

The Hubble Space Telescope Advanced Camera for Surveys Quicklook Application

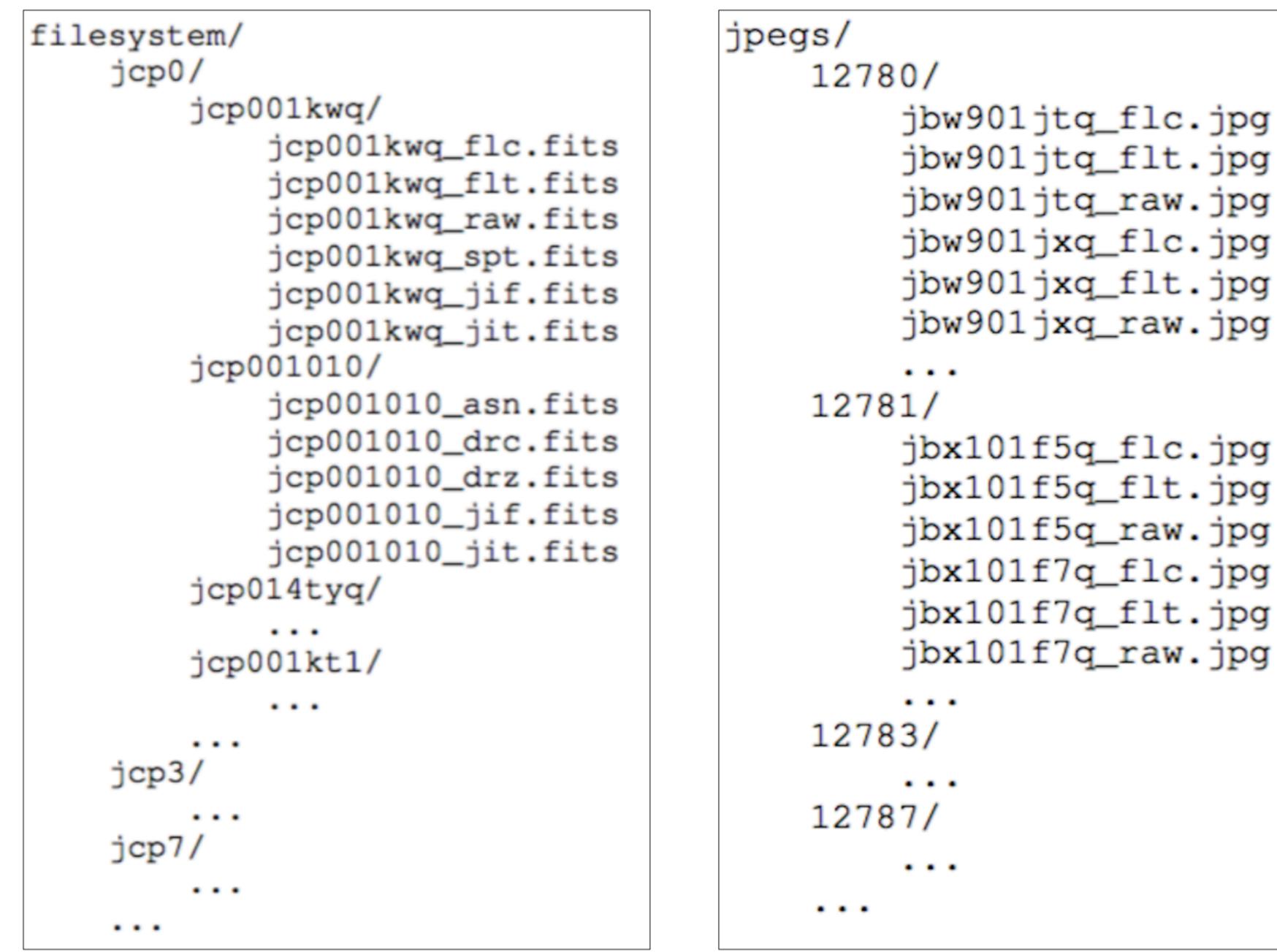
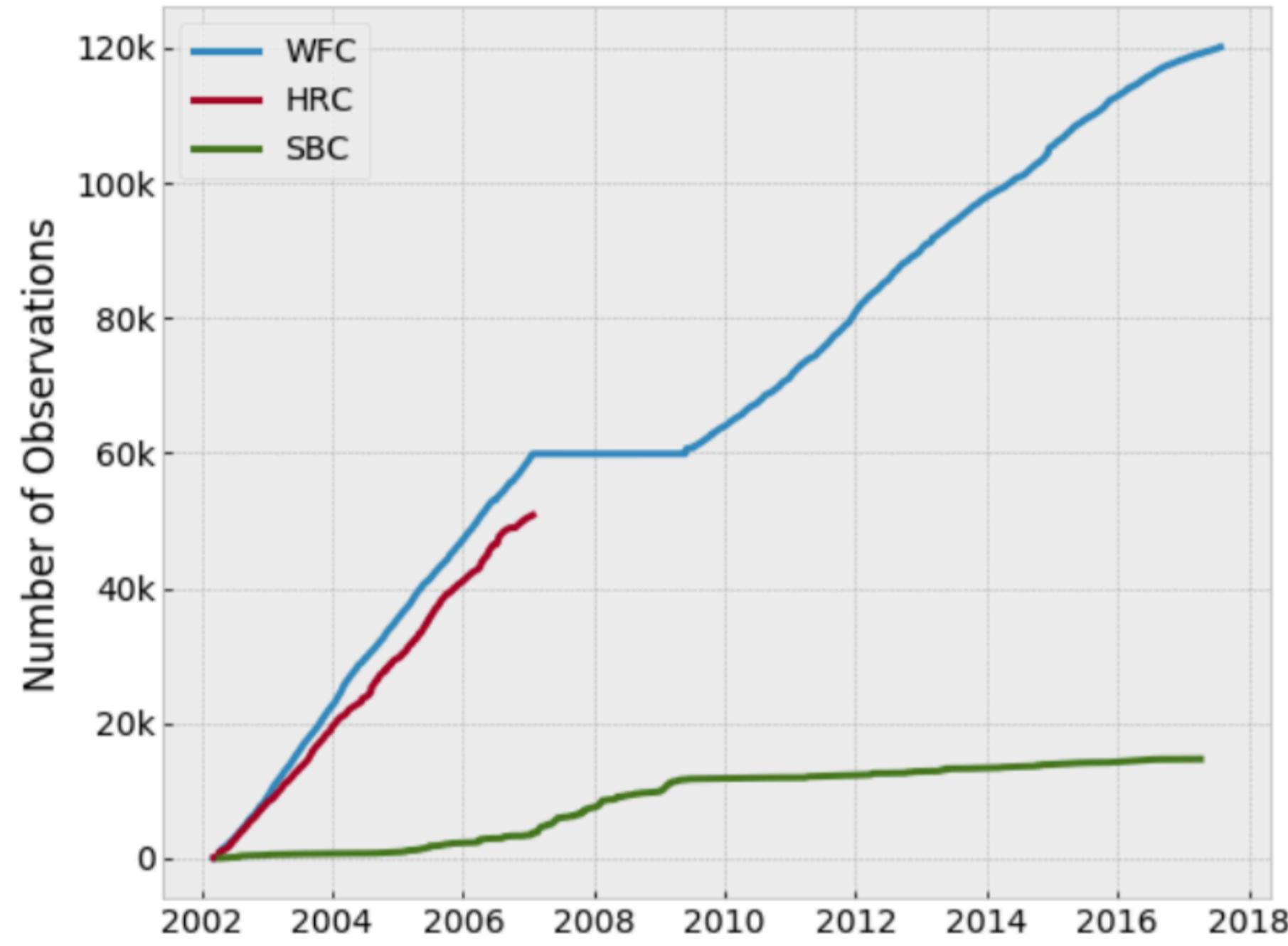


