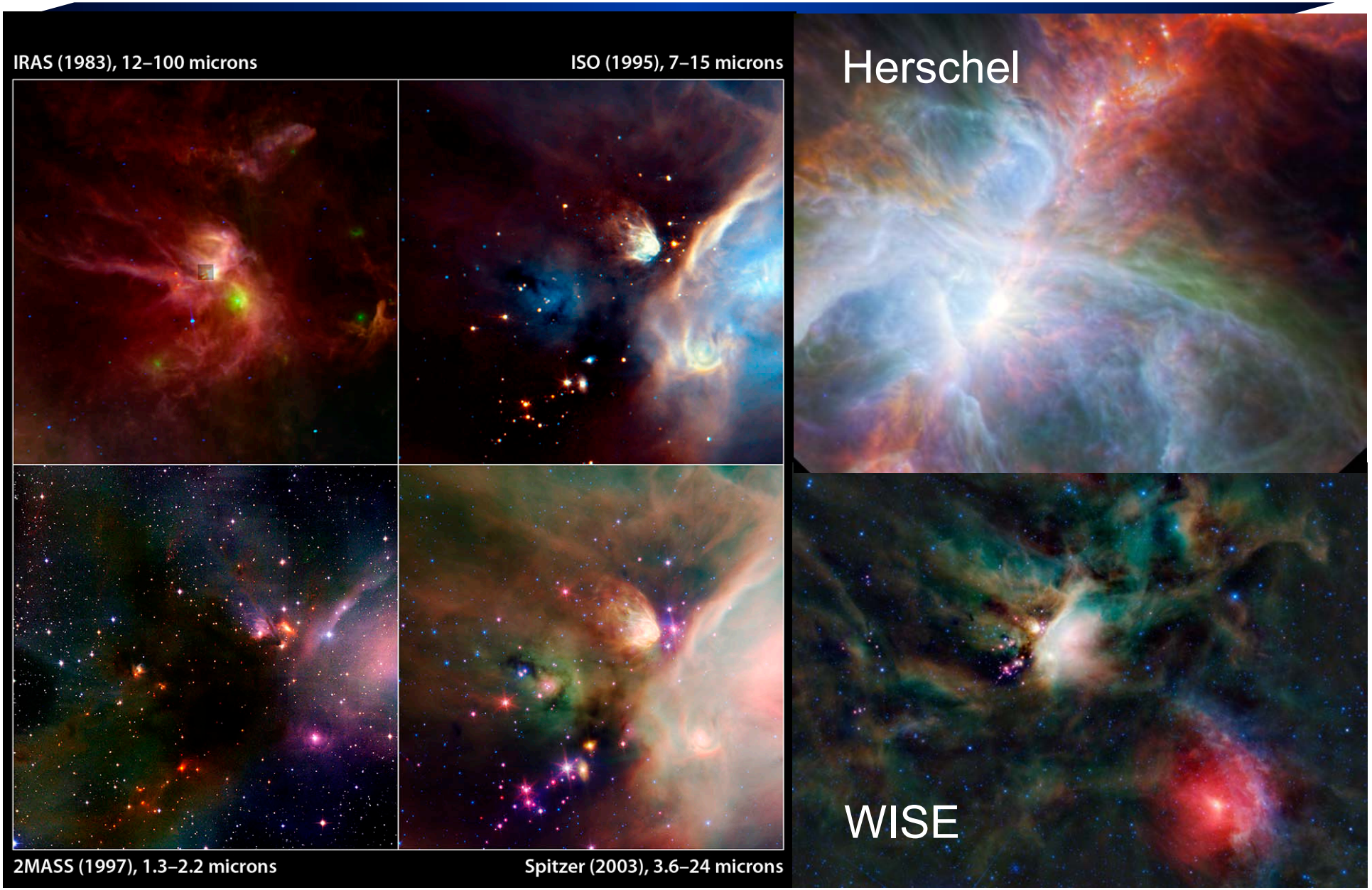
IPAC as Institutional Partner for the Far-IR Surveyor

Sean Carey (IPAC)

IPAC support for the FIR Surveyor STDT

- IPAC is eager to support the STDT and its mission
- IPAC can make substantial and cost-effective contributions to the STDT effort, based on
  - *Work and products from past missions,*
  - *expertise from past and current missions,*
  - *existing communication channels to FIR community*

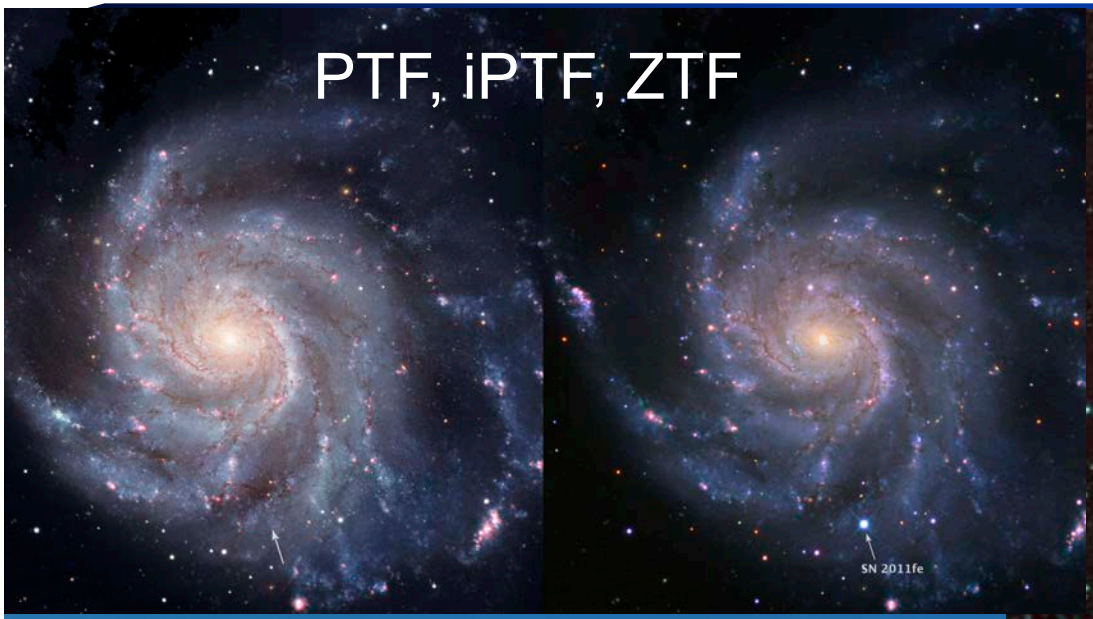
NASA's Infrared Processing and Analysis Center

