

Frontier Fields

Posted: 30 Apr 2012

Updated: 31 Mar 2020



- **IRSA/Spitzer science data products:** <http://irsa.ipac.caltech.edu/data/SPITZER/Frontier/>
- **MAST/HST science data products:** <http://archive.stsci.edu/prepds/hff/>

The Hubble and Spitzer projects proposed to do new public deep field observations as part of the NASA 2012 Senior Review. After considering valuable advice from the astronomical community and a broad range of open questions in galaxy evolution, an advisory committee unanimously recommended HST and Spitzer undertake a program of six deep fields centered on strong lensing galaxy clusters in parallel with six deep "blank fields". Spitzer data are essential for this program because they enable measurements of physical parameters such as stellar mass and age and differentiate between high ($z > 5$) and low ($z < 3$) redshift galaxies with similar 0.3-2 micron colors. Spitzer has committed to observing these fields as a major DDT program.

The key science goals the Spitzer data addresses in these new frontier fields are:

- to solidify our understanding of the stellar masses and star formation histories of sub-L* galaxies at the earliest times
- to provide the first statistically meaningful characterization of the stellar populations in star forming galaxies at $z > 5$
- to find $z > 8$ galaxies magnified enough by cluster lensing for spectroscopic follow-up.

The full report and recommendations can be found on the <http://www.stsci.edu/hst/campaigns/frontier-fields/>

Download science data products from IRSA:
<http://irsa.ipac.caltech.edu/data/SPITZER/Frontier/>

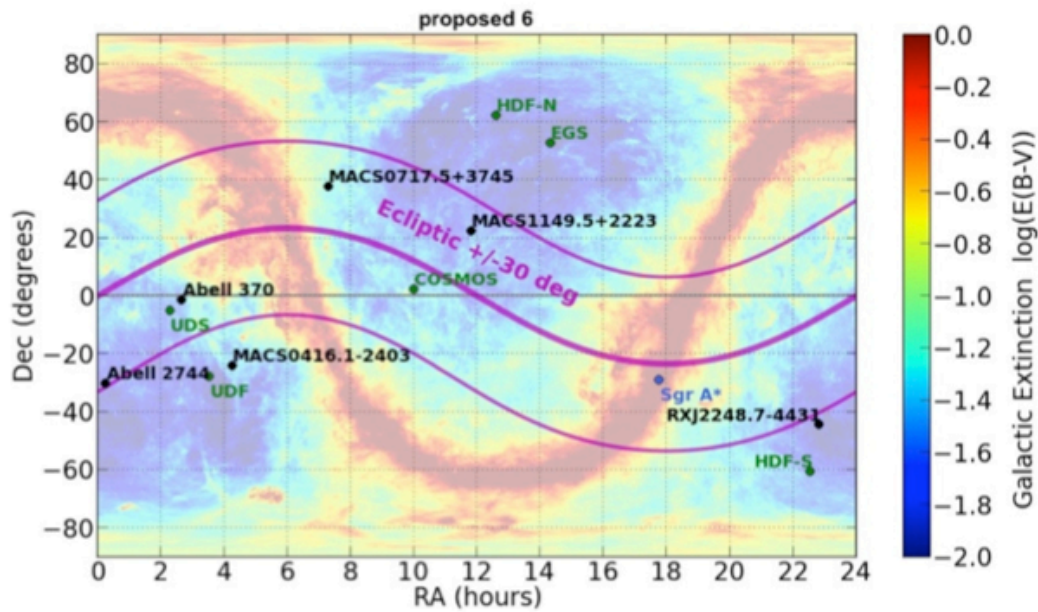
Cluster Name	z	Cluster		Parallel Field		PID	Program Name
		RA	Dec	RA	Dec		
Abell 2744	0.308	00:14:21.2	-30:23:50.1	00:13:53.6	-30:22:54.3	83, 90257	FRONTIER_A2744
MACSJ0416.1-2403	0.420	04:16:08.9	-24:04:28.7	04:16:33.1	-24:06:48.7	80168, 90258	FRONTIER_MACSJ0416
MACSJ0717.5+3745	0.545	07:17:34.0	+37:44:49.0	07:17:17.0	+37:49:47.3	40652, 60034, 90009, 90259	FRONTIER_MACSJ0717
MACSJ1149.5+2223	0.543	11:49:36.3	+22:23:58.1	11:49:40.5	+22:18:02.3	60034, 90009, 90260	FRONTIER_MACSJ1149
RXCJ2248.7-4431	0.348	22:48:44.4	-44:31:48.5	22:49:17.7	-44:32:43.8	60034, 10170	FRONTIER_RXCJ2248
Abell 370	0.375	02:39:52.9	-01:34:36.5	02:40:13.4	-01:37:32.8	137, 60034, 10171	FRONTIER_ABELL370

