

# Latest developed features for Worldwide Telescope

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## Virtual Observatory (VO)

- Virtual Observatory (VO) is a data-intensively online astronomical research and education environment, taking advantages of advanced information technologies to achieve seamless, global access to astronomical information.
- The Virtual Observatory (VO) aims to provide a research environment that will open up new possibilities for scientific research based on **data discovery, efficient data access, and interoperability.**
- International Virtual Observatory Alliance

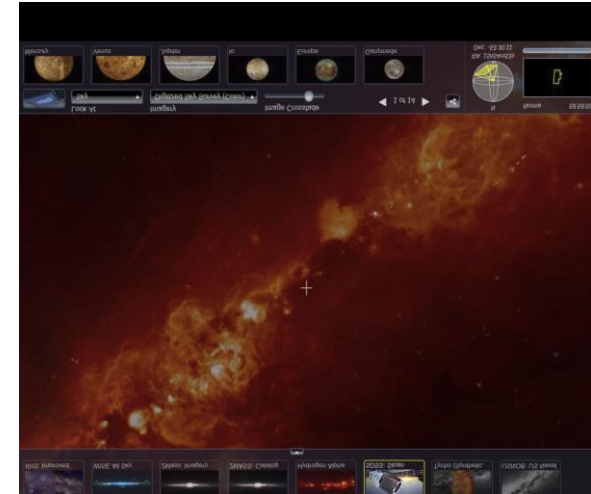
--"facilitate the international coordination and collaboration necessary for the development and deployment of the tools, systems and organizational structures necessary to enable the international utilization of astronomical archives as an integrated and interoperating virtual observatory."



## WorldWide Telescope (WWT)

“A tool for showcasing astronomical data and knowledge.” A public version of Virtual Observatory.

- “Google Maps for the sky”
- A research data visualization tool
- A 4D Solar System simulator
- An educational environment
- A reusable Web toolkit
- A Windows application for high end work



## A brief history of the WWT

- ~2006–7: project conceived in Microsoft Research
- 2008: Launch of the Windows incarnation
- 2009: Launch of the Web incarnation
- 2015: Project is open-sourced, transitioned to AAS management
- 2017: First release of Jupyter-enabled “pywwt” tool
  
- Feb. 2018: China-VO WWT 1.0 (localized version)
- May 2019: China-VO WWT 2.0 (HiPS support)
- Oct. 2021: China-VO WWT 2.1 (SATCON limited support)



## Demo I: Satellite Orbits

Reference Frame

### Position

A Keplerian orbit is an elliptical orbit defined by at least 6 parameters. There are some variations in how those parameters are described, but most orbits can be translated into the terms below.

Semimajor Axis (a)	Semimajor Axis Units	Mean anomaly at epoch
6915280.28252037	Meters	349.4962
Eccentricity (e)	Argument of periapsis	Epoch (Julian Date)
0.0002885	139.1941	2459423.67978341
Inclination	Longitude of the Ascending Node n Daily Motion	
28.4692	155.5951	5434.8877908

