Application to the science

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IVOA Small Projects Meeting

The development plan of JVO

- JVO develops for a few limited science scenarios, and it expands for other science scenarios.

- The required functions are probed and added.

Scientific target on JVO prototype 2

- Cross match of the optical and X-ray catalogs and image retrievals.

- Search for <u>gravitational lens</u> objects.
  - A phenomenon that the space-time is distorted by a huge mass object, and multiple images of another object behind the massive object are observed around it.

- SDF and SXDS data observed by Subaru are used.
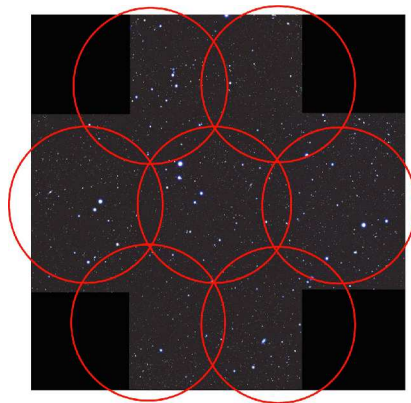
Work flow for Gravitational lens search

1. Retrieve Subaru catalog data in a specified region.
2. Calculate brightness.
3. Define condition to select quasars.
4. Make a list of pair quasar objects.
5. Retrieve image data of the pair objects.
6. Narrow candidates by analyzing the image data.

User Authentication

User login page.

JVO QL Editor

Query condition can be specified on this web form.
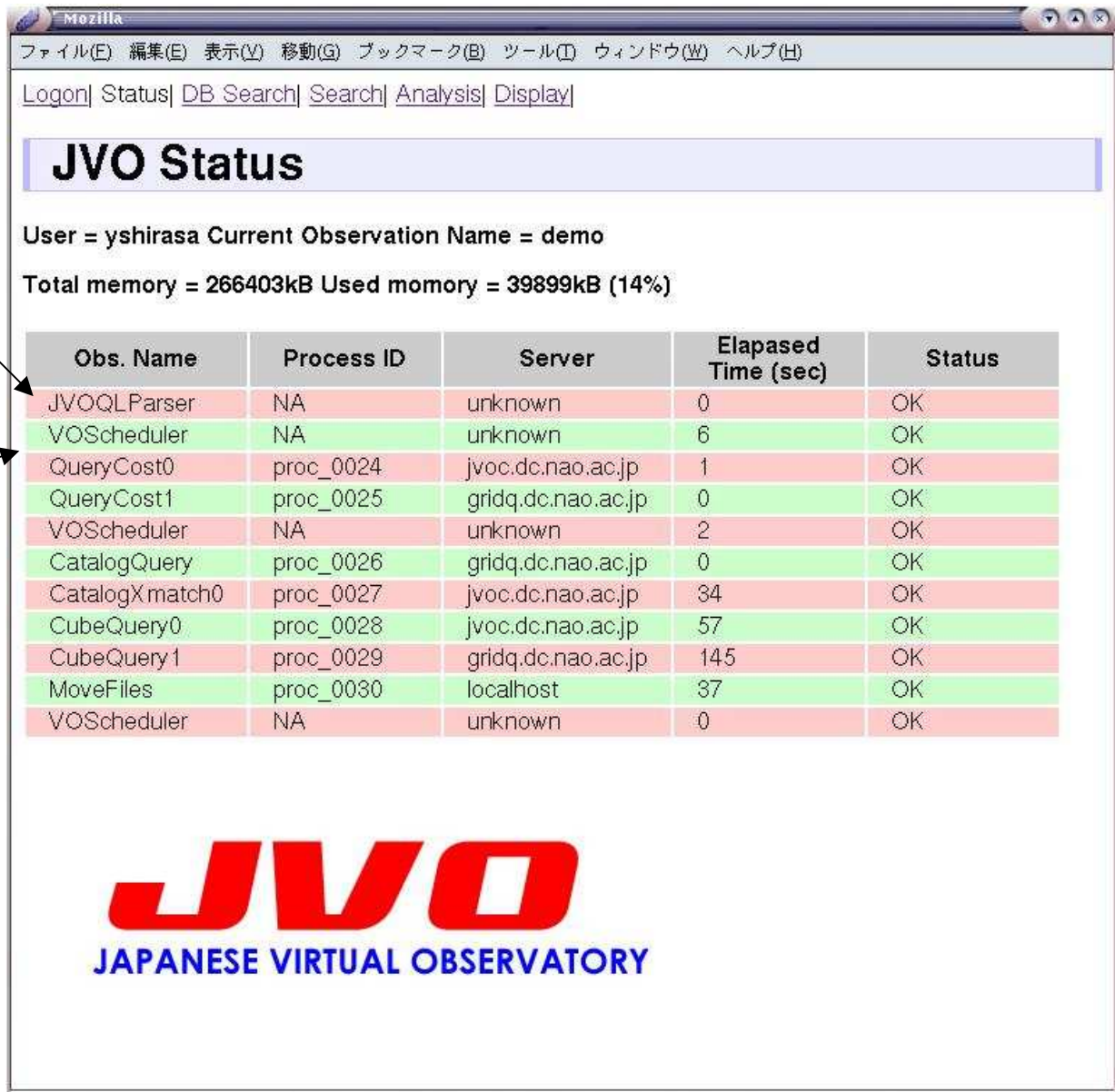
DB Search