These targets were selected primarily on their predicted lensing strength*, their low/moderate zodiacal and Galactic backgrounds, their observability with ALMA and Mauna Kea, and their observability with HST

and Spitzer. We have also looked at their suitability for deep radio observations, and their existing multi-wavelength data observations.

(* Lensing strengths were calculated by Dan Coe, Johan Richard, and Adi Zitrin, based on existing HST data.)

If you use Frontier Fields data, please cite Lotz et al. (2017):
<http://adsabs.harvard.edu/abs/2017ApJ...837...97L>



Frontier Fields Locations

Spitzer Implementation

Spitzer has committed to supporting this effort and will provide commensurate data. In Cycles 9 and 10 a total of 50 hours of integration with IRAC will be spent in each of the 3.6 and 4.5 micron channels on the first four clusters to be observed by HST. If the Spitzer mission is extended past Cycle 10, then the last two clusters may be observed in future Cycles. We expect the nominal 5-sigma point source sensitivities to be 26.6 AB mag at 3.6 microns (channel 1) and 26.0 AB mag at 4.5 microns (channel 2). However, contributions from confusion and the intra-cluster light may mean the observations are less sensitive at the cluster core.

Two of the clusters (MACS0717 and MACS1149) are in a previously approved Spitzer Cycle-9 program SURFSUP (90009), and two more of the clusters (MACS0416 and MACS0717) were observed by the Cycle-8 program iCLASH (80168). New observations for these four clusters will receive commensurately less time. The observations from the Frontier Field program will be combined with those from these programs.

All data taken as part of the Frontier Fields program will have no proprietary period, and will be publically available for download from the <http://sha.ipac.caltech.edu/applications/Spitzer/SHA/>.

The SSC will be providing reduced image mosaics of Spitzer data for all six clusters as the data become available. However, the IRAC photometry will be heavily confused; especially in the cluster cores and so

no photometric catalogs will be made available. We encourage interested parties to apply for ADAP or HST-archival funding to analyze these data.

