamma-ray photons from blazars
  - Intra-Halo Light

Intra-Halo Lights

- Stripped stars from galaxy mergers
- Spectrum & fluctuation
  - Flat near 1μm
  - < 1μm spectrum
  - Fluctuation up to 300 kpc

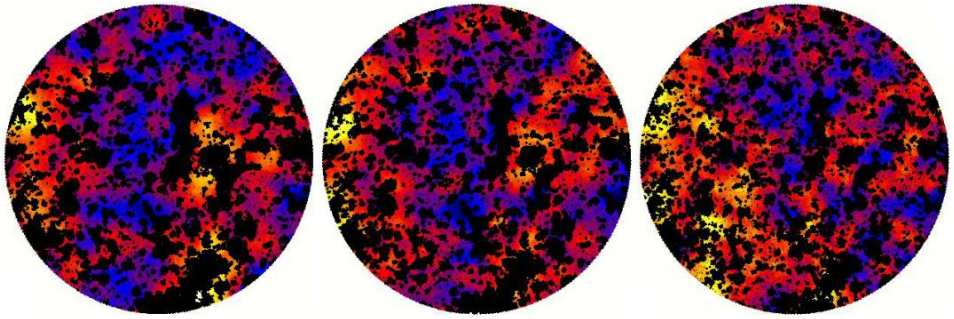






Fluctuation of CIB

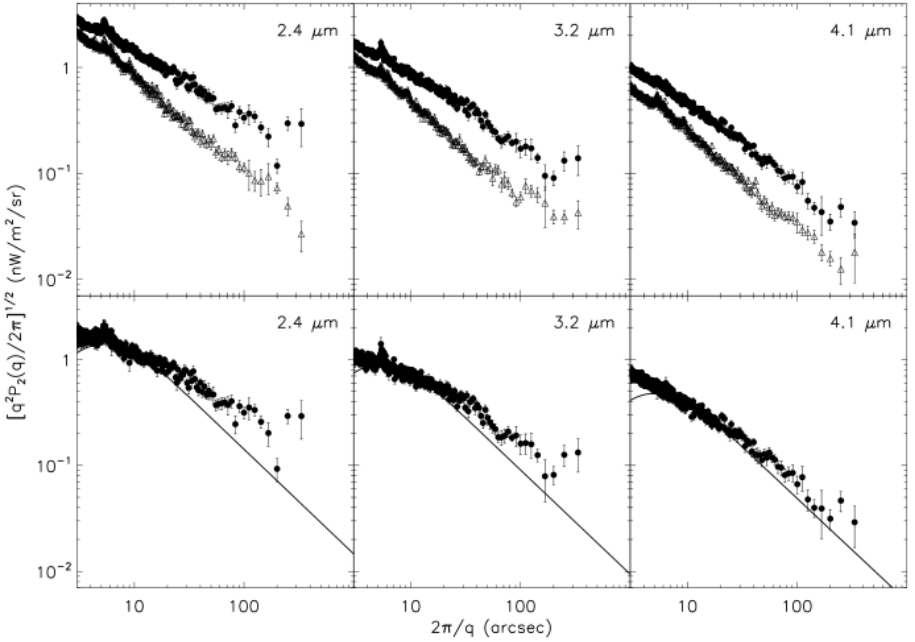
- Smoothed image
- Correlation & fluctuation
- Fluctuation strength:
  ~2% of sky brightness



Matsumoto, Seo, Jeong *et al.* (2011)

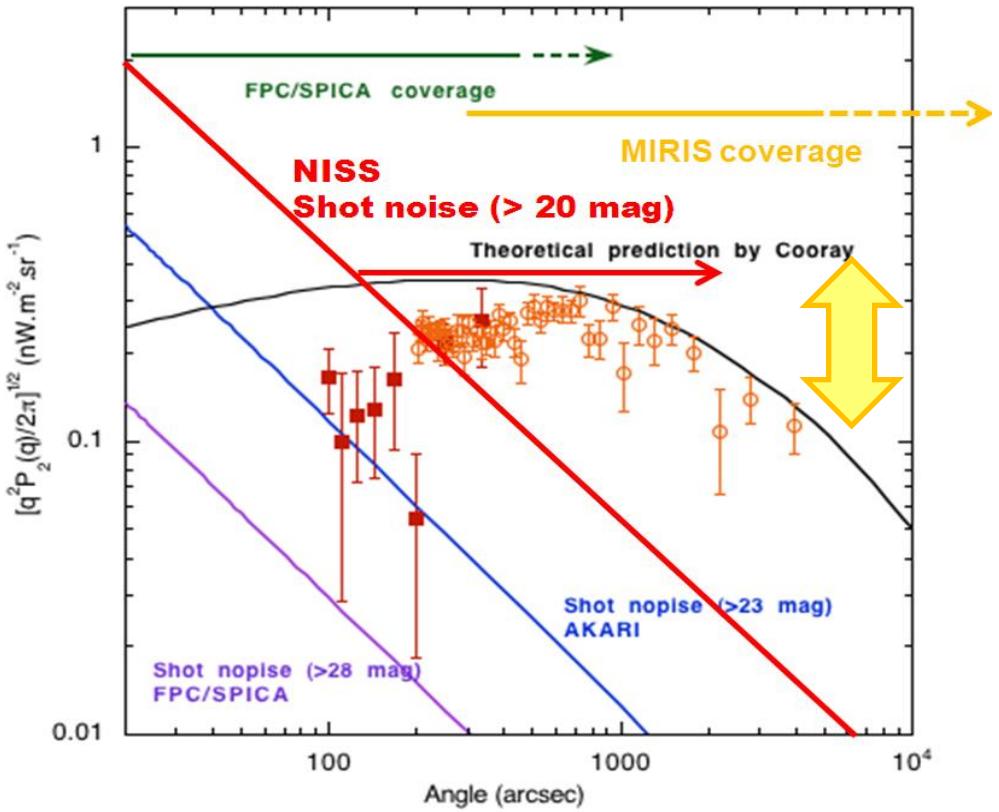
- Fluctuation
  at >100 arcsec

- Smooth fluctuation from ZL (Pyo *et al.* 2012)
- Upper limit of fluctuation:
  ~0.02% of sky rightness



Fluctuation of CIB

- Fluctuations from
  - AKARI observation (~ 100″)
  - MIRIS: large scales > 3°
  - NISS : medium scales
    but, continuous
  - SPHEREx : large scales
    & continuous



