

What's New in Visualyse Interplanetary in 2022

Abstract: As we start the New Year, we look back at the old one, and in case you missed it, here are some of the new features we introduced in Visualyse Interplanetary during 2022.

Introduction

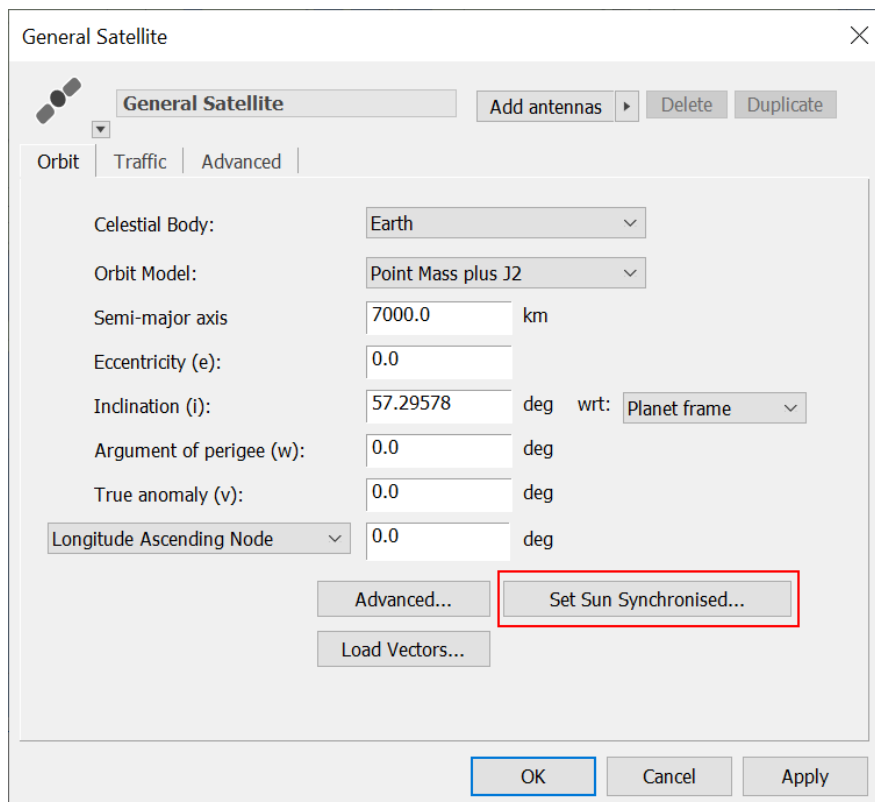
Some of the new features in [Visualyse Interplanetary](#) that were added during 2022 include:

1. Additional tool to define satellites using Sun Synchronous orbits
2. Ability to set the equatorial plane to use for orbits defined via Classical Orbit Elements
3. Enhanced Doppler Modelling tools.
4. Generic GeoTIFF Terrain and Surface Format Interface
5. Elevation Dependent Clutter Loss
6. Updates to Propagation Models
7. Extended number of Gain Tables for Beamforming Antennas
8. New Notification Centre and Search Tool.

These are described further below. Full information including a complete list of new features is available from the Maintenance History documents available from the Help Menu. We are already working on new features for 2023. If you have any suggestions or preferences for what we work on next, please send us an email.

Additional tool to define satellites using Sun Synchronous Orbits

A new tool was added in 2022 to assist in defining satellites using Sun Synchronous orbits. The tool is available from the General Satellite's orbit tab:



It can be used to configure a sun-synchronous orbit using repeating or non-repeating ground tracks:

Set Sun Synchronised
✕

Repeating track:

Number of orbits: Valid

Days for these orbits: Valid

Semi-major axis: km

Inclination: deg

Longitude of ascending node: deg

Date and time satellite at equator for this longitude:

Date:

Time:

Ability to set the equatorial plane to use for orbits defined via Classical Orbit Elements

In [Visualyse Interplanetary](#), for general satellites, a new feature in 2022 allowed the orbit inclination to be defined either to the instantaneous Earth equator or the J2000.0 equator.