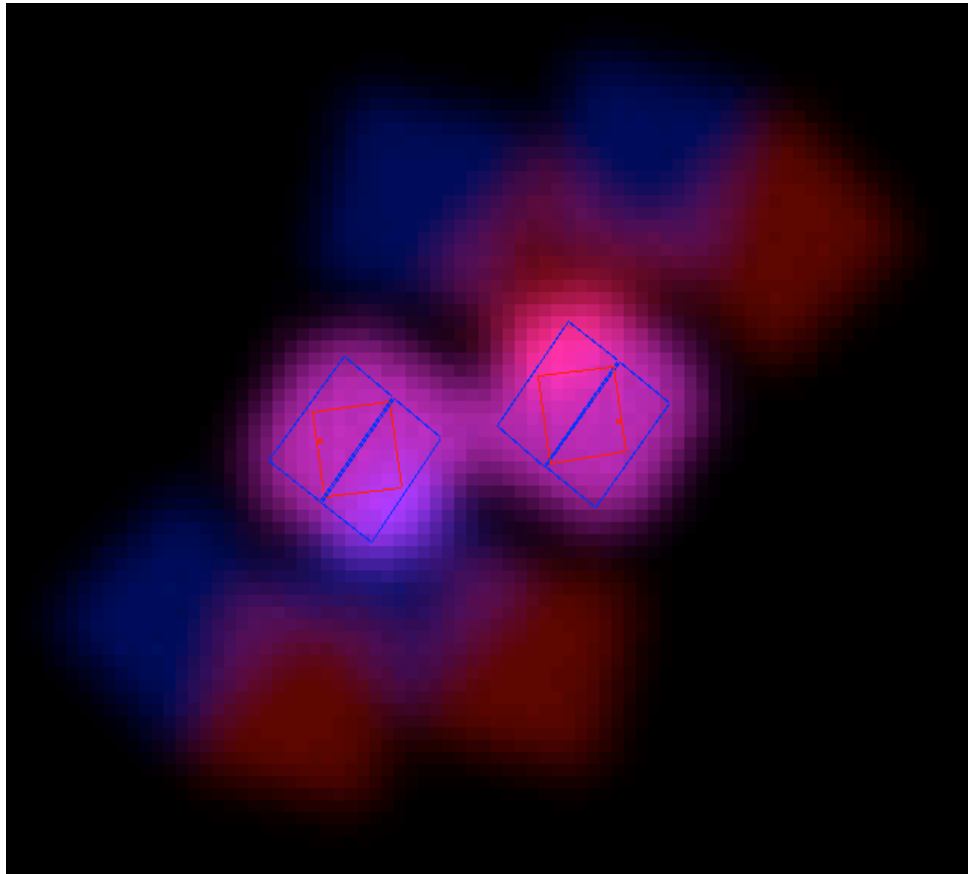
Existing and expected IRAC coverage maps are provided on this page along with quick reductions of the existing data. We will be updating these as more data become available.

Due to conflicting roll angle constraints with HST and Spitzer, the IRAC and HST fields of view could not be matched in PA. Furthermore, to maximize the depth of these observations we have constrained the observing windows to the lowest background periods. As a result there is a significant "flanking field" area covered by IRAC to 25h depth around the main HST fields.

Coverage Maps

Region files, fits files and other information is available as a link in the caption of each coverage image for the fields Spitzer has committed to observe in Cycles 9 and 10.