MIRIS Observations

- Large Area Surveys of Pole Regions

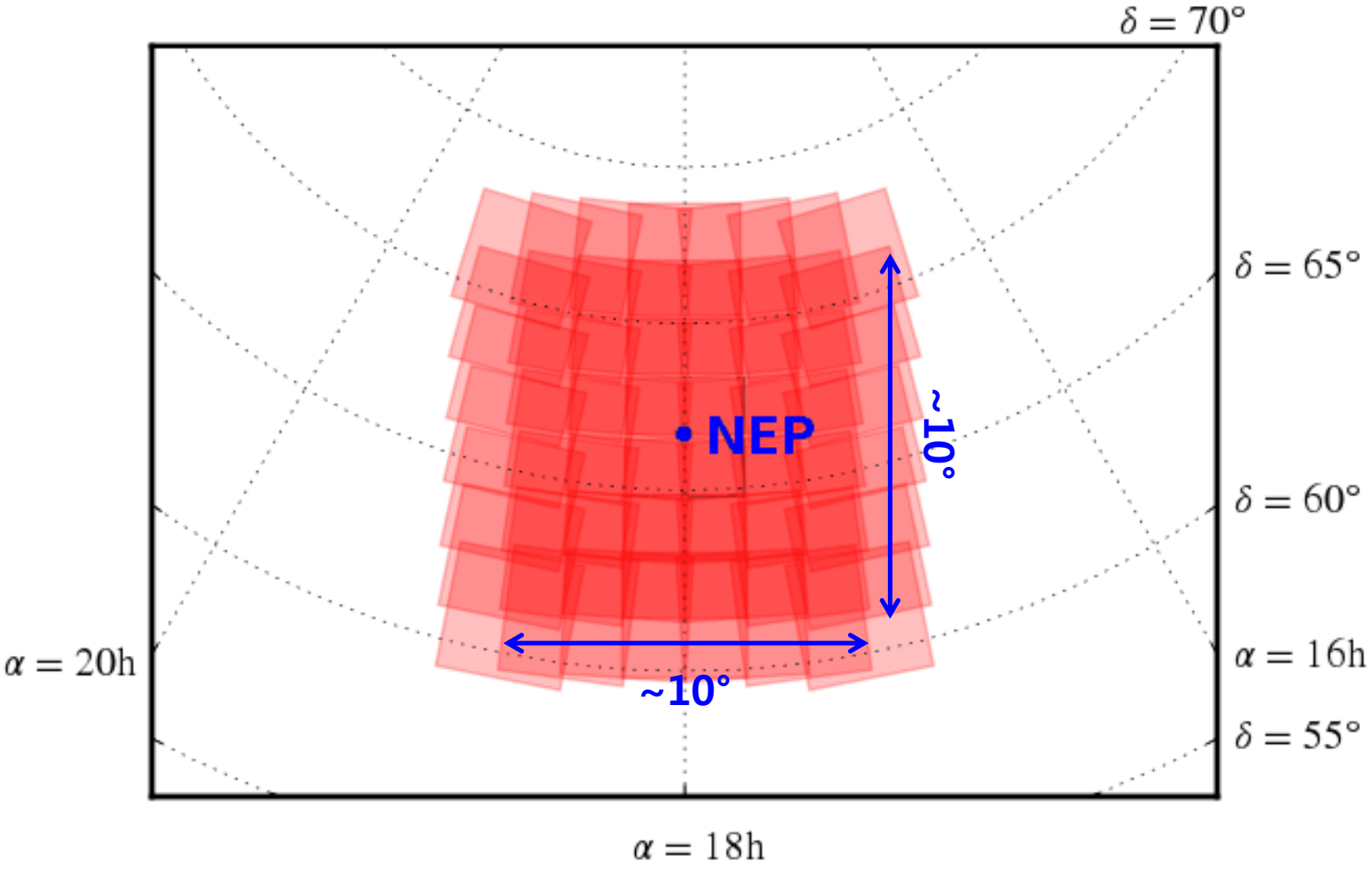
- NEP (North Ecliptic Pole) Monitoring Observations

Large Area Surveys

- Targets: **NEP, NGP, SGP**
- 7×7 pointing observations with 50% overlap
  → 4 times observations of ~10°×10° area
- Wavelengths: 1.1 μm and 1.6 μm bands
- Observe for 8 minutes for each band
  (effective exposure: 6.5 minutes)

- Additional observations: **NEP Monitoring**
- Observe NEP every two days
  (1.1 μm and 1.6 μm bands)
- Can be used to study **zodiacal light** and for **instrument calibration**