General Satellite
✕

General Satellite

Orbit

Traffic

Advanced

Celestial Body: ▼

Orbit Model: ▼

Semi-major axis: km

Eccentricity (e):

Inclination (i): deg

Argument of perigee (w): deg

True anomaly (v): deg

Longitude Ascending Node ▼ deg

wrt:

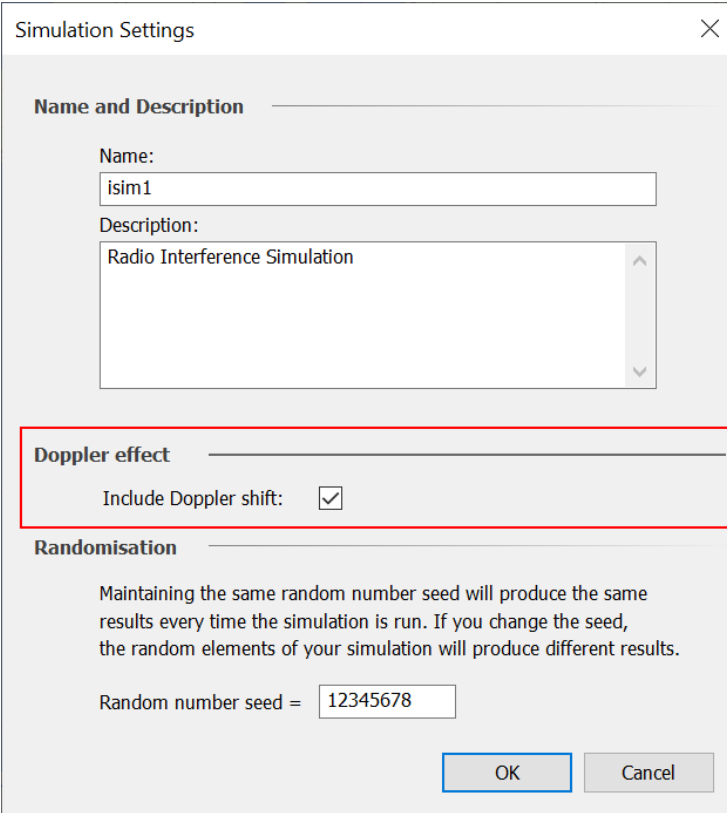
Planet frame ▼

Planet frame

J2000 frame

Enhanced Doppler Modelling tools.

In [Visualyse Interplanetary](#), new features in 2022 made it possible to include the impact of Doppler by enabling it using the field on the Simulation Settings dialog:



Simulation Settings

Name and Description

Name: isim1

Description: Radio Interference Simulation

Doppler effect

Include Doppler shift:

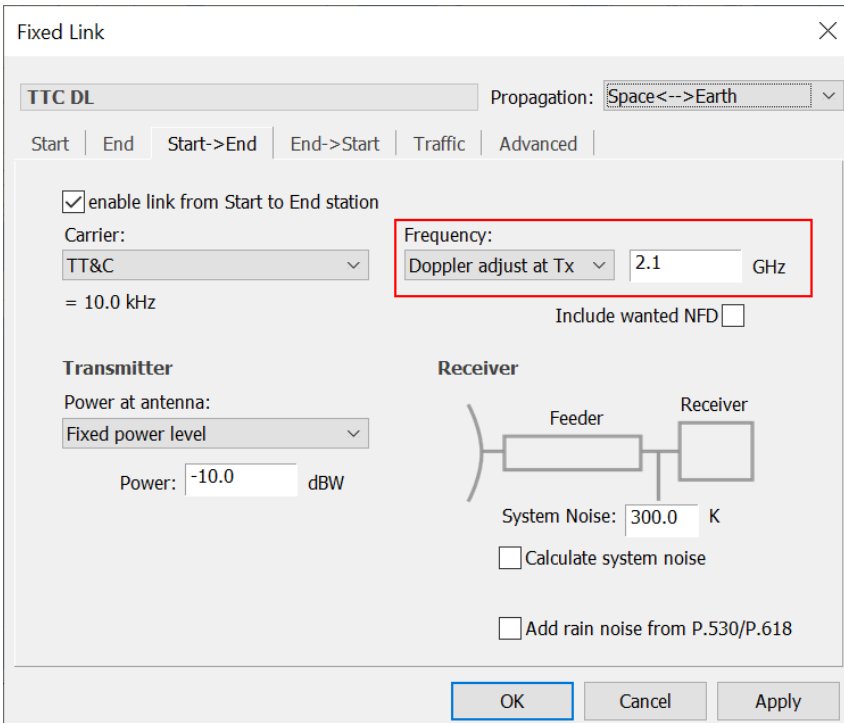
Randomisation

Maintaining the same random number seed will produce the same results every time the simulation is run. If you change the seed, the random elements of your simulation will produce different results.