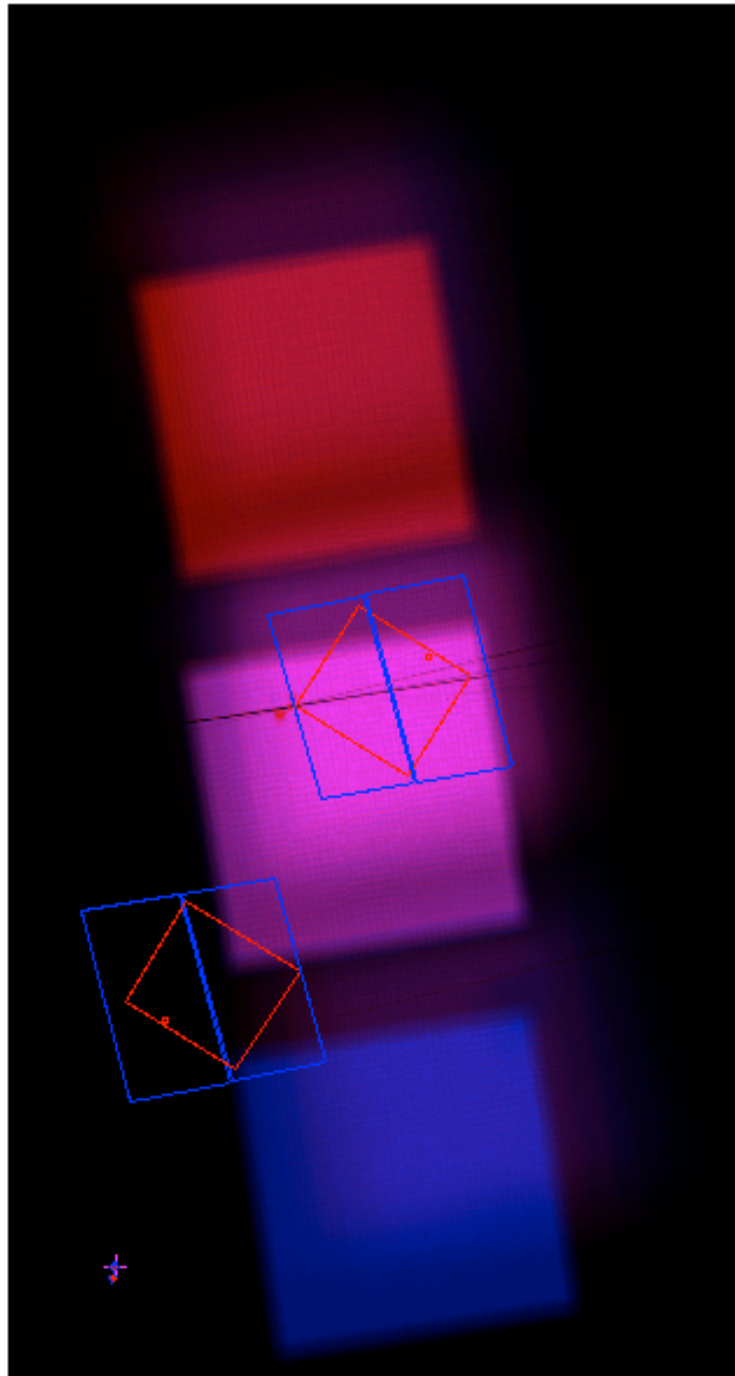
Abell 2744



Abell 2744

blue = Spitzer IRAC ch1, red = Spitzer IRAC ch2, magenta=both Spitzer channels, red line = HST WFC3, blue line= HST ACS