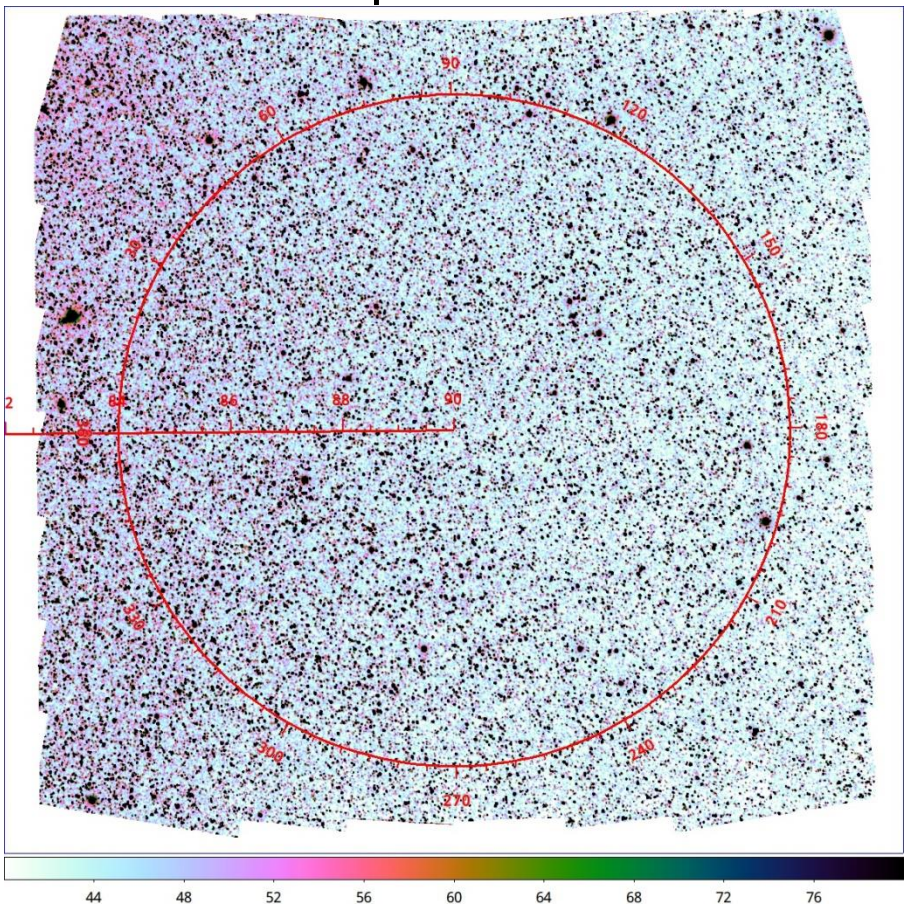
Large Area Surveys



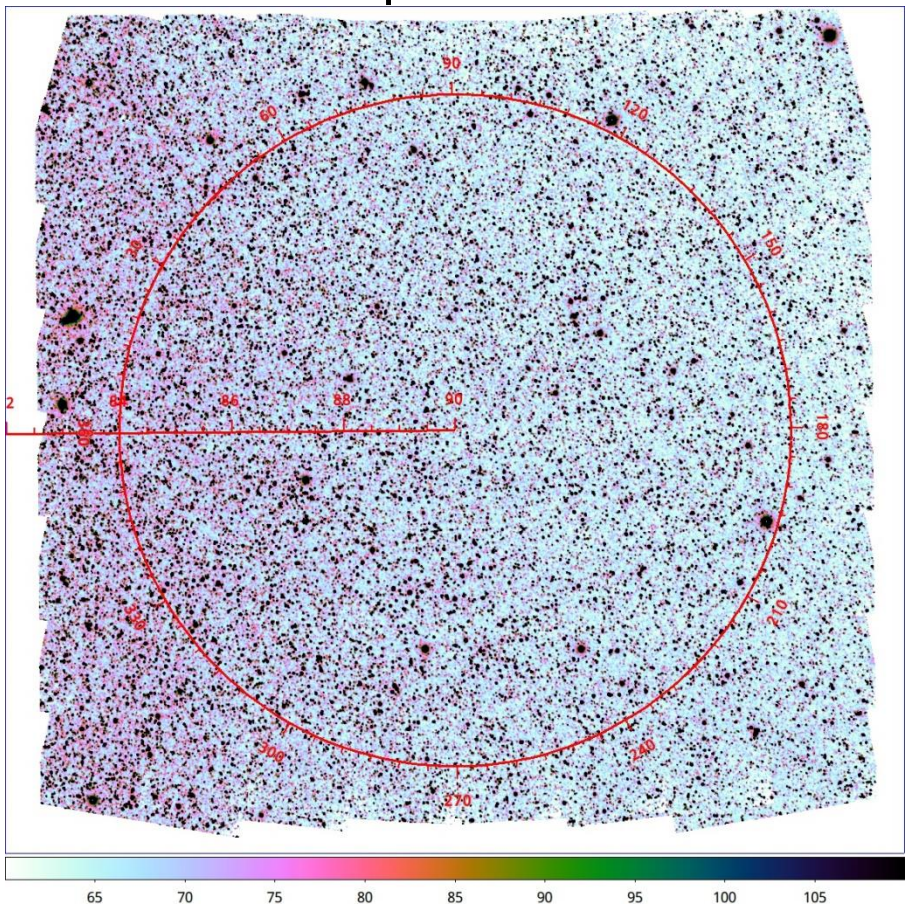
Large Area Surveys

- **NEP Wide Field** Observations (2014. 3.)