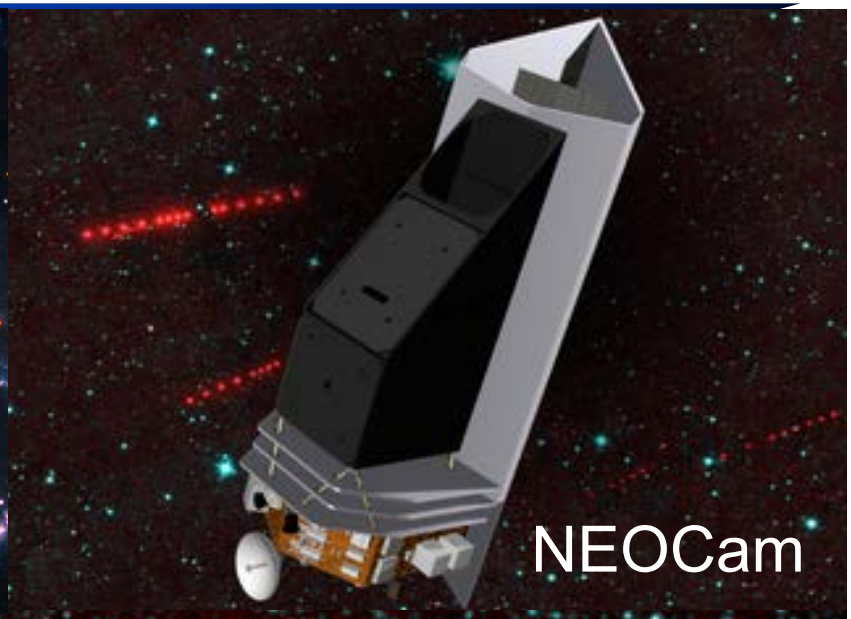


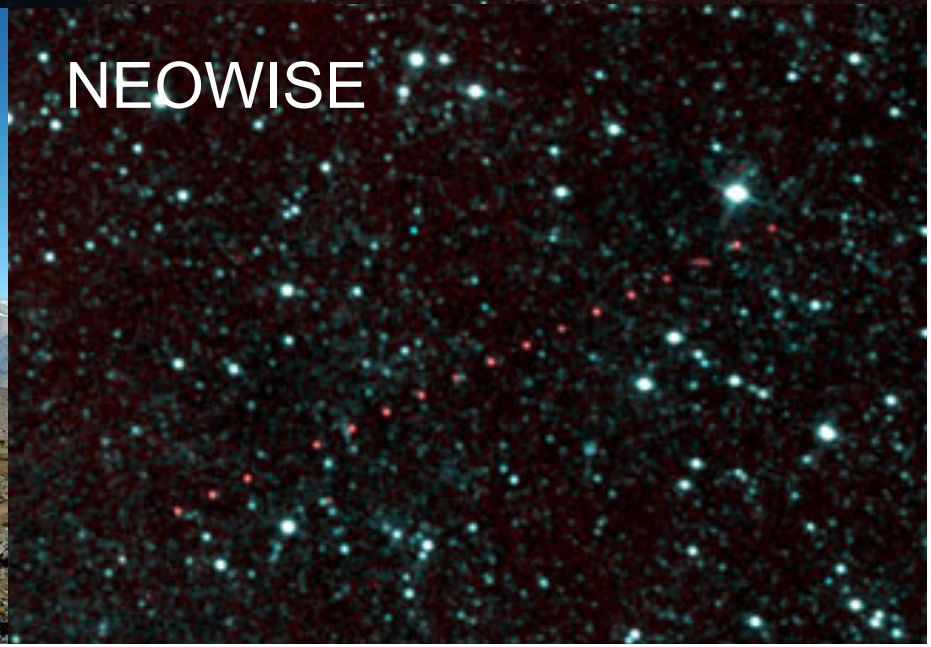
NASA's Infrared Processing and Analysis Center

- 30+ year legacy of supporting space-based IR astronomy
- General purpose observatories: ISO, Spitzer and Herschel
- Large surveys: IRAS, 2MASS, MSX, WISE, Planck
- Three main centers: Spitzer Science Center, NASA's Exoplanet Science Institure (NExScI), IPAC Classic
- Three Archives: InfraRed Science Archive (IRSA), NASA's Extragalactic Database (NED) and NASA's Exoplanet Archive
- 100+ dedicated scientists/engineers/programmers
- All stages of astronomical missions supported
  - *Formulation*
  - *Integration, Testing, Operations*
  - *Data Analysis and Pipeline Processing*
  - *User support and documentation*
  - *Archiving*