Random number seed = 12345678

OK Cancel

It is also possible to define the transmit or receive frequency so that it is adjusted to take account of Doppler shift on the wanted link:



Fixed Link

TTC DL Propagation: Space<-->Earth

Start | End | Start->End | End->Start | Traffic | Advanced

enable link from Start to End station

Carrier: TT&C = 10.0 kHz

Frequency: Doppler adjust at Tx 2.1 GHz

Include wanted NFD

Transmitter

Power at antenna: Fixed power level

Power: -10.0 dBW

Receiver

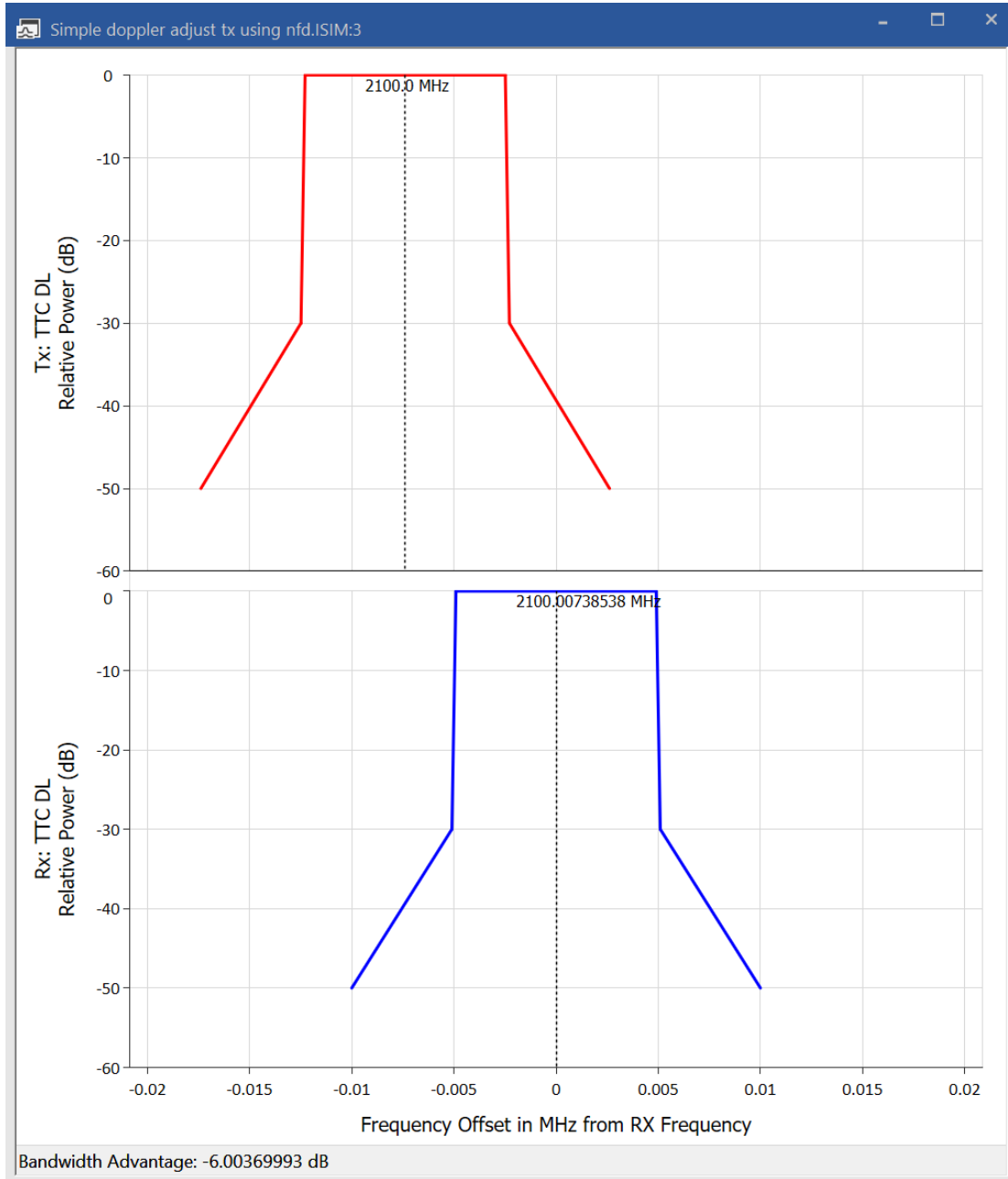
System Noise: 300.0 K

Calculate system noise

Add rain noise from P.530/P.618