1.1 μm band



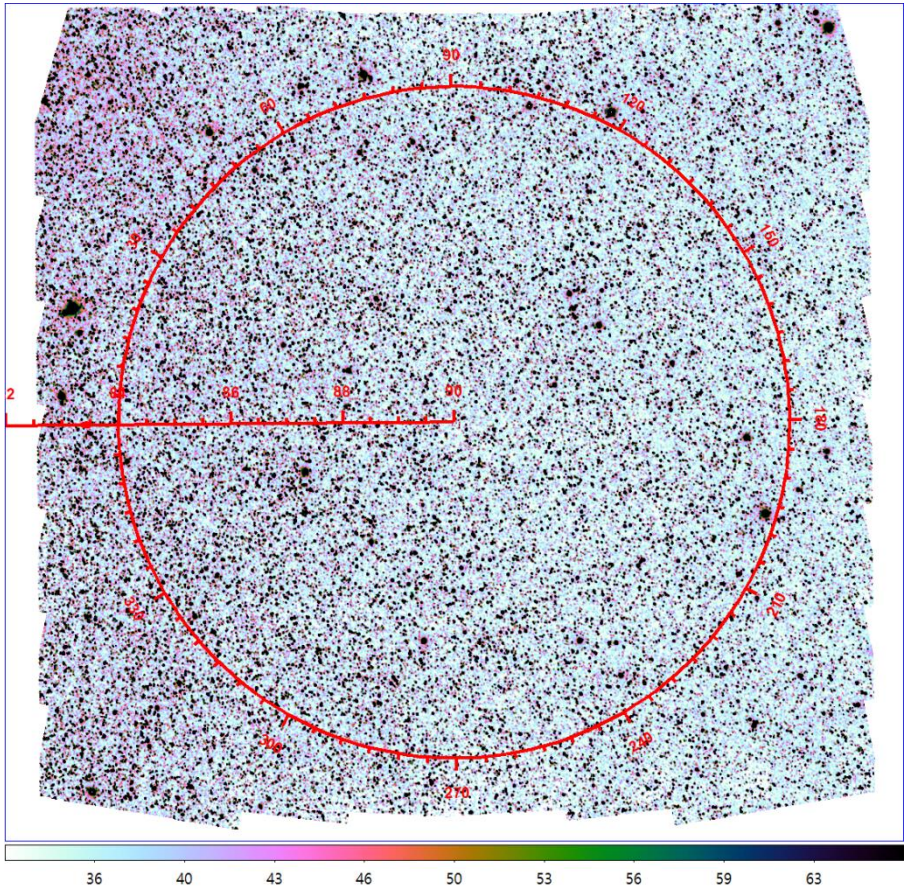
1.6 μm band



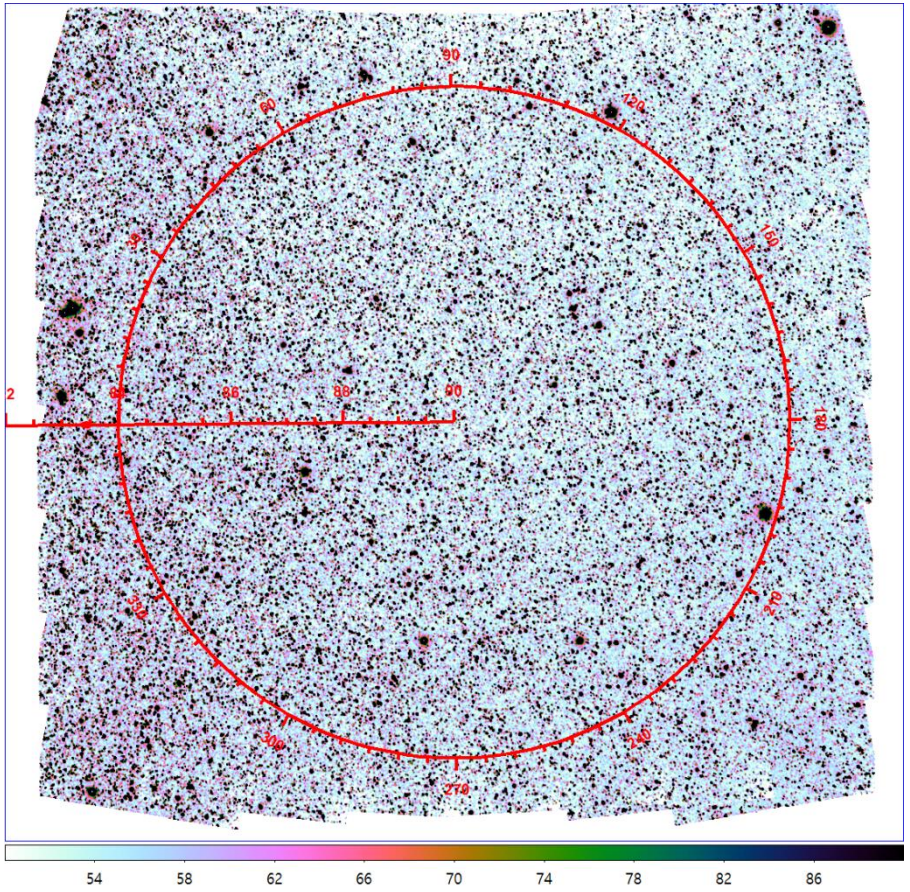
Large Area Surveys

- **NEP Wide Field** Observations (2014. 9.)