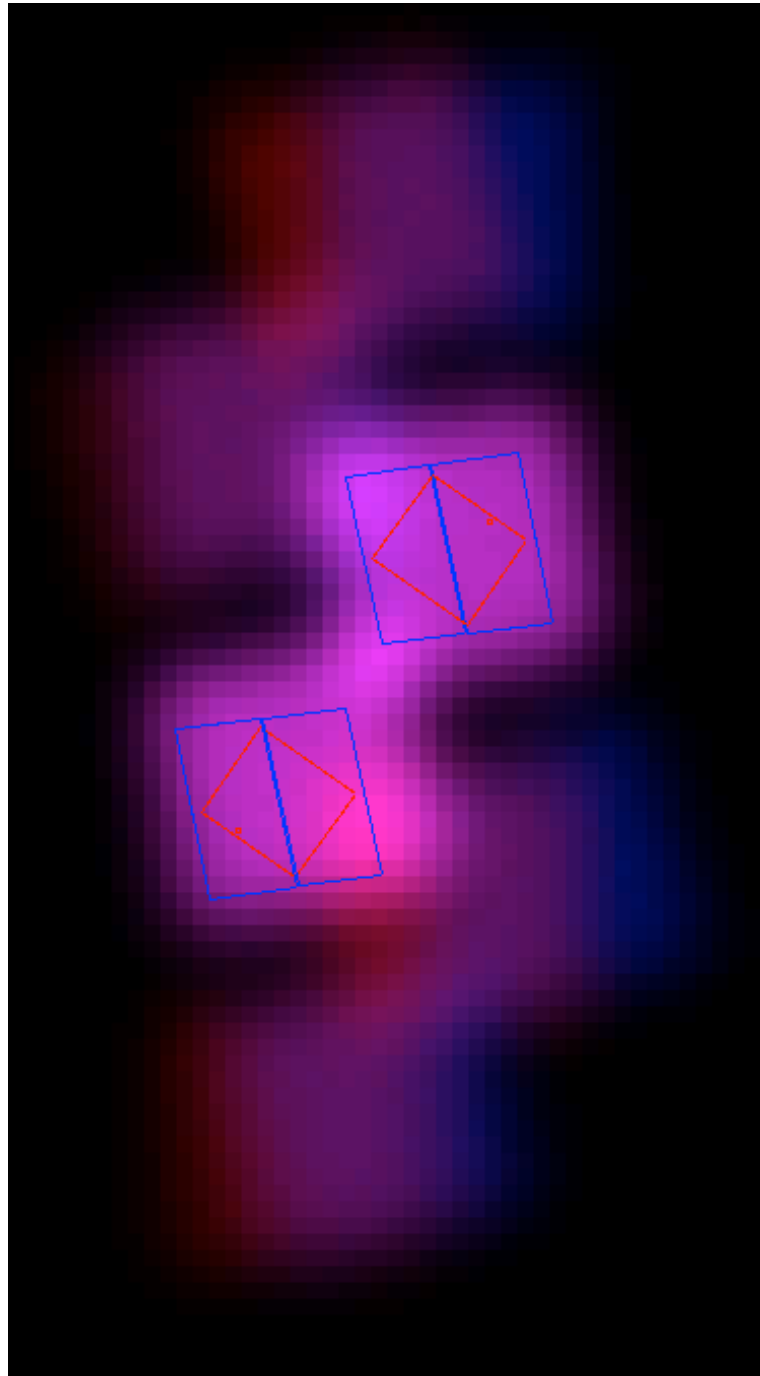
Abell 370



Abell 370

blue = Spitzer IRAC ch1, red = Spitzer IRAC ch2, magenta=both Spitzer channels, red line = HST WFC3, blue line= HST ACS

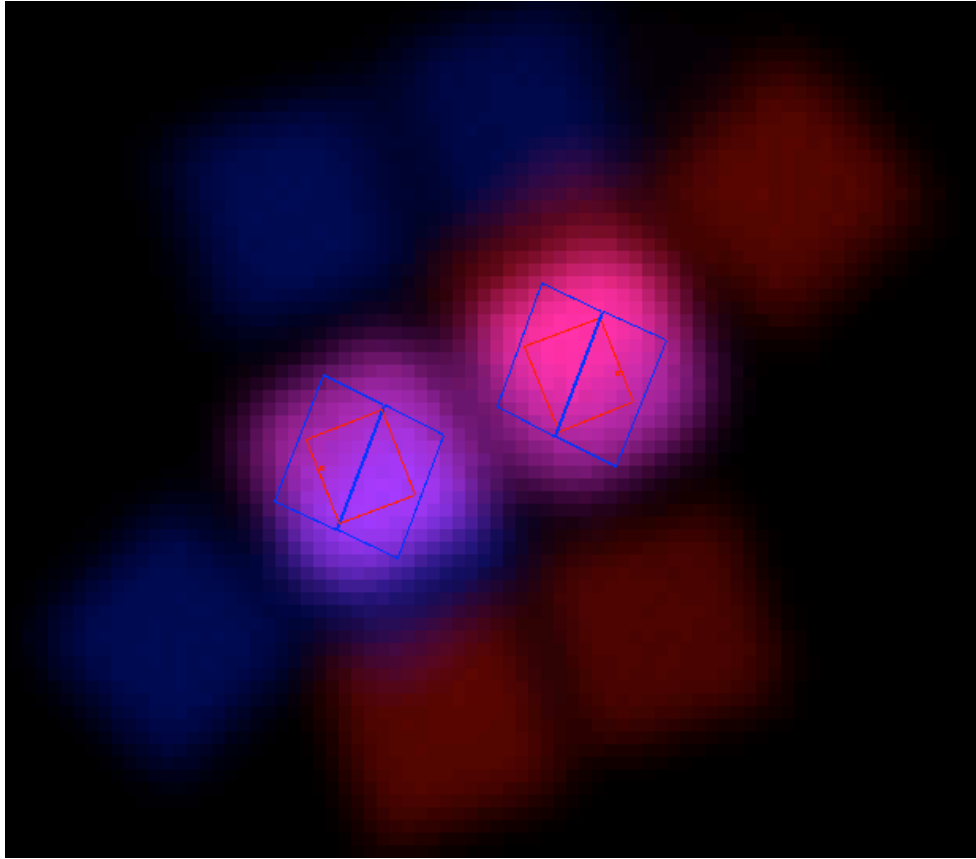
MACSJ0717



MACS0717

blue = Spitzer IRAC ch1, red = Spitzer IRAC ch2, magenta=both Spitzer channels, red line = HST WFC3, blue line= HST ACS