New Initiatives



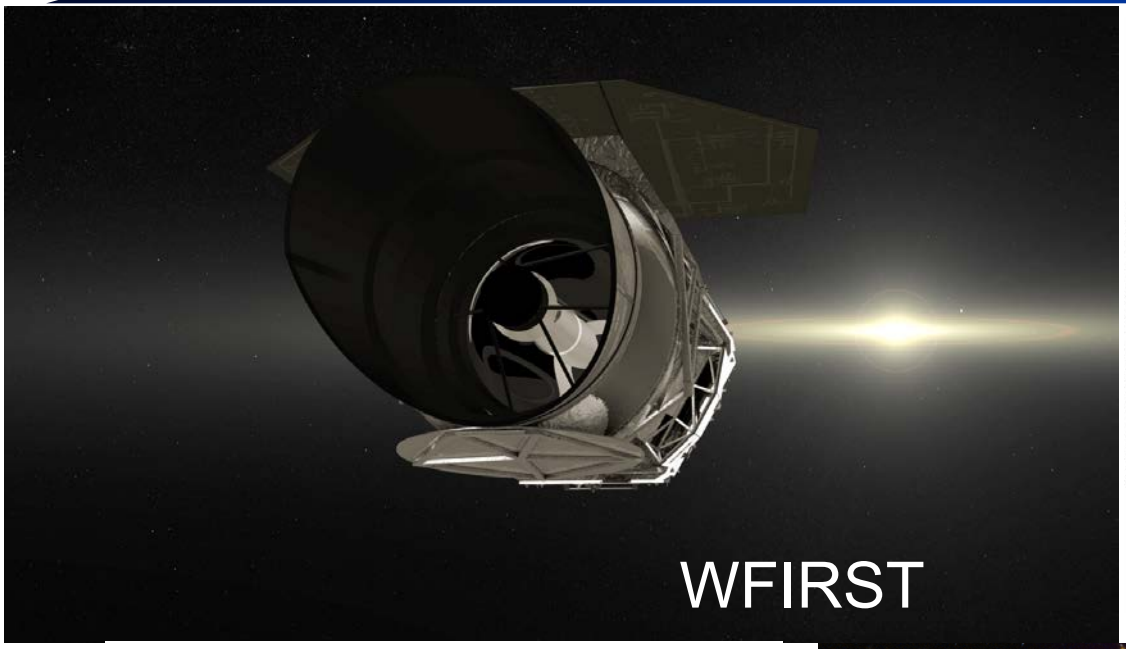


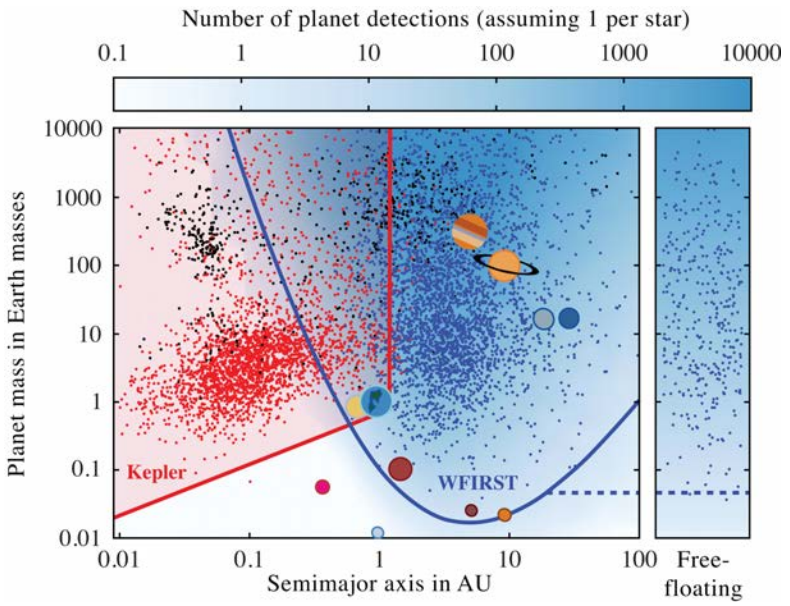


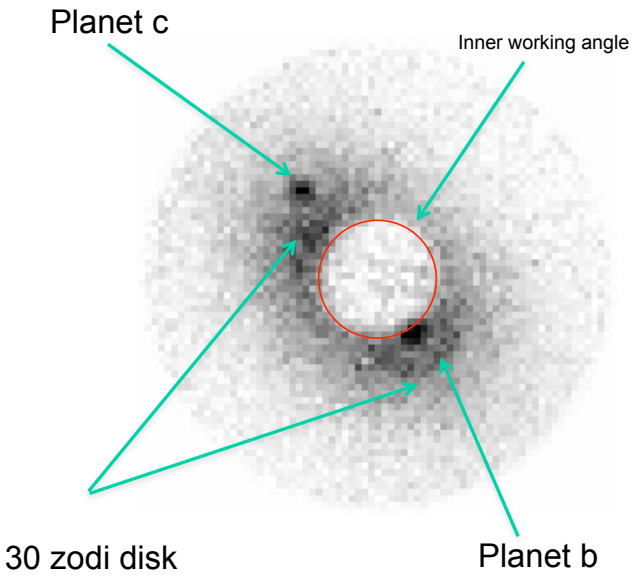
New Initiatives

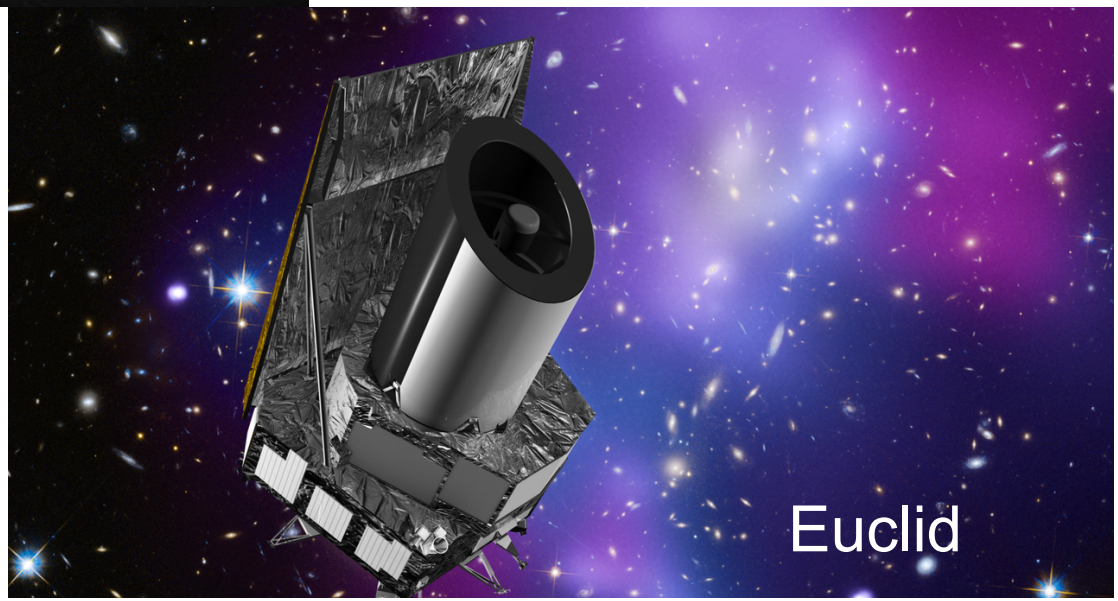
- Time-domain astronomy
  - *Science pipeline / archive for Palomar Transient Factory and Zwicky Transient Facility*
  - *Science User Tools for LSST*
- "Big Data" astronomy
  - *PTF, ZTF : Petabyte scale pipelines and archives*
  - *Synthesis of Galactic plane surveys: GLIMPSE, MIPSGAL, HiGal*
- Solar system science
  - *Rapid data processing and release*
  - *NEOWISE*
  - *NEOCam (in development)*

