Science Planning for a Limited Lifetime Mission - Spitzer Experience

Lisa Storrie-Lombardi, Spitzer Science Center
Asst. Director for Community Affairs

Introduction

- **Spitzer had a 2.5 year prime mission lifetime requirement, goal of 5 years (lasted 5.5)**
- **Spitzer had no precursor 'finder charts' at the sensitivity levels it would reach**
- **typical science cycle too long for a 2.5 year mission**

propose → observe → analyze → publish→ interpret → repeat

How to Maximize Science?

- **Legacy Science Program**
- **First Look Survey**
- **Second-Look Observations**

Legacy Science Program

- **Select large, public programs to execute early in the mission**
- **Require data products to be returned to the archive**
- **Criteria for competitive peer review**
  - Large, coherent projects, not reproducible by any reasonable number of combination of smaller GO programs
  - General and lasting importance to the broad astronomical community with the Spitzer observational data yielding a substantial and coherent database
  - Data public domain immediately upon processing and validation, thereby enabling timely follow-up

Legacy Science Program (2)

- **6 programs, 3160 hours selected in November 2000**
  - Launch scheduled for 2001 when call for proposals issued, actual 2003
- **Executed in first year of the mission**
  - Half of the data in first year was non-proprietary
- **Legacy programs solicited in Cycles 2-5**
  - Continued with zero proprietary period and return of enhanced data products
- **Legacy enhanced data products are some of the most popular data available in the archive**
  - Same experience HST has with deep fields and Treasury programs

First Look Survey

- **First Look Survey (FLS) was designed to provide data to the community that characterized the Spitzer sky**
- **100 hours of Director's Discretionary Time**
  - 3 components: extragalactic, galactic, asteroids
  - Observations and field selection based on community input workshops
  - Execution and data reduction done by the SSC
- **First observations executed in nominal operations**
  - After 60-day In-Orbit Check-out, 30-day Science Verification phases
  - Early Release Observations primarily executed during IOC and SV

Second-Look Observations

- **Spitzer cryogenic mission proposals allowed the inclusion of 'second-look' targets**
  - Defined as something you could predict but you did not know the target positions
  - Used frequently with imaging surveys that proposed second-look spectroscopic observations
  - Did not have to wait for the next cycle to do spectroscopy on all of your targets

Other Observing Programs

- **All other General and Guaranteed Time Observer programs had nominal one-year proprietary periods**
- **Many large programs waived the proprietary period (Legacy programs always zero)**
- **DDT programs have default zero proprietary period**
  - Can request a maximum of 90-days

Warm Mission

- **> 75% of the time awarded to > 500 hour programs**
  - Default zero proprietary period, can request 90 days
- **All other programs have default one-year proprietary periods**
  - Many large (> 100 hour programs) waive the proprietary period or ask for a shorter period (90-180 days)

Landscape in 2003

- **HST, Chandra, XMM operating**
- **GALEX launched in April**
- **Spitzer launched in August**
- **SWIFT, Fermi, Kepler, WISE, Herschel, Planck coming in the future**
  - SWIFT: 2006, Fermi: 2008, all others launched in 2009
- **JWST approved and planned for 2011 launch**

Landscape in 2018

- HST?, Chandra?, TESS operating
- HST, Spitzer, Chandra, Kepler, etc. will have provided substantial initial target lists for JWST
- At launch, JWST data reduction pipelines, tools, etc., should be much more mature leading to a faster turnaround in data observation-to-publication

Closing Thoughts

- The Spitzer project implemented innovative programs to provide data to the community early in the mission to maximize the overall science return
- Typical time period from observation to publication is 2-3 years, regardless of the proprietary period
- Need creative policies to address the conflicting drivers, provide reward to GTOs, get data out early and prime the follow-up cycle to accelerate and maximize the science.