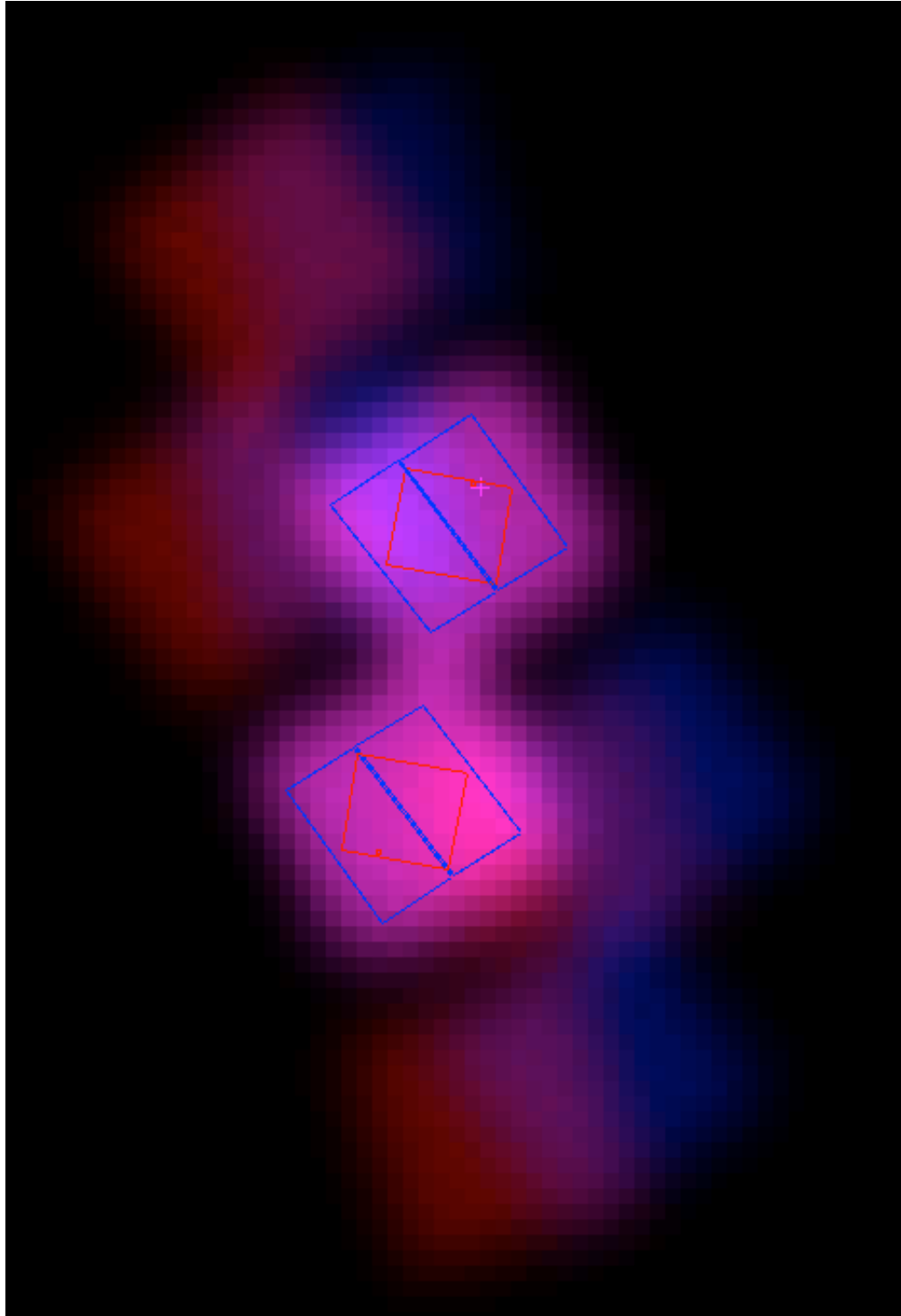
MACSJ01416



MACS0416

blue = Spitzer IRAC ch1, red = Spitzer IRAC ch2, magenta=both Spitzer channels, red line = HST WFC3, blue line= HST ACS