WFIRST and Euclid



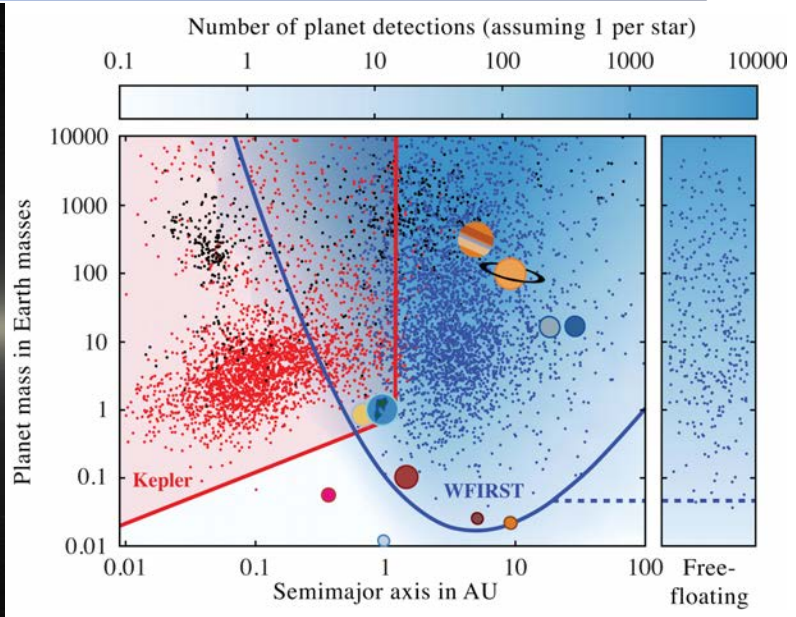


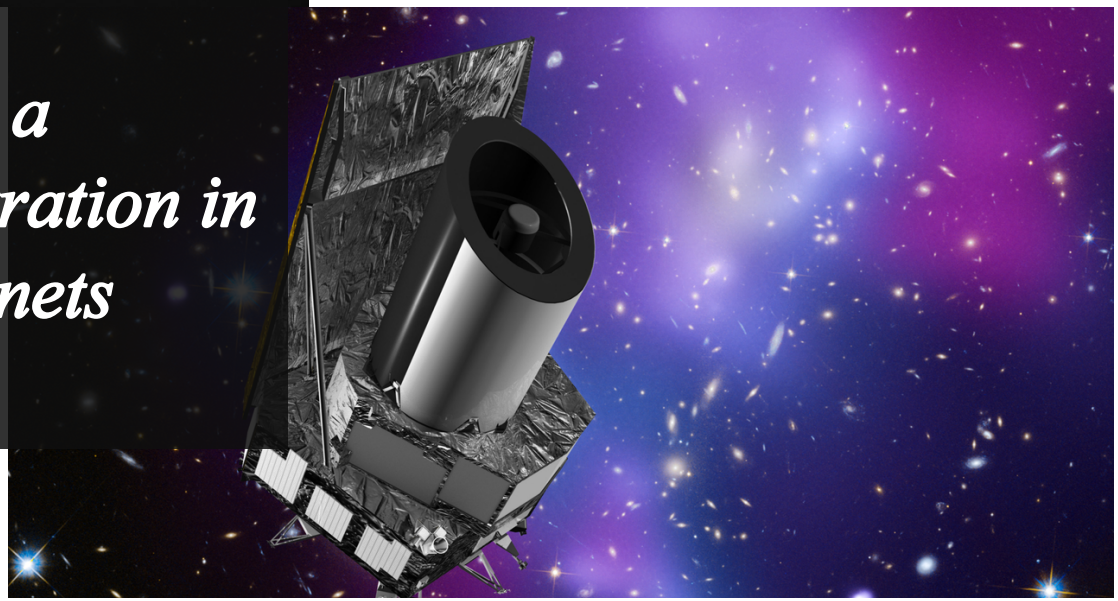




WFIRST and Euclid

- Science Centers for both WFIRST and Euclid
  - *NASA Euclid Science Center following in the tradition of the NASA centers for ISO, Herschel and Planck*
  - *WFIRST effort has a significant concentration in the study of exoplanets*