Registry is used to find available data.

Search Status

JVOQL parser decomposes JVOQL.

Scheduler generates work flow, and Executer performs remote procedure calls.

Search result

Cross match of the optical and X-ray catalogs and image retrievals.

This is a kind of VOTable viewer and provides an easy access to both the table and image data.

Column attributes are displayed by pushing the "column_info" button, where you can also control the column layout.

Analysis tools for Gravitational lens search

GL search can be carried out using the VOTable of search result.

Select VOTable.

Select pair objects of similar color.

It is easy to add new analysis tools for conducting particular science.

Combine the three color images.

Plot the photo *z*, color.

The science target in prototype 3

- Cosmic String Search through the gravitational lens effect.
- Environmental dependence of QSO evolution.
- Automatic classification of late type star.
- Search for very metal-poor stars.
- etc.

Cosmic String

http://www.damtp.cam.ac.uk/user/gr/public/cs_evol.html
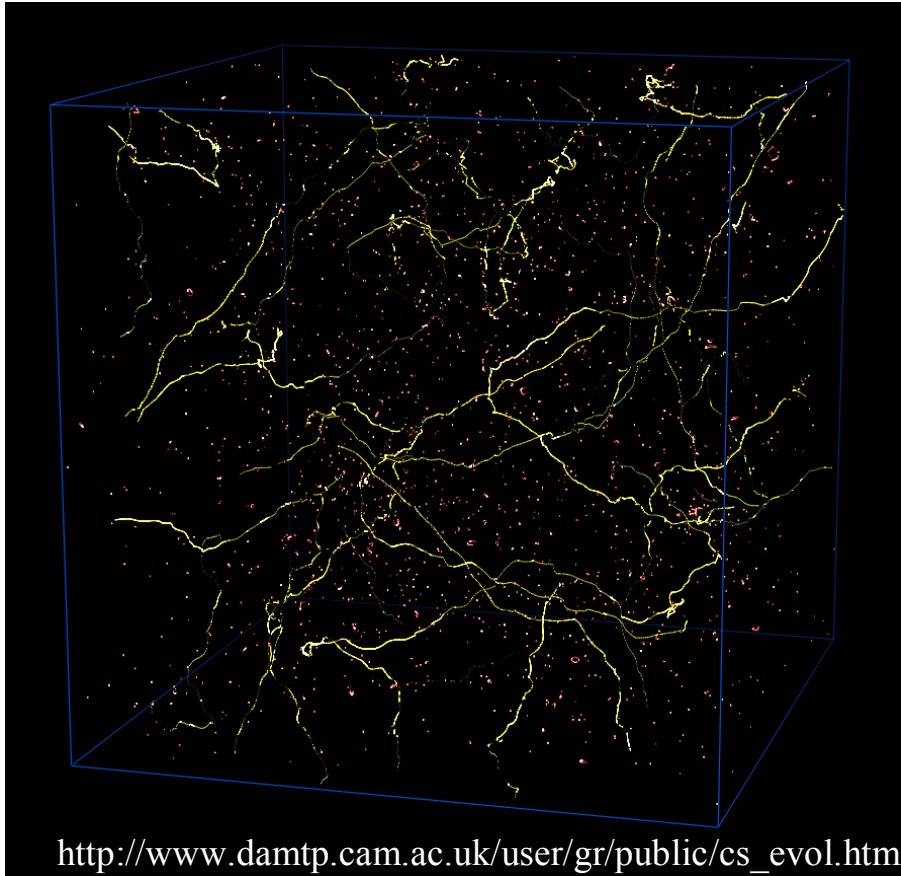