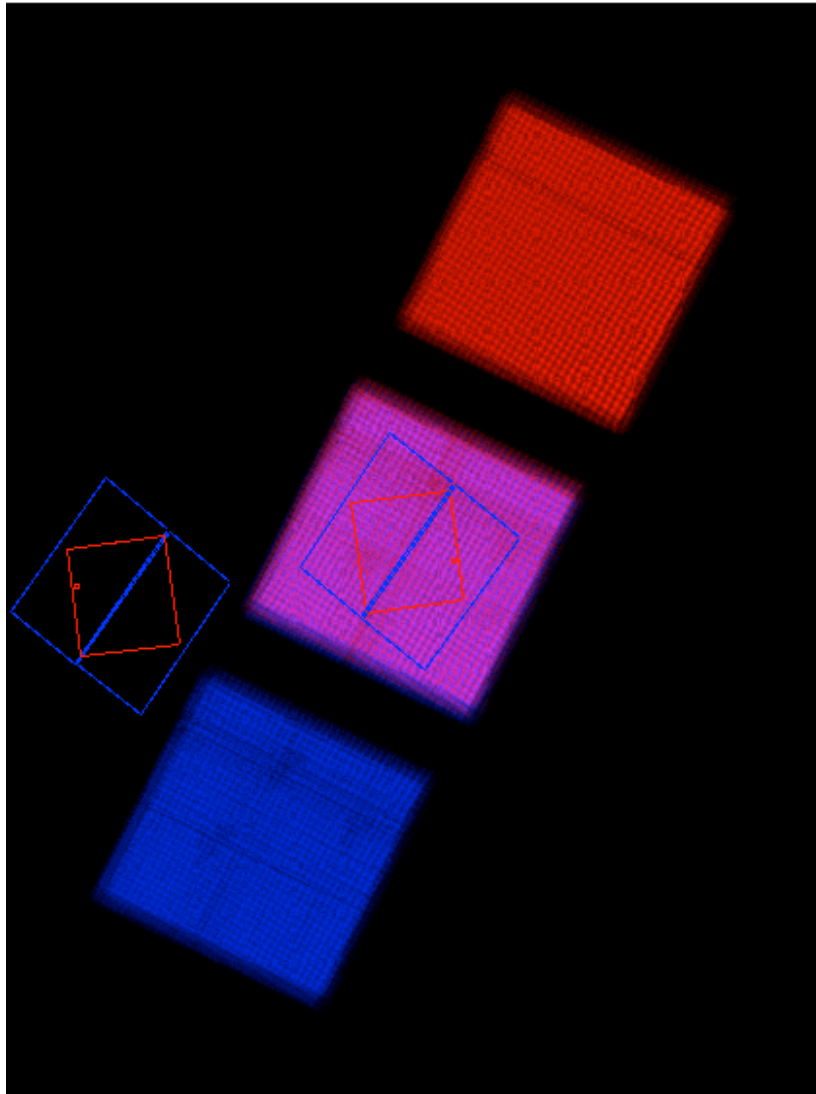
MACSJ1149



MACSJ1149

blue = Spitzer IRAC ch1, red = Spitzer IRAC ch2, magenta=both Spitzer channels, red line = HST WFC3, blue line= HST ACS

RXCJ2248



RXCJ2248

blue = Spitzer IRAC ch1, red = Spitzer IRAC ch2, magenta=both Spitzer channels, red line = HST WFC3, blue line= HST ACS