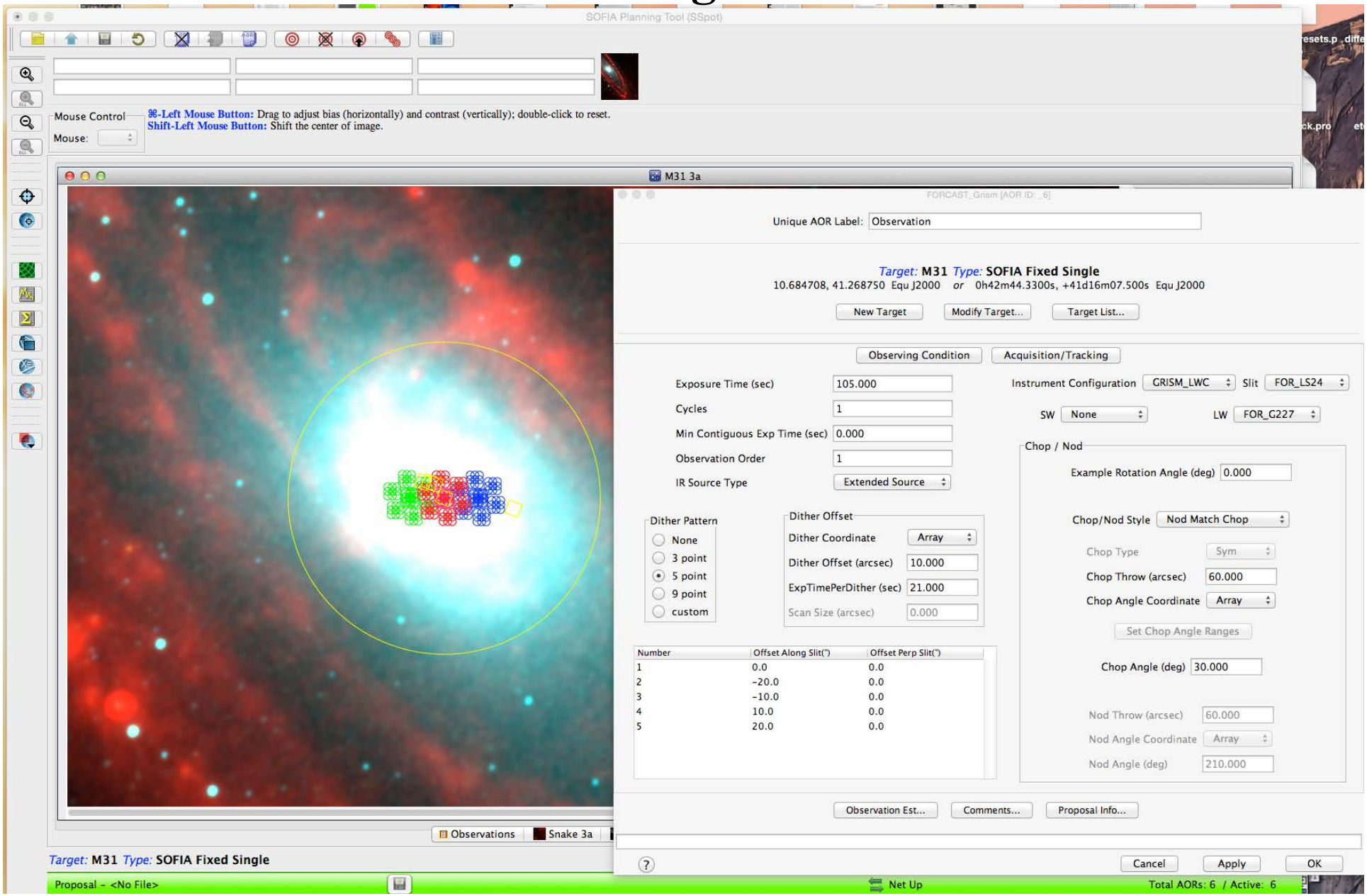




Potential Science Tool Contributions

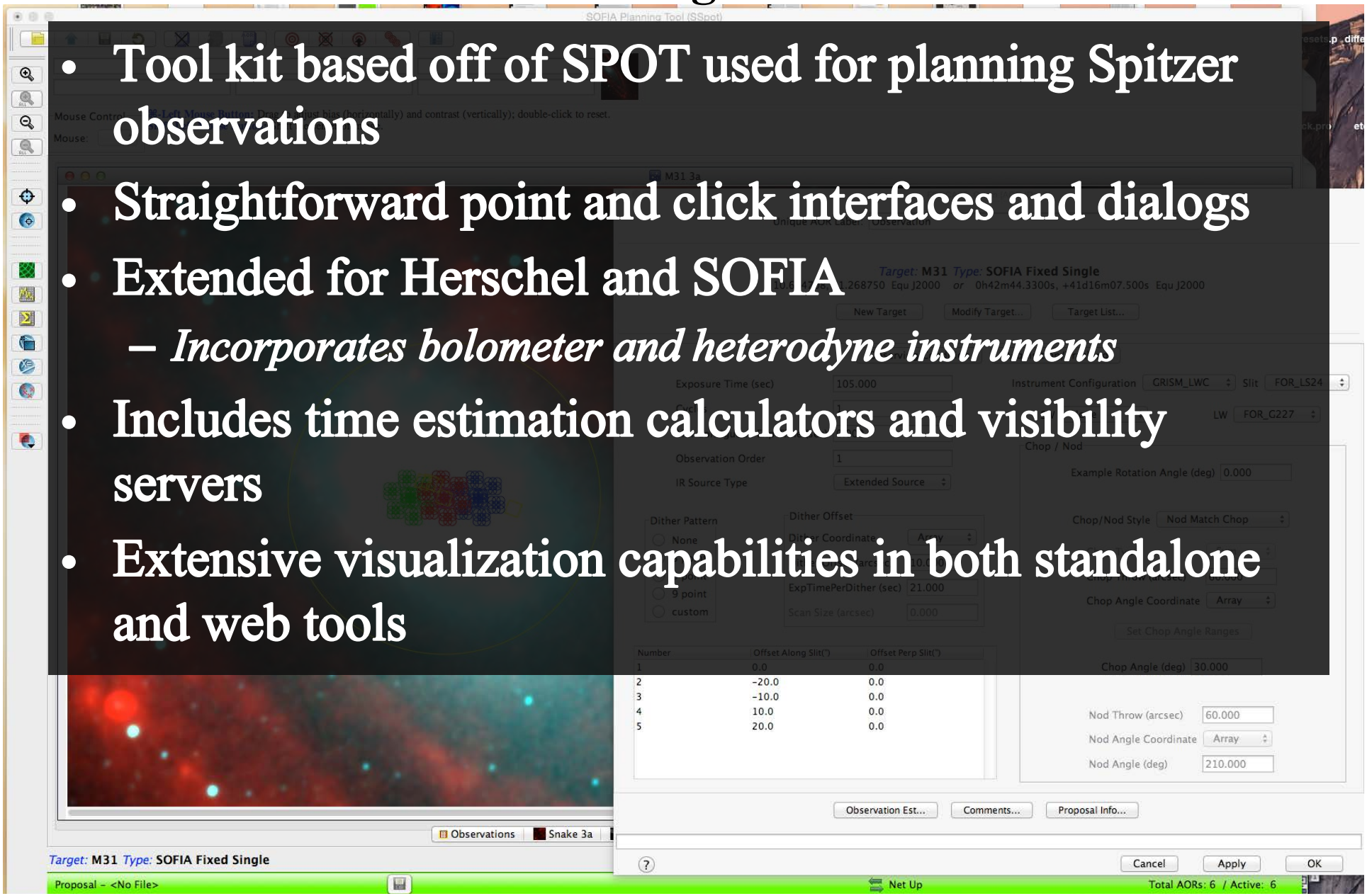
- Background estimators (Zodiacal, Milky Way, CIB, CMB) and brightness fluctuation estimators [Adapt/extend existing tools]
- Confusion estimators (from galaxy counts and MW emission, continuum and lines) [Adapt/extend existing tools]
- Time estimators (from analytic approximations of performance) [Adapt/extend existing tools]
- Sky observing/data simulators (higher fidelity than time estimators) [leverage on-going simulation work and knowledge of FIR sky]
- Other tools as requested by STDT