1.1 μm band



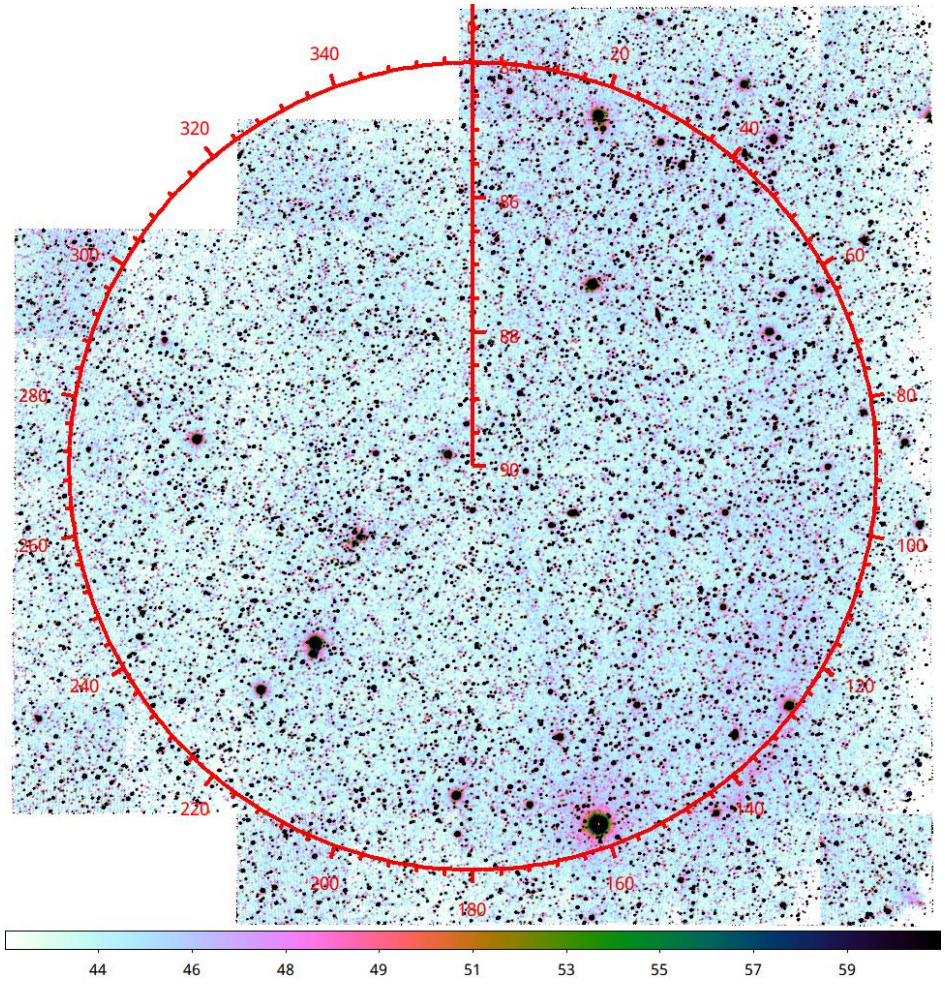
1.6 μm band



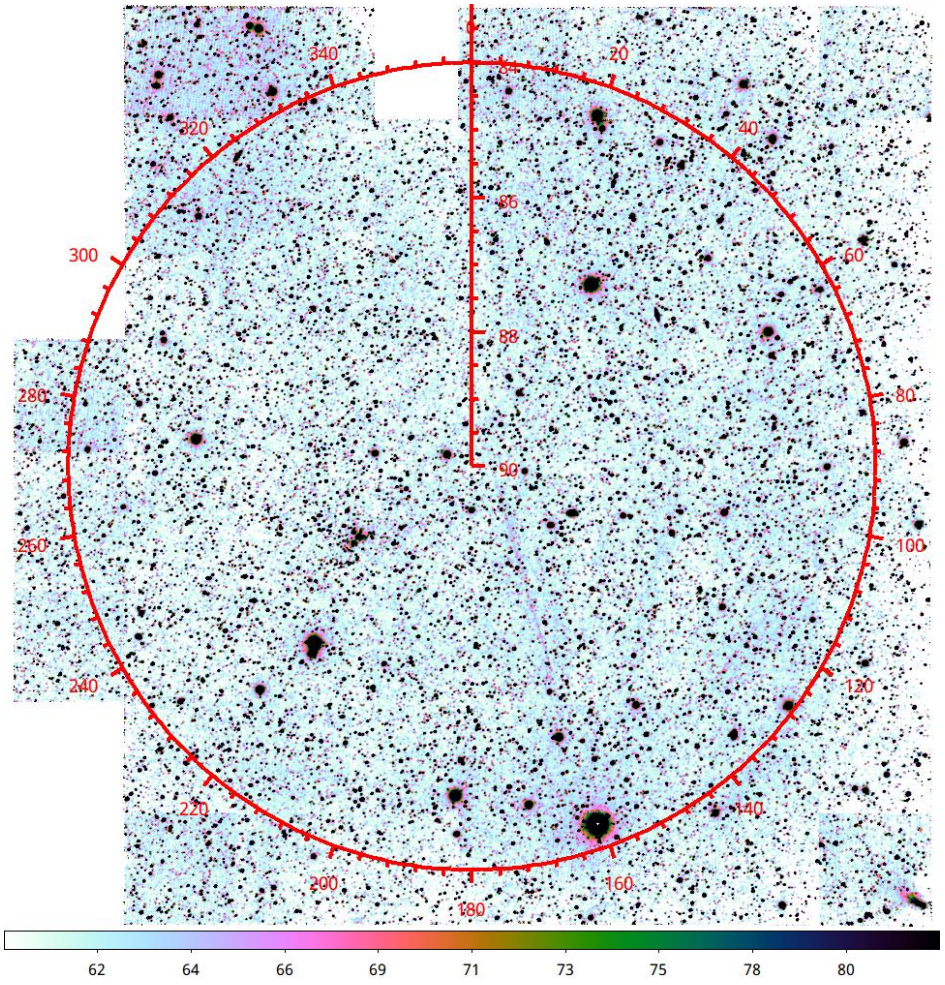
Large Area Surveys

- **NGP Wide Field** Observations (2014. 3.)