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The Hubble Space Telescope (HST) Advanced Camera for Surveys (ACS) instrument has been acquiring thousands of images each year since its installation in 2002 (via Servicing Mission 3B) and subsequent restoration in 2009 (via Servicing Mission 4). The ACS Quicklook application (acsq) provides a means for users to view all on-orbit ACS image and header data through a browser interface, an API to build custom datasets through relational queries, and a platform on which to build automated instrument calibration and monitoring routines. This is accomplished through the various system components: (1) a ~40 TB **filesystem**, which stores all publicly-available ACS data on disk, (2) a MySQL **database**, which stores all publicly-available FITS header data for each ACS filetype and header extension, (3) a Python/Flask-based **web application**, which allows users to navigate and display any public ACS archival data, and (4) a Python **software package**, which serves as the filesystem, database, and website API. ACS Quicklook is intended to be extended to support the forthcoming James Webb Space Telescope mission.

Filesystem

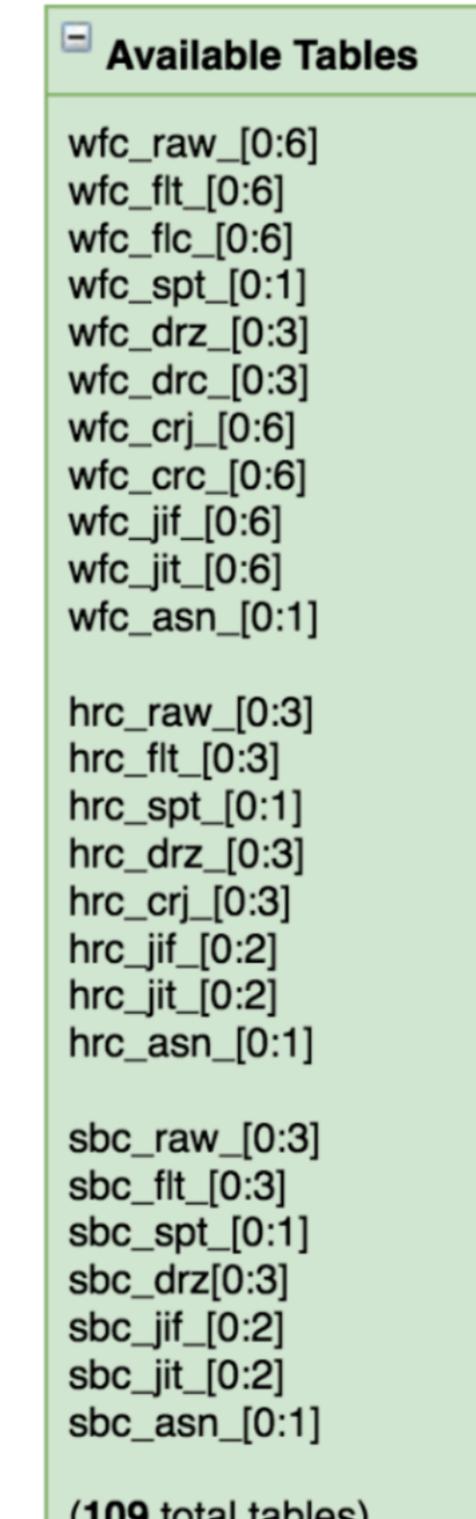
The acsq filesystem contains all publicly-available on-orbit ACS data from each of its three detectors: The Wide Field Channel (WFC), the High Resolution Channel (HRC) and the Solar Blind Channel (SBC). The filesystem is organized based on the 9-character observation rootname. It also contains "Quicklook" JPEGs for each image, organized by the 5-digit Proposal ID.



Database

The acsq database is a MySQL database constructed using Python, SQLAlchemy, and the relational schema below. The database stores observational metadata taken from the headers of each ACS FITS filetype and FITS extension for all publicly-available ACS observations. The database_interface Python module provides a means to programmatically perform relational queries on the database.

```
In [1]: from acsq.database.database_interface import session
In [2]: from acsq.database.database_interface import Master
In [3]: from acsq.database.database_interface import WFC_raw_0
In [4]: from acsq.database.database_interface import WFC_spt_1
In [5]: from acsq.database.database_interface import WFC_flt_1
In [6]: results = session.query(
...     Master.rootname, WFC_raw_0.date_obs, WFC_raw_0.time_obs,
...     WFC_spt_1.jwtemp1, WFC_flt_1.mearmark
... ).join(WFC_raw_0, WFC_spt_1, WFC_flt_1)
... .filter(Master.rootname.like('j6mf12%'))
... .all()
In [7]: results
Out[7]:
[("j6mf12ev", "2003-01-26", "16:10:36", "-76.6214, 1.1987731"),
 ("j6mf12f0", "2003-01-26", "16:19:34", "-77.3857, 1.1987731"),
 ("j6mf12f4", "2003-01-26", "16:28:32", "-76.6214, 1.1987731"),
 ("j6mf12fa", "2003-01-26", "16:37:30", "-76.6214, 1.1987731"),
 ("j6mf12fg", "2003-01-26", "16:46:28", "-75.8571, 1.1987731"),
 ("j6mf12fs", "2003-01-26", "17:44:00", "-76.6214, 1.2780551),
 ("j6mf12fy", "2003-01-26", "17:53:26", "-76.6214, 1.2780551),
 ("j6mf12g2", "2003-01-26", "18:02:52", "-75.0929, 1.2780551),
 ("j6mf12g8", "2003-01-26", "18:12:18", "-76.6214, 1.2780551),
 ("j6mf12gd", "2003-01-26", "18:21:44", "-76.6214, 1.2780551),
 ("j6mf12gg", "2003-01-26", "19:19:03", "-76.6214, 1.2780551),
 ("j6mf12gi", "2003-01-26", "19:28:29", "-76.6214, 1.2780551),
 ("j6mf12gm", "2003-01-26", "19:37:55", "-76.6214, 1.2780551),
 ("j6mf12go", "2003-01-26", "19:47:21", "-77.3857, 1.2780551),
 ("j6mf12gr", "2003-01-26", "19:56:47", "-76.6214, 1.2780551)]
```