Visualization and Observation Planning Tools

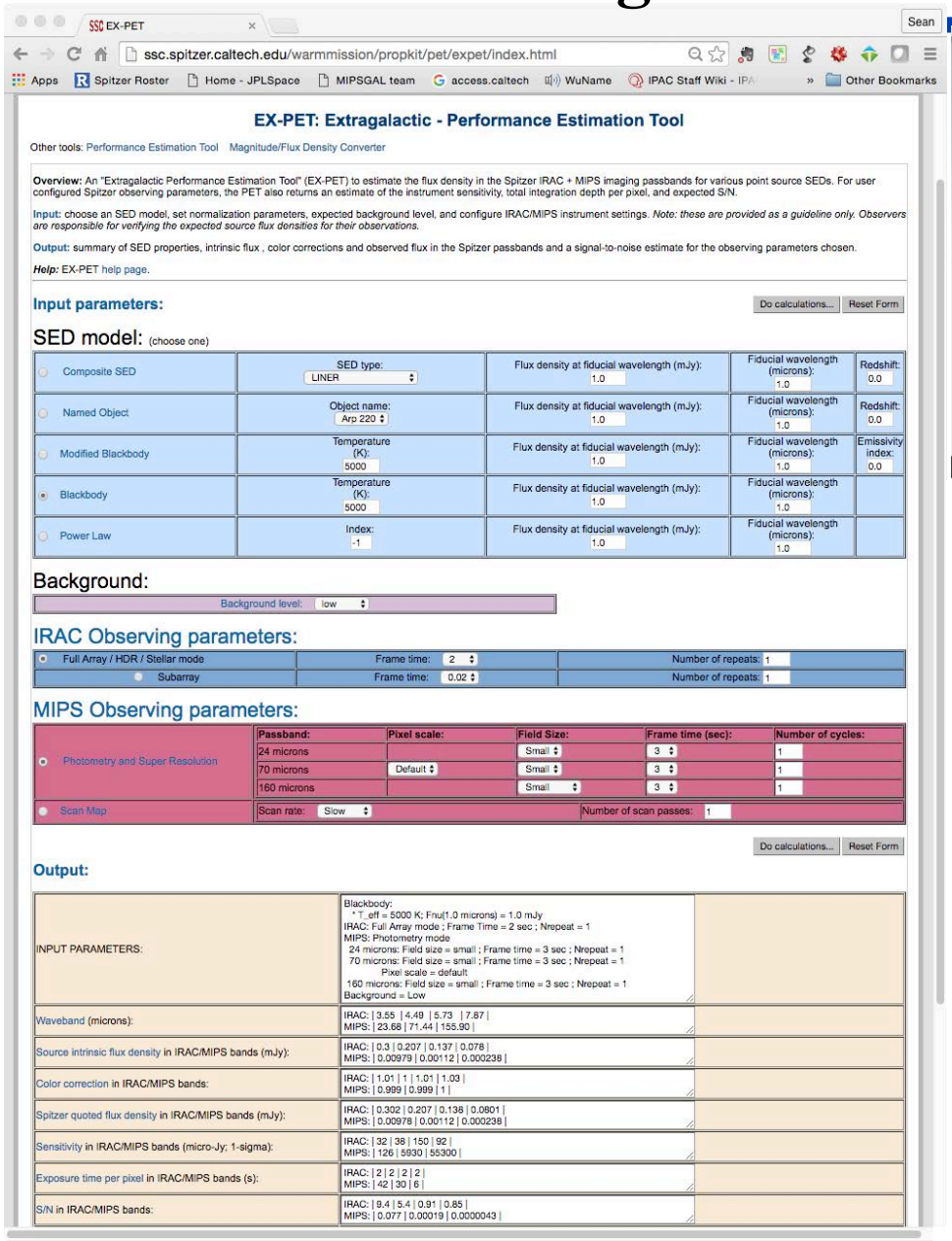


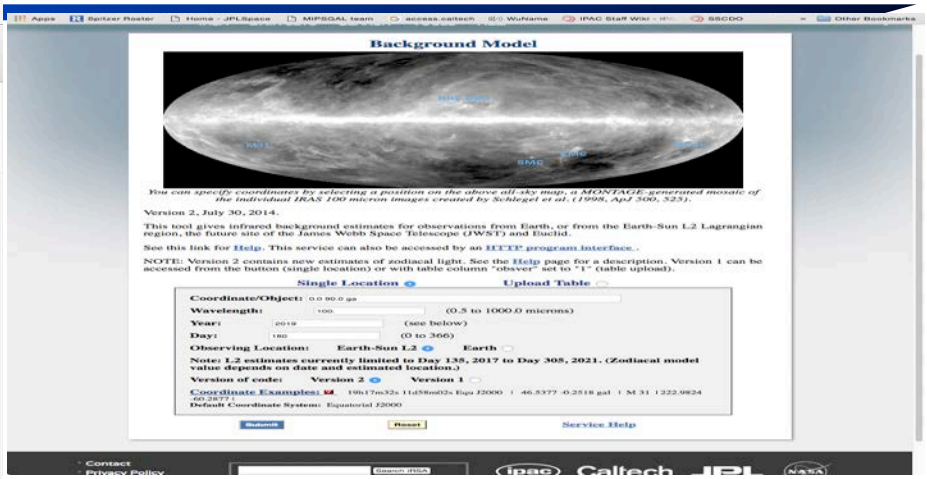
Visualization and Observation Planning Tools

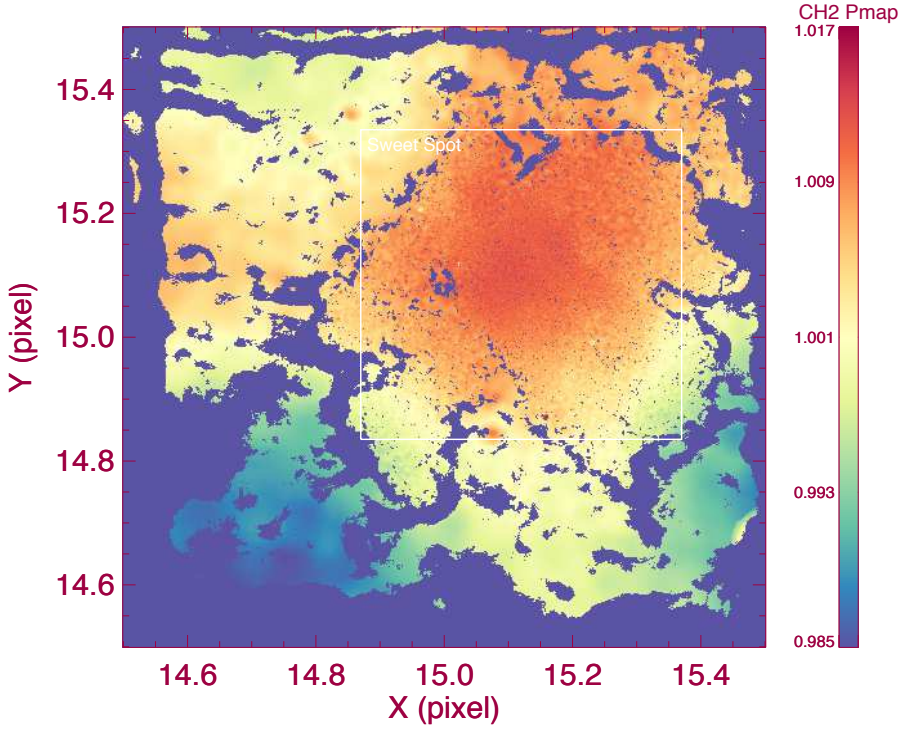
- Tool kit based off of SPOT used for planning Spitzer observations
- Straightforward point and click interfaces and dialogs
- Extended for Herschel and SOFIA
  - *Incorporates bolometer and heterodyne instruments*
- Includes time estimation calculators and visibility servers
- Extensive visualization capabilities in both standalone and web tools