1.1 μm band



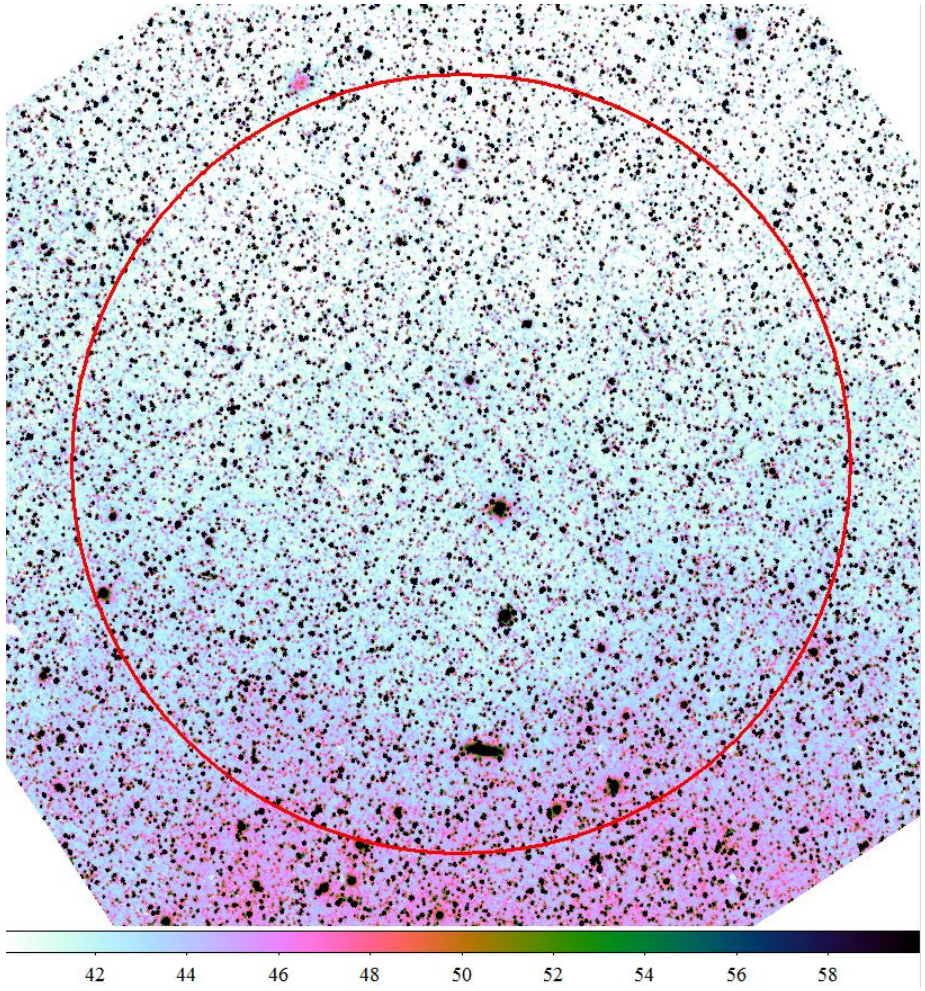
1.6 μm band



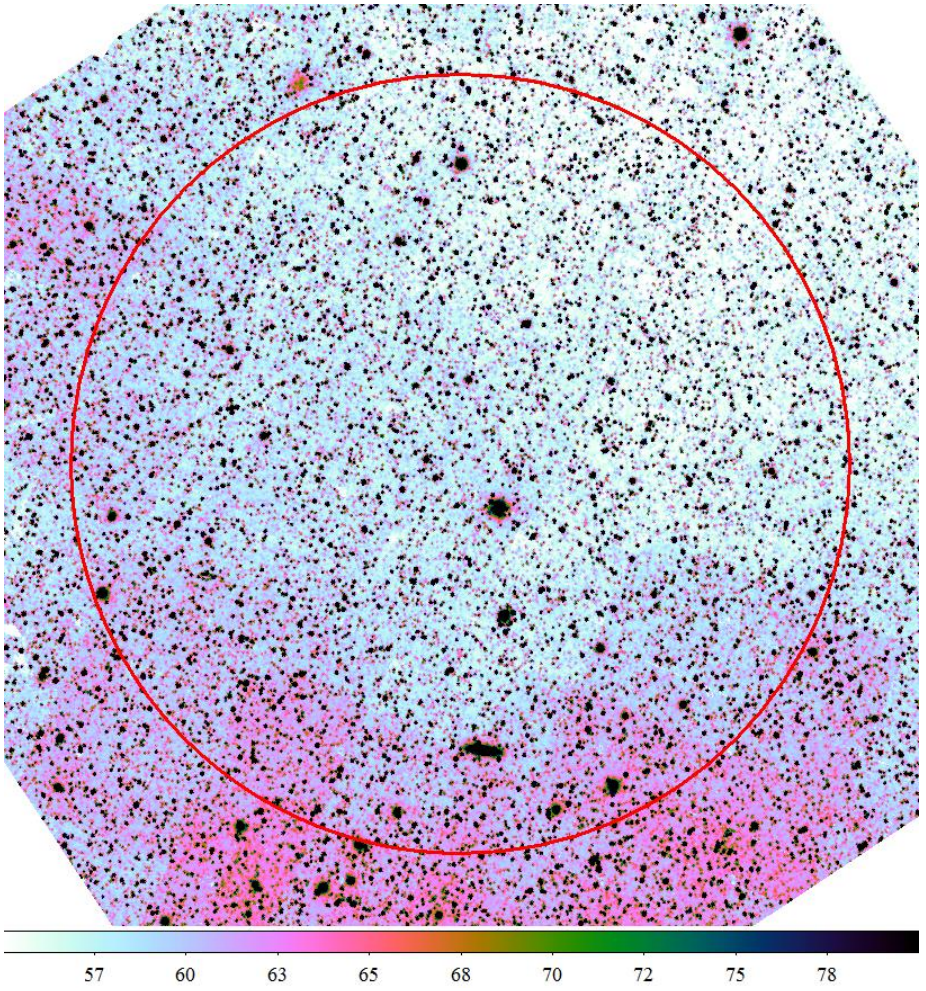
Large Area Surveys

- **SGP Wide Field** Observations (2014. 10.)

1.1 μm band



1.6 μm band



NEP Monitoring

- **NEP Monitoring** Observations

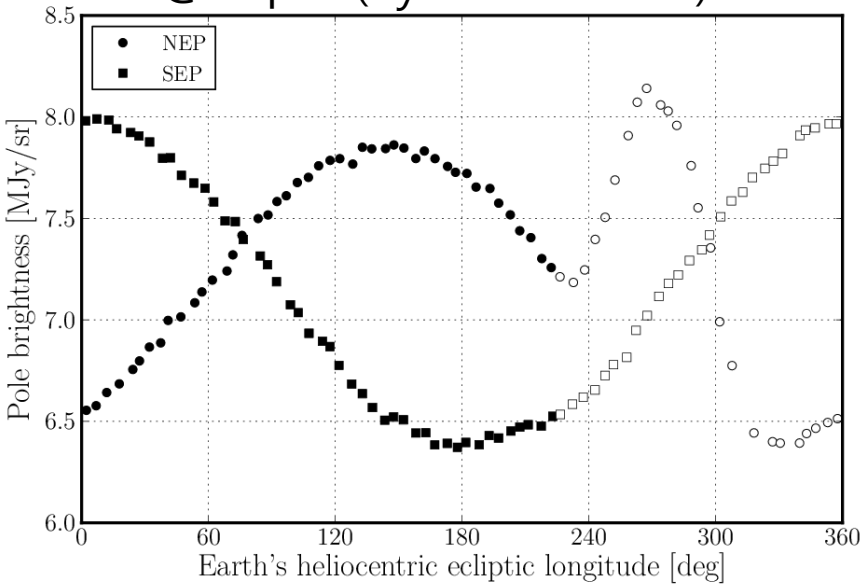
  : Observe the north ecliptic pole every another day

  – Monitoring and calibration of the detector condition

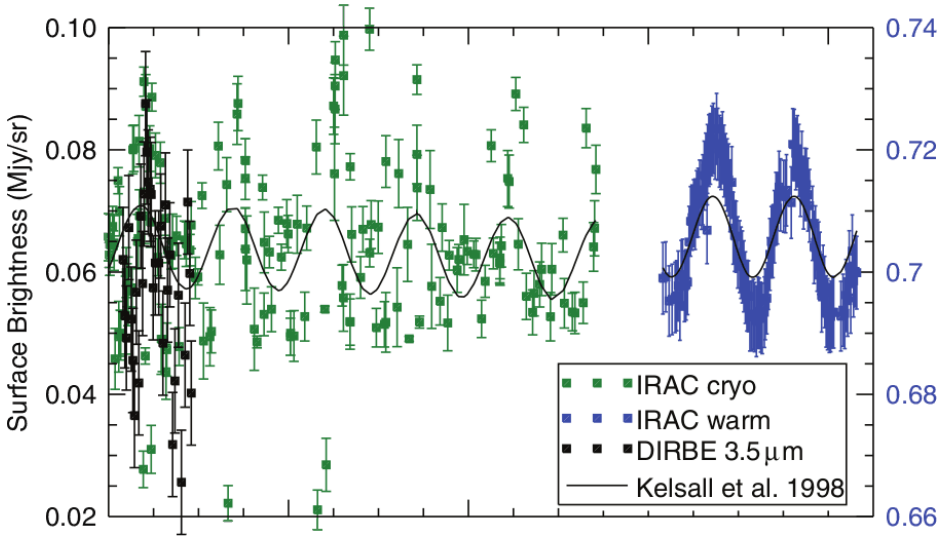
  – Variation of background brightness due to ZL

  → Useful for ZL study, but no good data in near-IR

@ 9 μm (Pyo et al. 2010)