Software Package

All source code and supporting materials for the acsq application are open-source and available on GitHub. API documentation and installation instructions are available on ReadTheDocs.

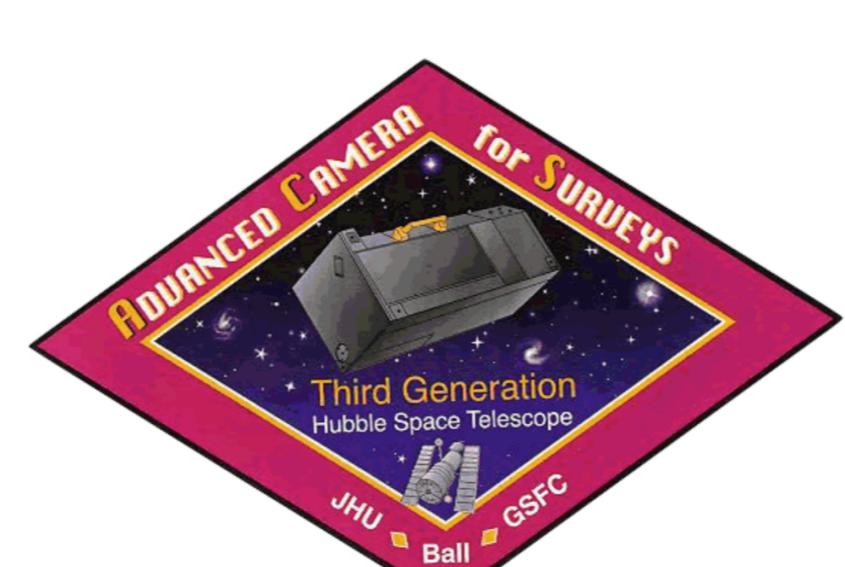
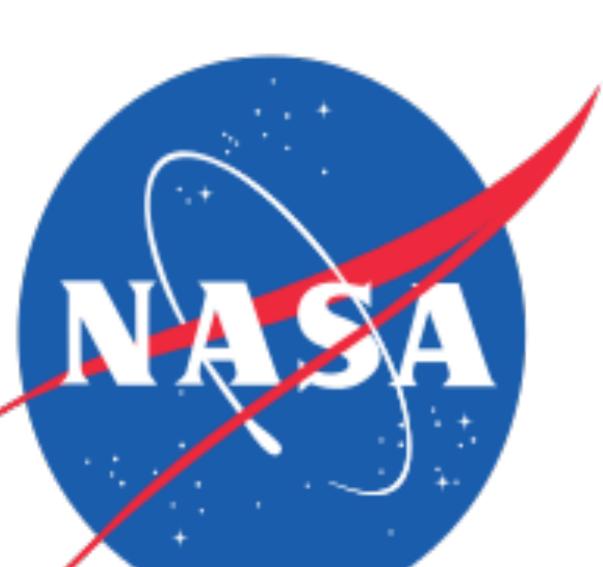
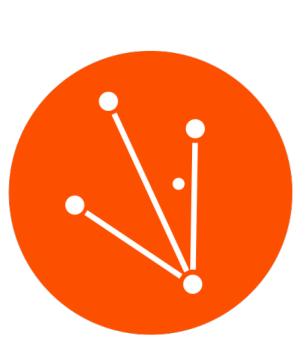


github.com/spacetelescope/acsql



acsq.readthedocs.io

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Web Application

The acsq web application (right) allows users to interact with the filesystem and database through a browser interface. Users may view images for any archival ACS observations as well as perform queries on the acsq database.