Paste TLE

Back

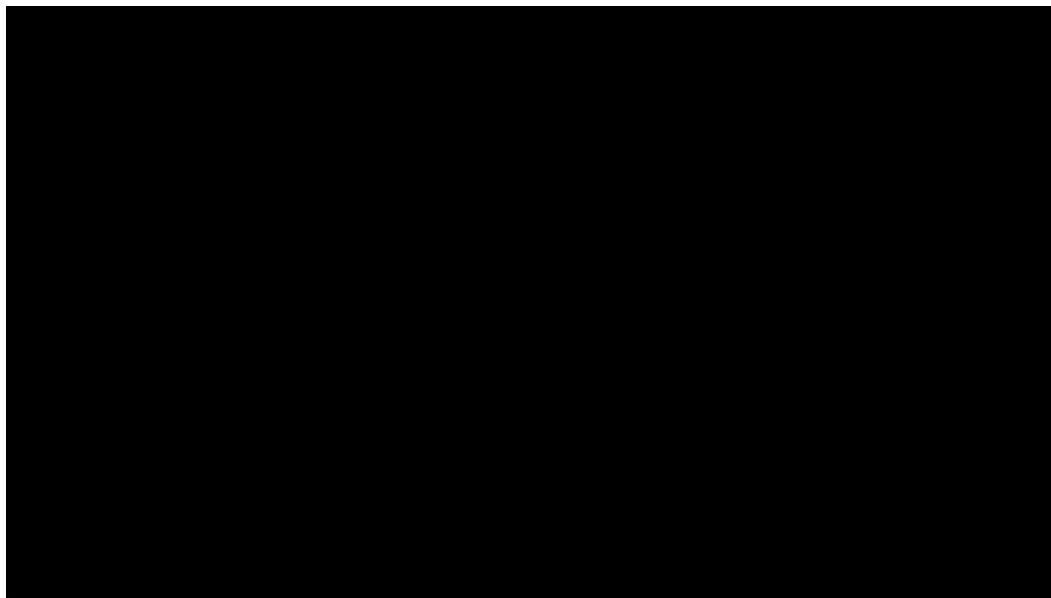
Next

Finish



## Demo II: 3D Model Support

WWT Tour: Tiangong II, the Chinese Space Station

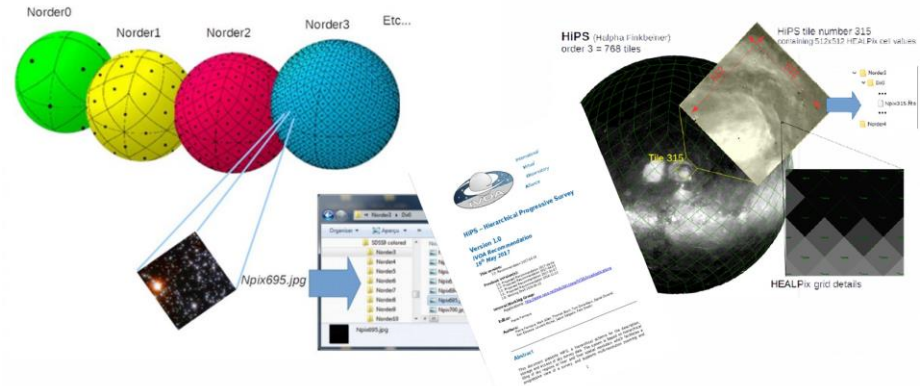


## IVOA HiPS (Hierarchical Progressive Surveys)

### Usage of HiPS in the community

- Aladin
  - Aladin Desktop
  - Aladin Lite
- ESA Sky
- WWT
  - China-VO WWT
  - AAS WWT
- ESO Archive Science Portal
- Firefly
- Other portals and websites

HiPS is the hierarchical tiling mechanism which allows one to access, visualize and browse seamlessly image, catalogue and cube data.



<http://aladin.u-strasbg.fr/hips/>

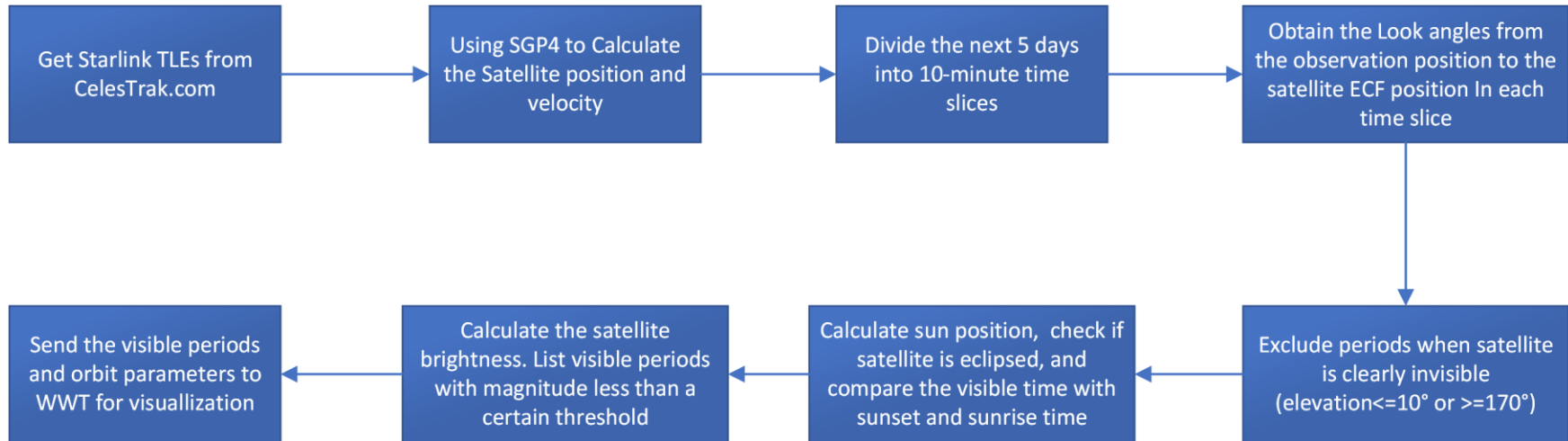


## Demo III: HiPS Dataset in WWT

- Since China-VO WWT version 2, HiPS was supported. Then the feature was also added into the AAS WWT.



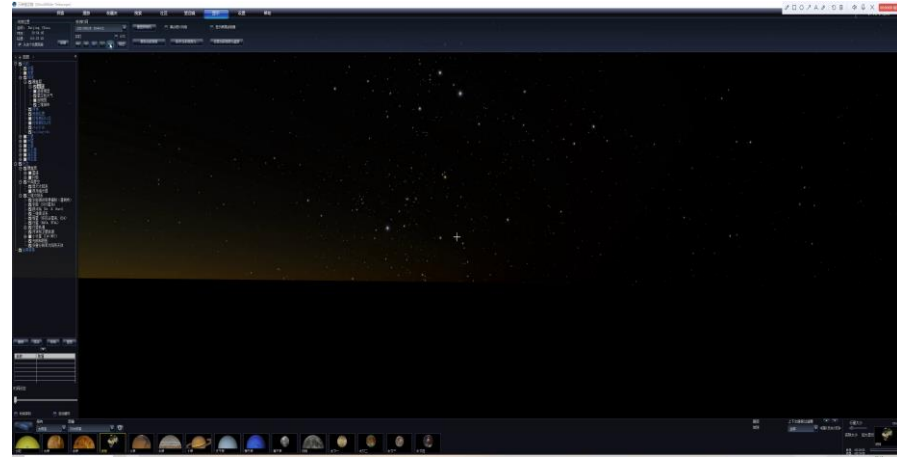
## Satellite visibility computing and visualization



## Starlink Visibility Visualization

### Example:

- Satellite: STARLINK-2044
- Observation location : Beijing (N39.9, E116.4)
- Visible time: 2021 2nd Oct 5:46 AM ~ 5:51 AM
- Start Direction: E189.43
- End Direction: E74.98
- Start Elevation: 10.18°
- End Elevation: 10.17°
- Max Elevation: 24.46°



Thank you for  
your  
attention!

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