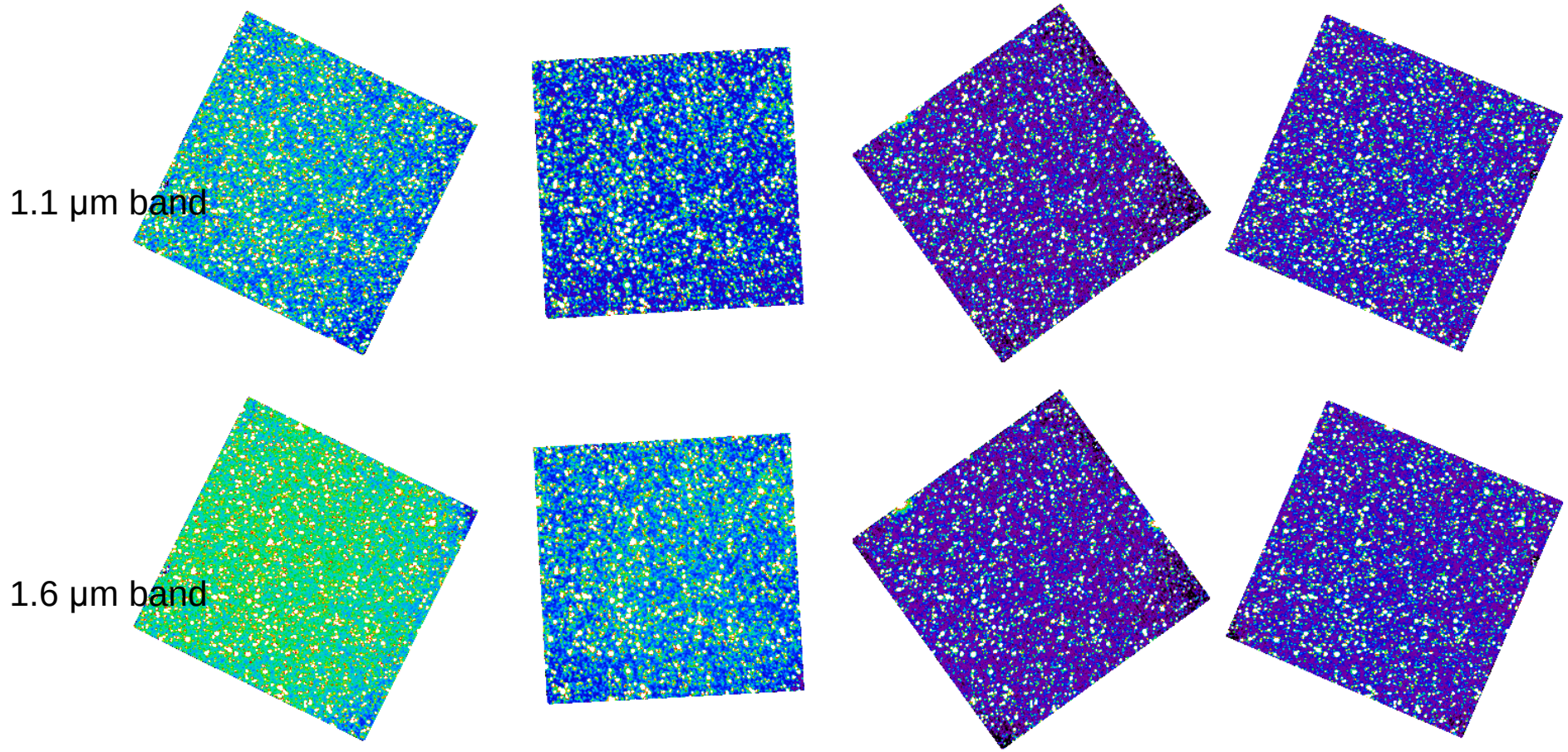


@ 3.6 μm (Krick et al. 2010)