- Prediction by Unified theory
 – super heavy cosmic strings with linear mass density of 10^{22} g/cm in the early universe.
- The lens effect by a long cosmic string
  – undistorted lensed image
  – co-aligned in a direction of string network
  – distributed in a very large scale.
- Because of its large scale nature, wide fied deep survey is crucial for its discovery. → Data mining from Subaru Suprime-Cam image data
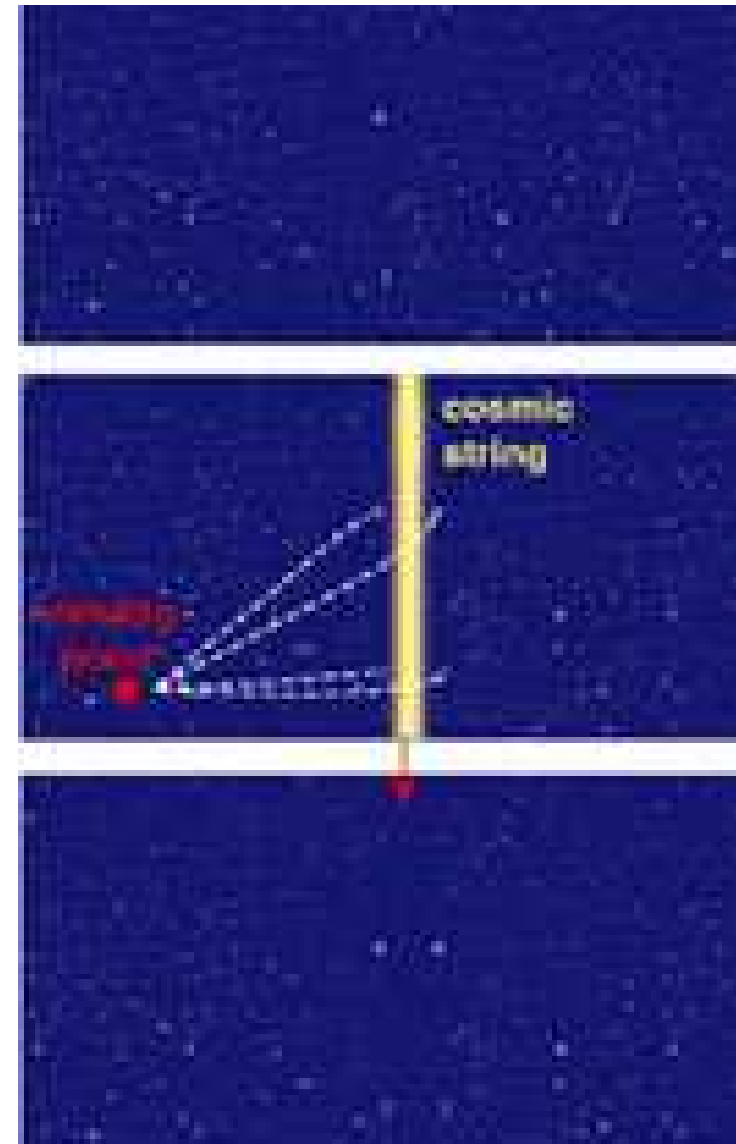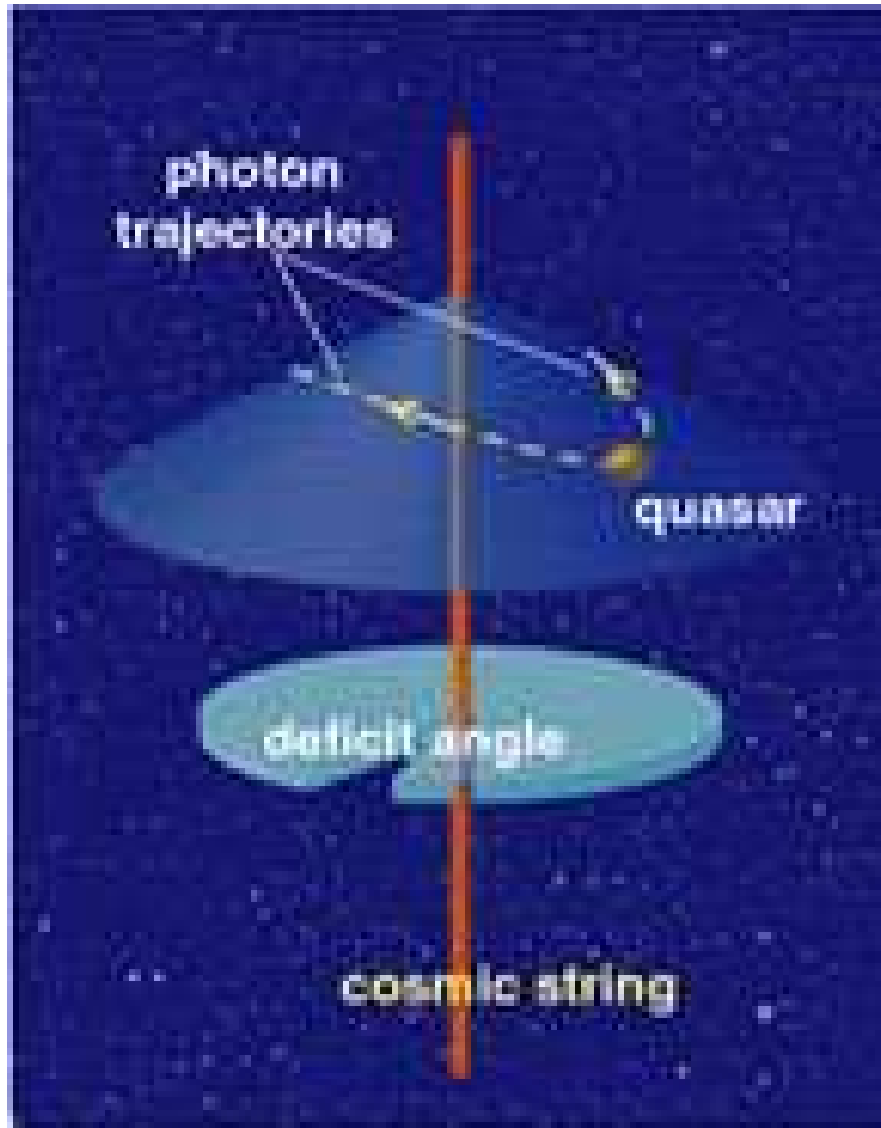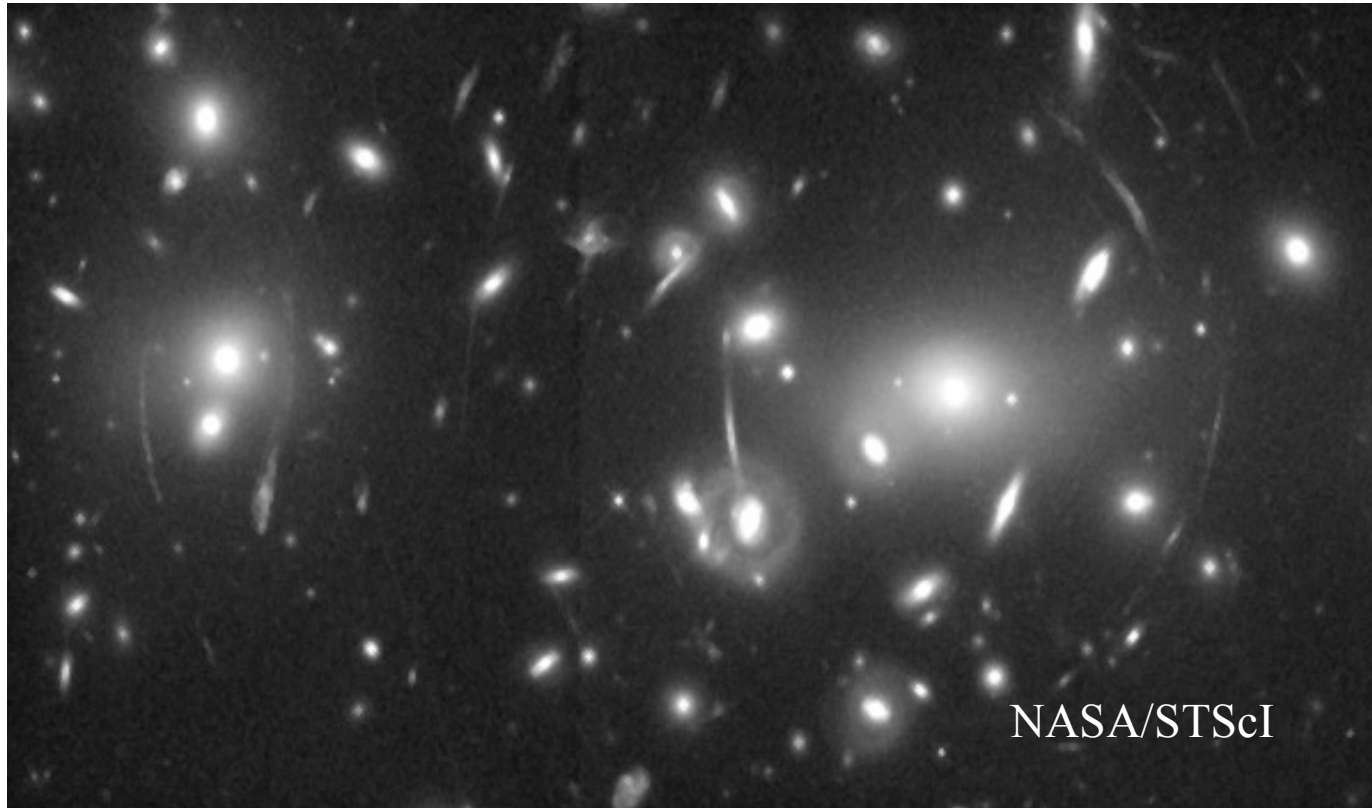
Cosmic String Search Result
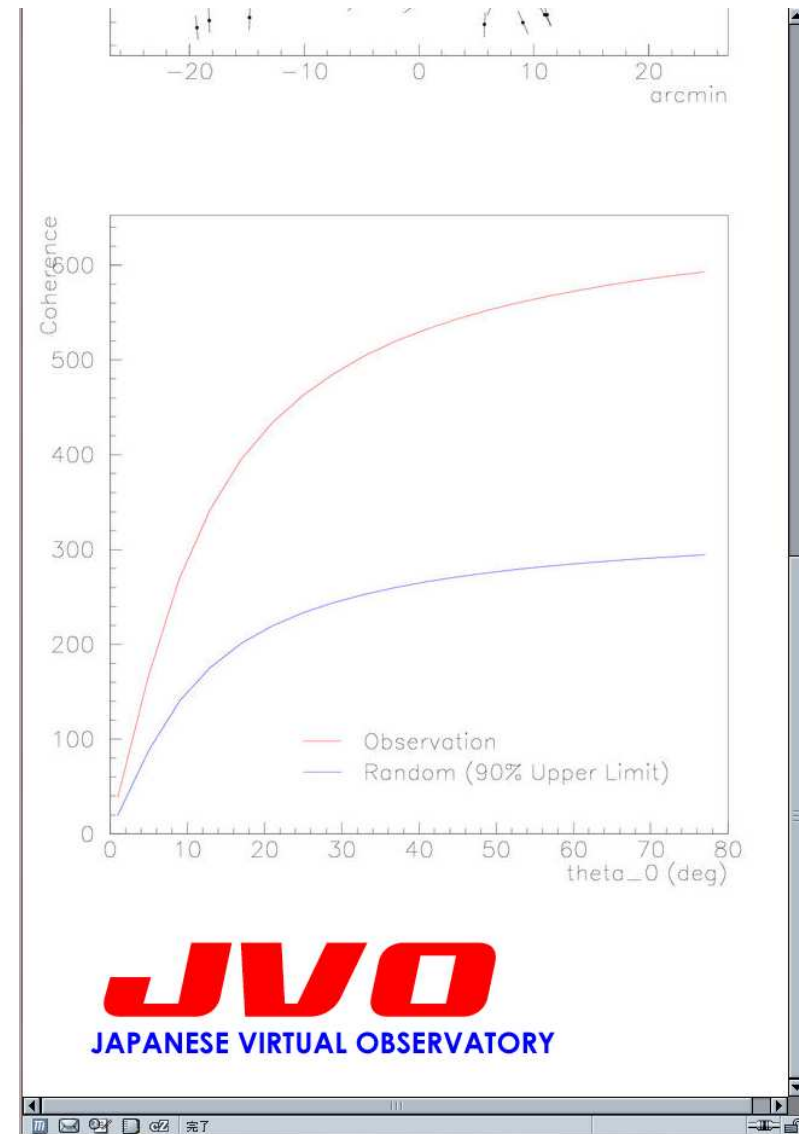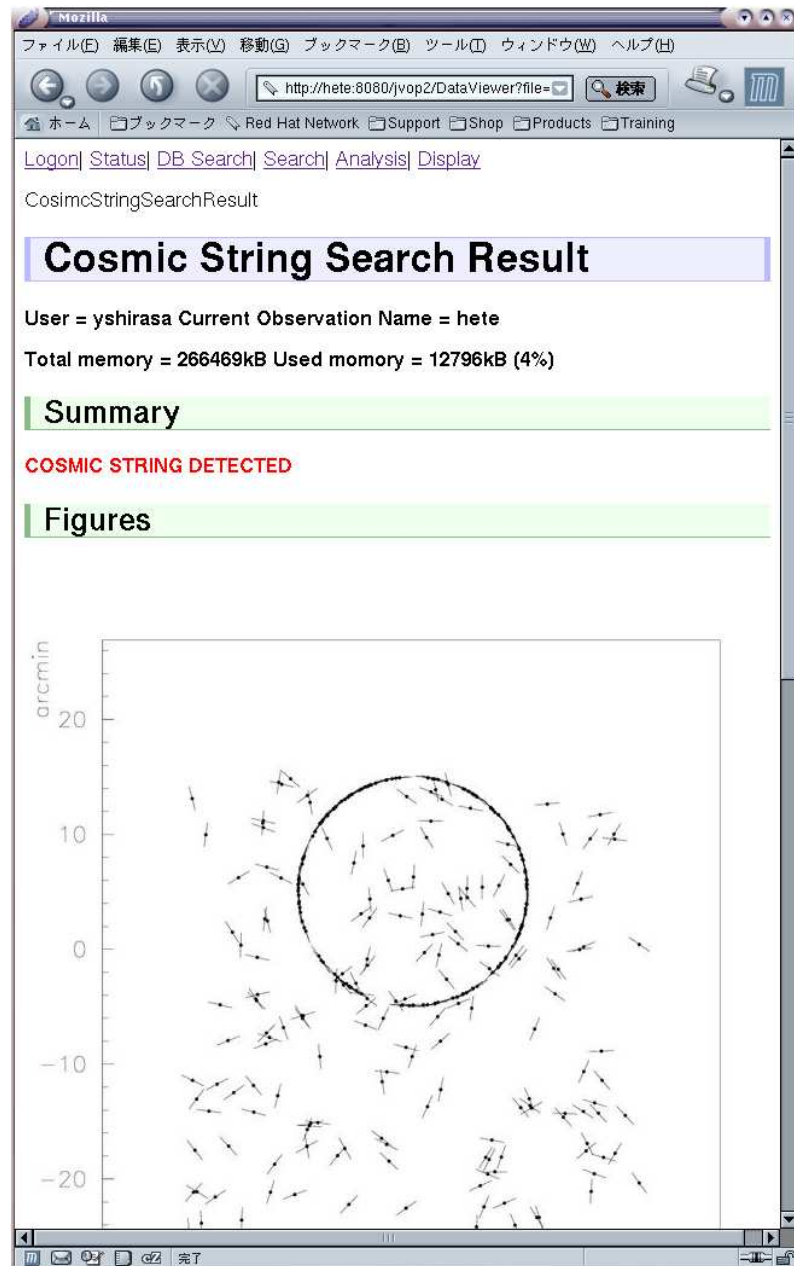
Gravitational Lens by Cosmic Strings

Gravitational lends

NASA/STScI