Background Estimators and Integration Time Calculators

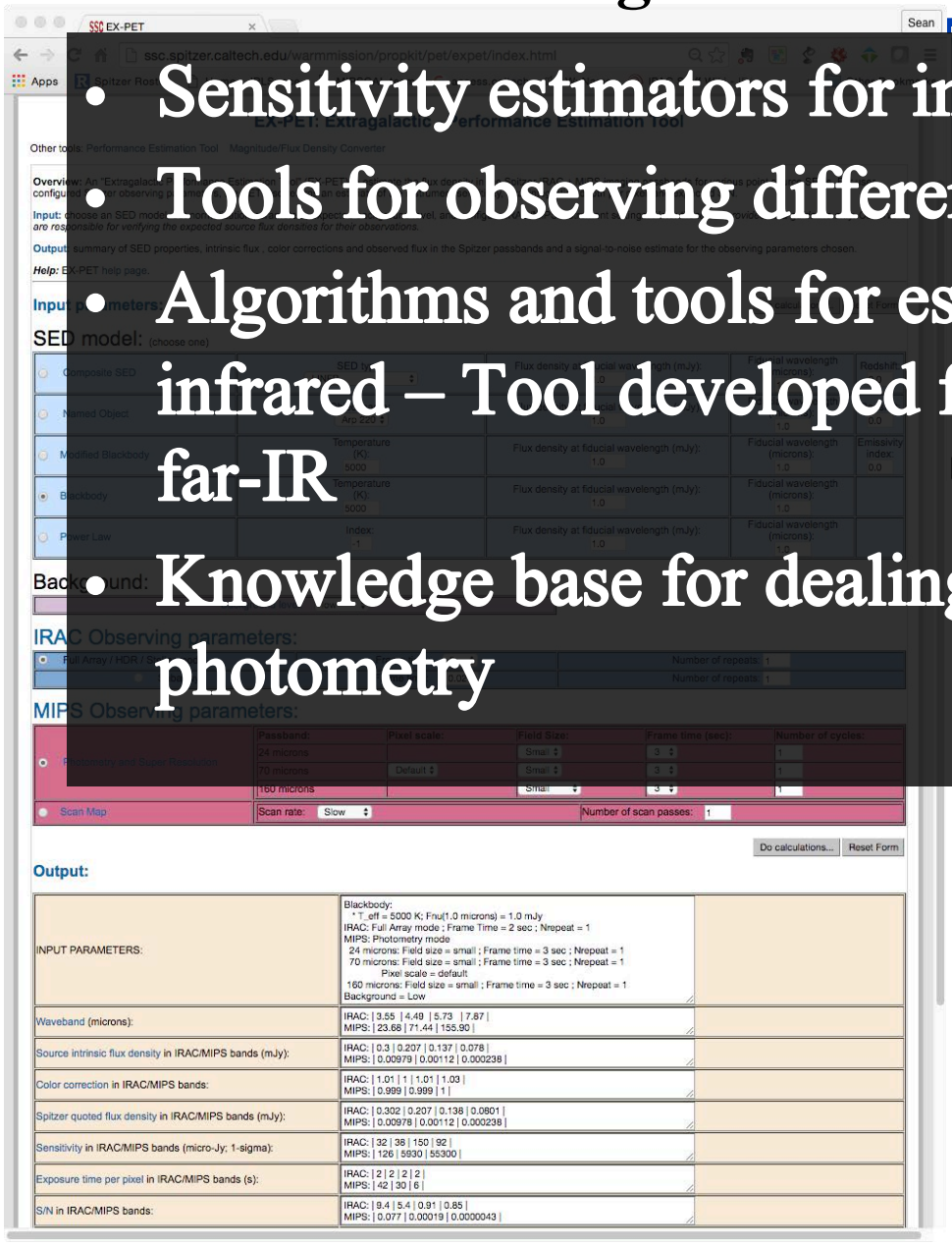


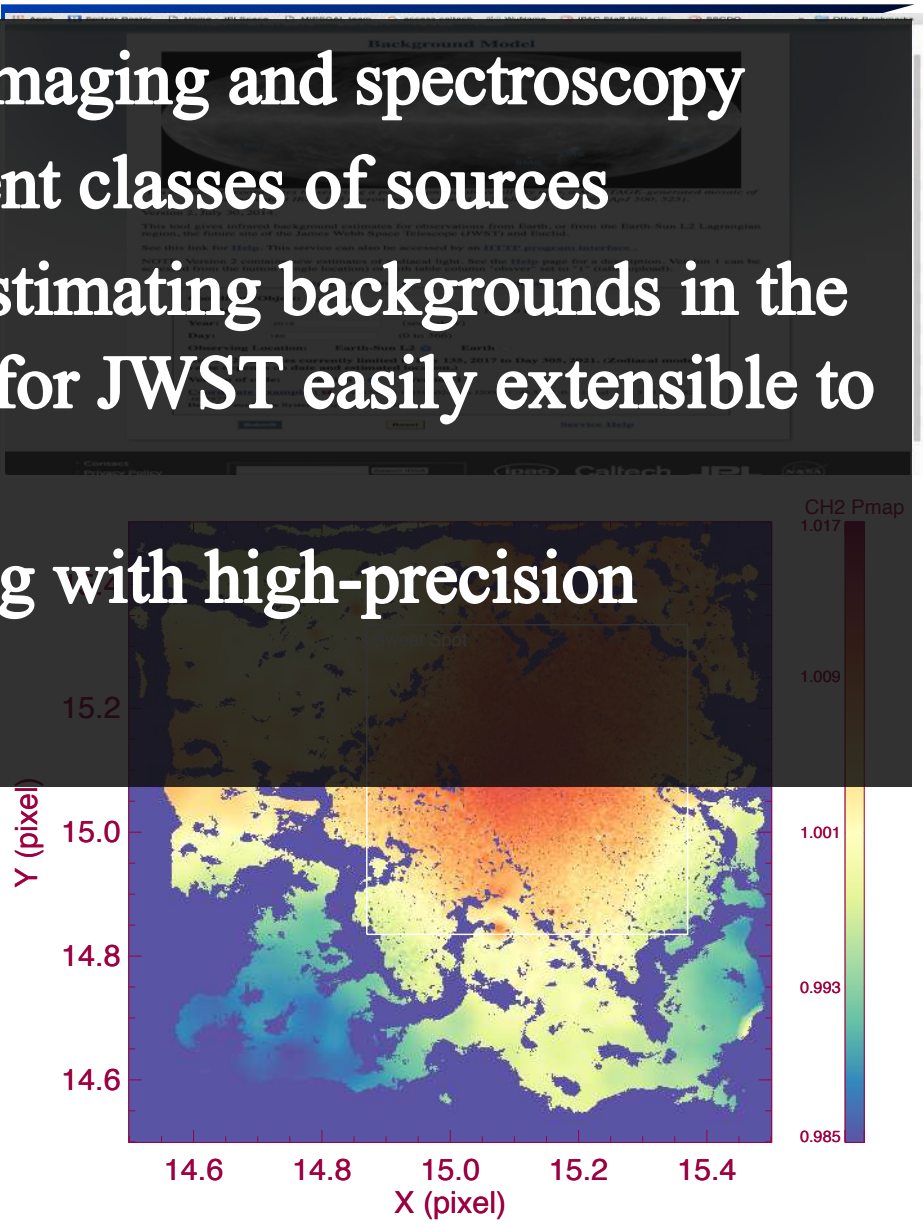




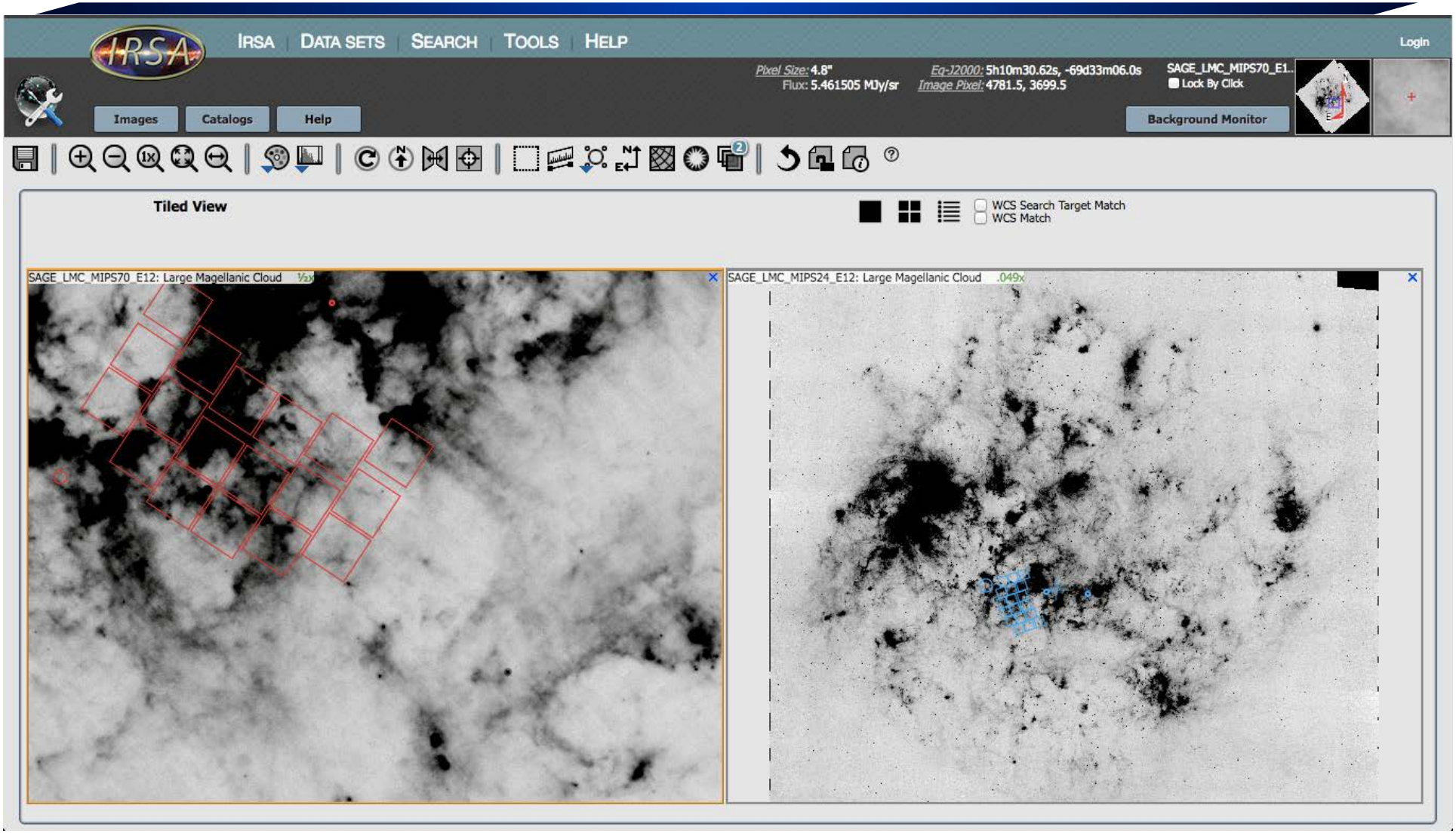
Background Estimators and Integration Time Calculators

- Sensitivity estimators for imaging and spectroscopy
- Tools for observing different classes of sources
- Algorithms and tools for estimating backgrounds in the infrared – Tool developed for JWST easily extensible to far-IR
- Knowledge base for dealing with high-precision photometry





Archive, Visualization and Data Manipulation



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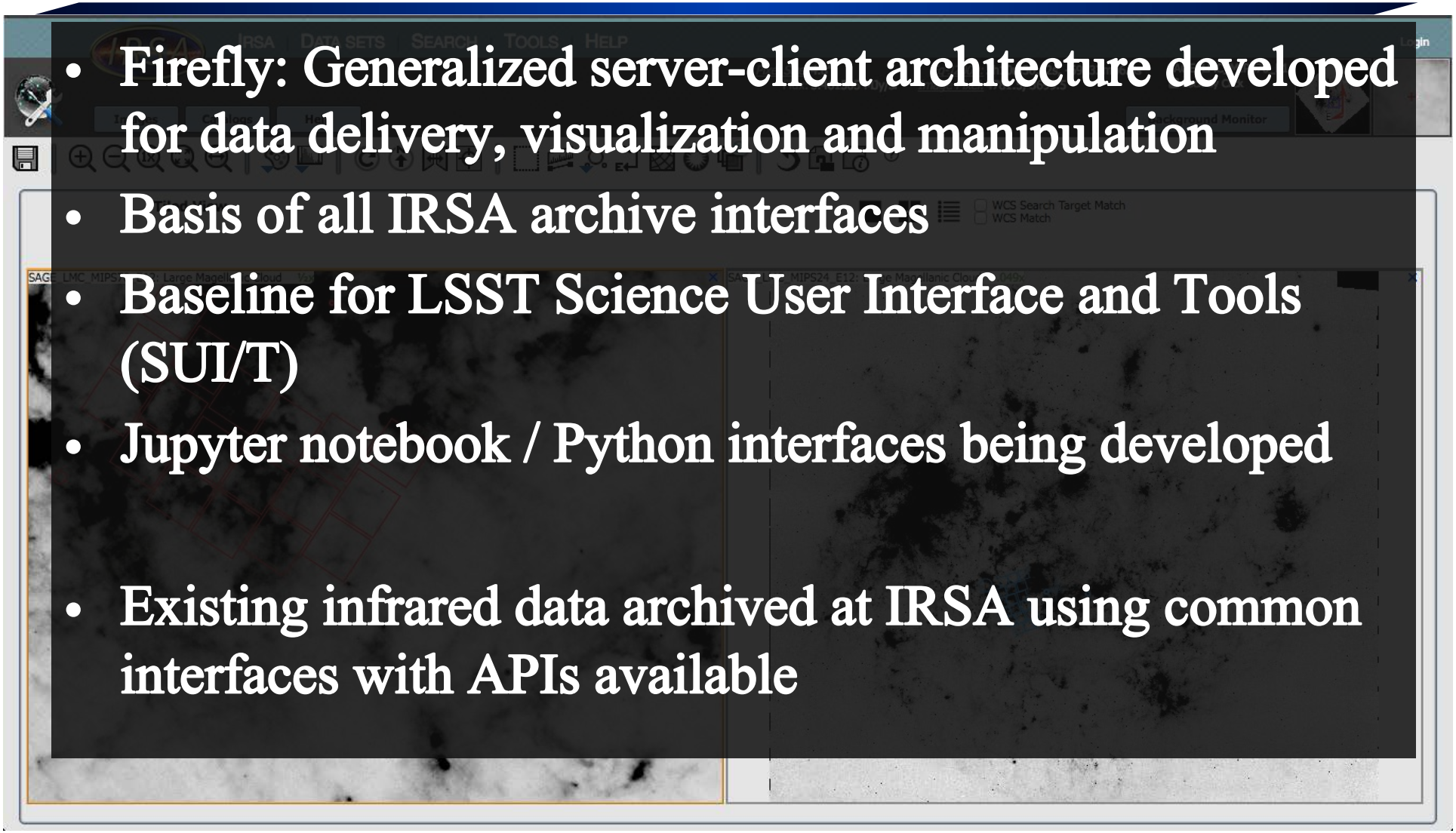

- Firefly: Generalized server-client architecture developed for data delivery, visualization and manipulation
- Basis of all IRSA archive interfaces
- Baseline for LSST Science User Interface and Tools (SUI/T)
- Jupyter notebook / Python interfaces being developed
- Existing infrared data archived at IRSA using common interfaces with APIs available

Collaborative Approach

- Science tool development:
  - *Algorithms scoped and formulated by the STDT, and implemented by IPAC*
  - *IPAC would develop the tools for any architecture or option, based on STDT guidance*
- Science operations tools:
  - *Framework would be scoped and formulated by the STDT, coordinated with the Study Center effort, and implemented by IPAC*
  - *IPAC would develop the tools for any architecture or option, based on STDT guidance, and participate in related trade studies*