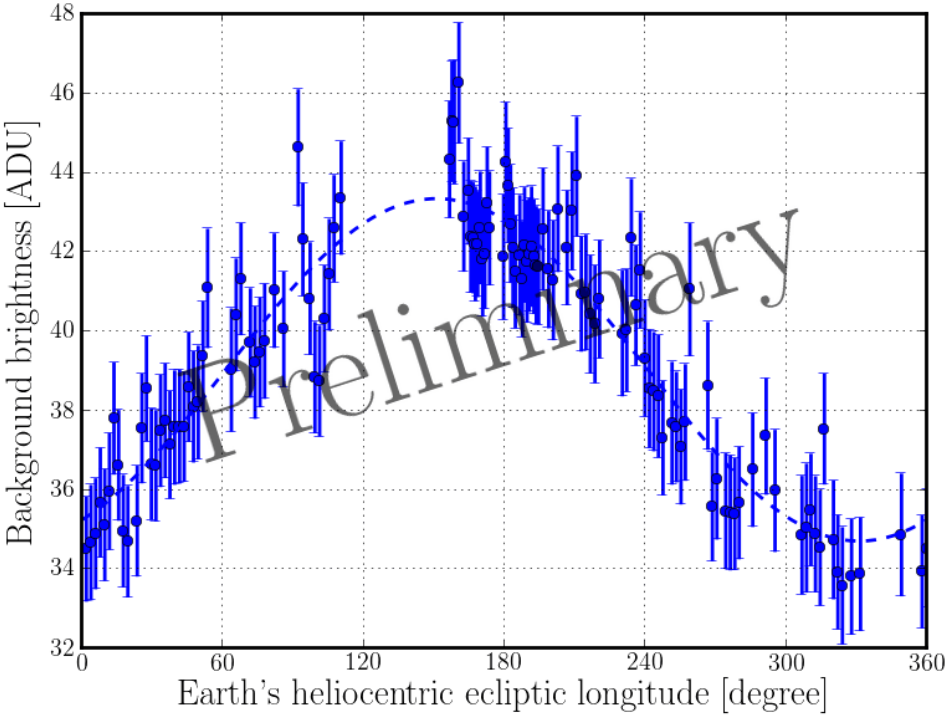
Time in years starting from Dec. 1 2013

NEP Monitoring

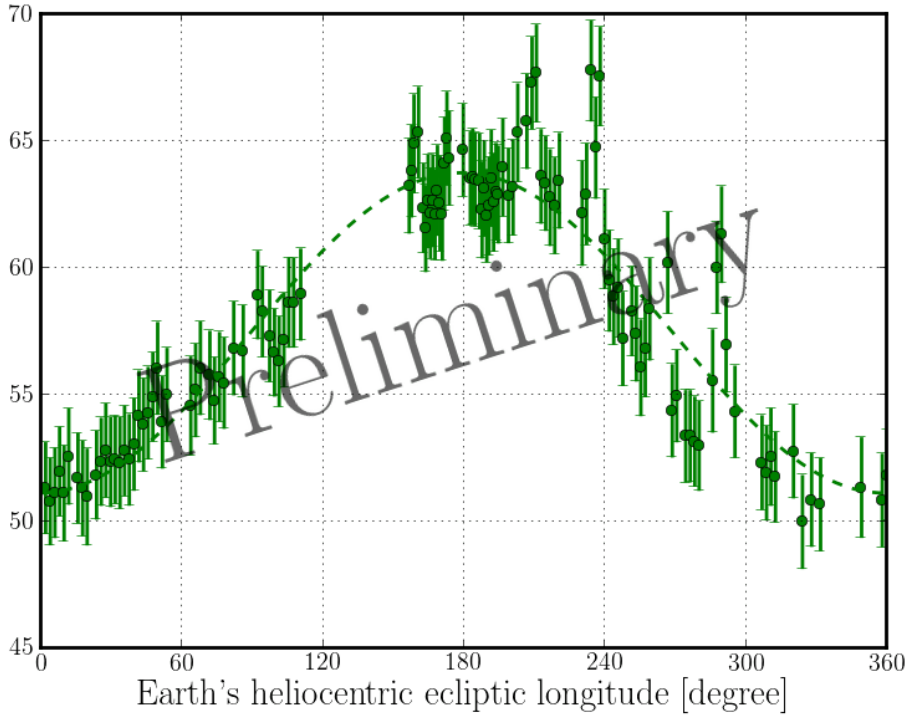


NEP Monitoring

1.1 μm band

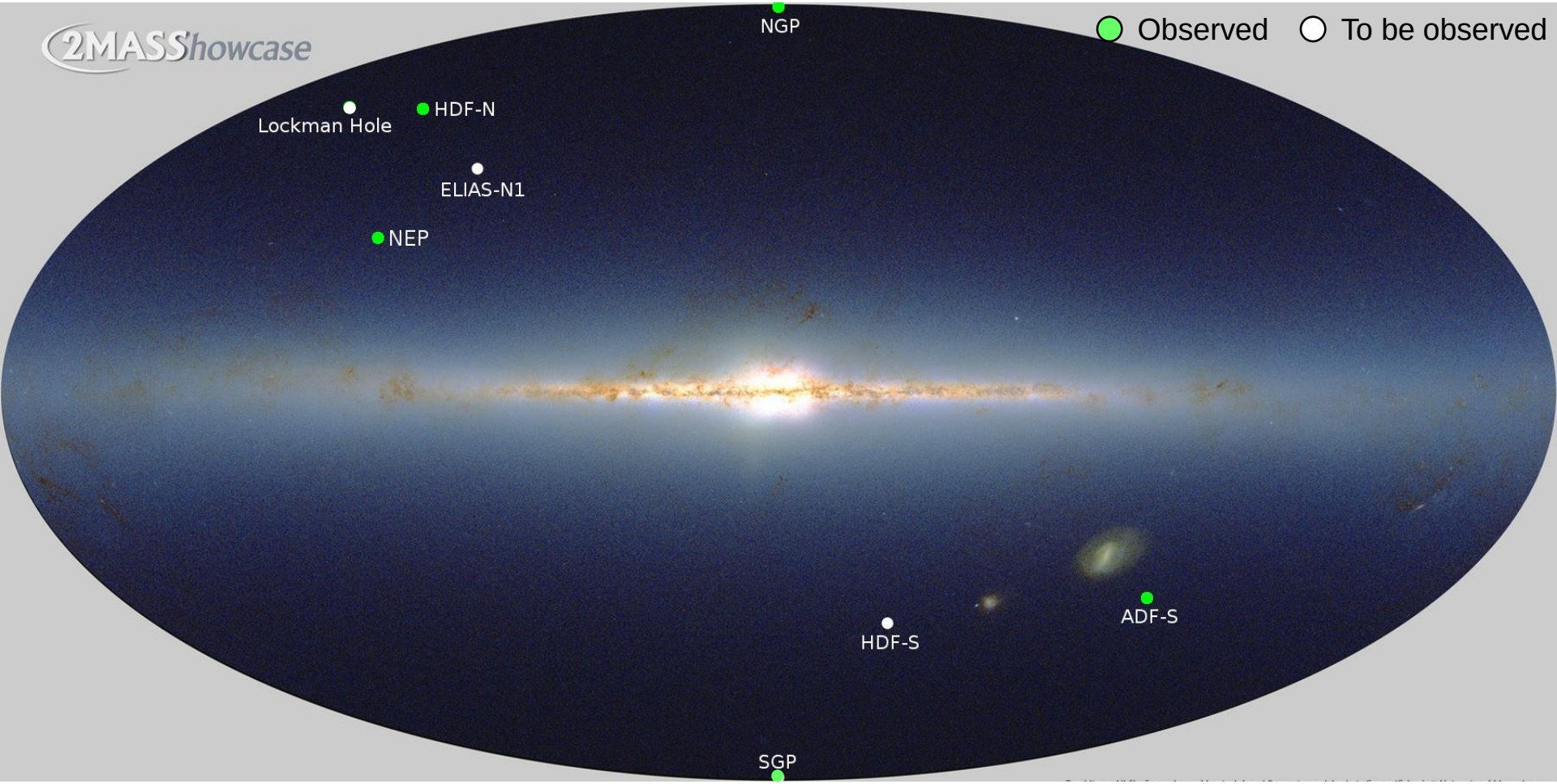


1.6 μm band



Cosmic Infrared Background

- Observations of **Deep Fields**



CIB Observations

- **Guest Observations**
  - Observations of **Dark Clouds** (Prof. Matsuura, ISAS)
    - On and off observations of dark clouds to study extragalactic background light
  - Observations of **Galaxy Clusters** (Prof. Matsumoto and Mr. Min Gyu Kim)
    - To study intrahalo light of galaxy clusters

Future Plans

- Large Area Surveys are completed.
- NEP Monitoring will continue by 2015 Mar.
- Issues
  - Background matching
  - Subtraction of ZL and DGL components