OK Cancel Apply

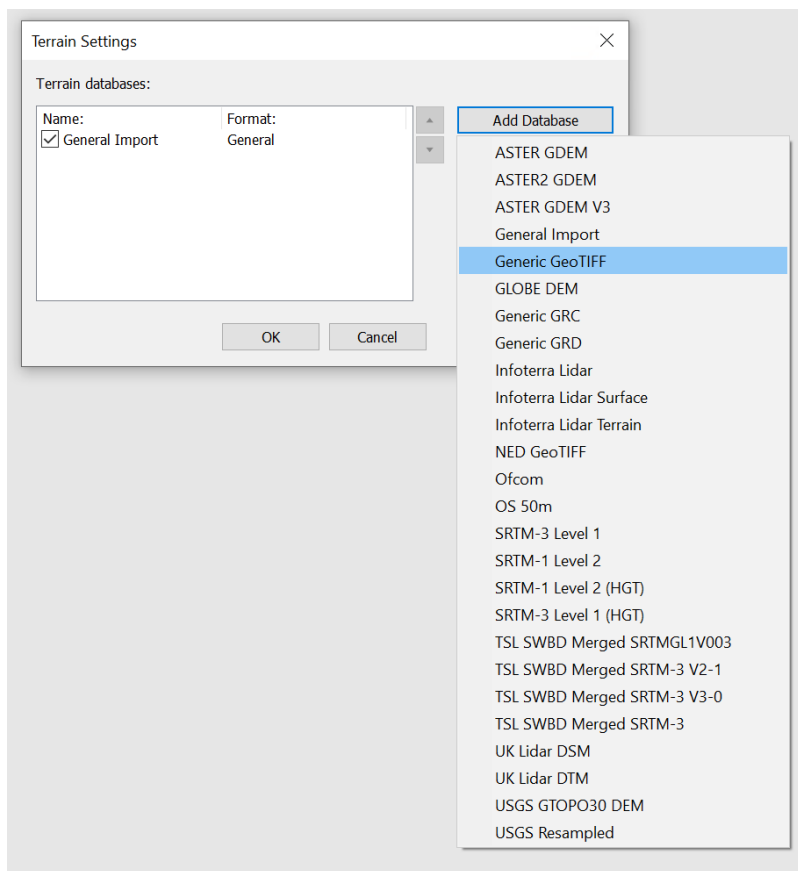
This can be done to keep the frequency constant at the transmitter or receiver and include the net filter discrimination (NFD) when calculating the wanted signal, if required:



Generic GeoTIFF Terrain and Surface Format Interface

A new generic interface to high resolution terrain and surface data in GeoTIFF format was included in 2022. This can be added from the Terrain settings dialog:

Email us at info@transfinite.com for further information or to give your views on this Newsletter.

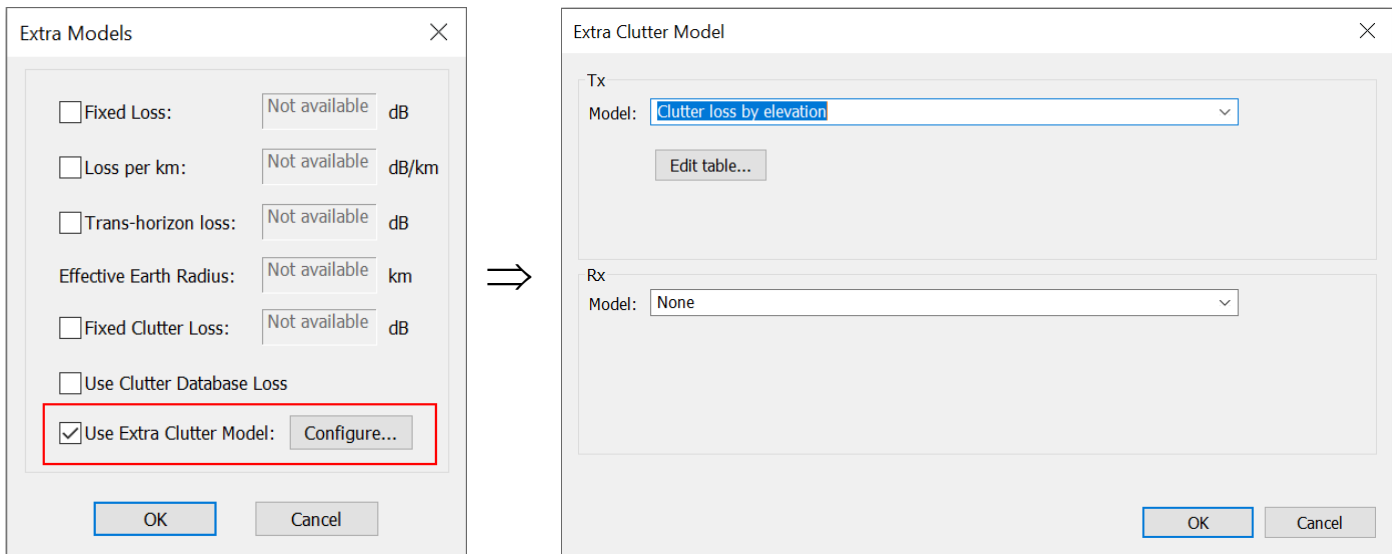


Elevation Dependent Clutter Loss

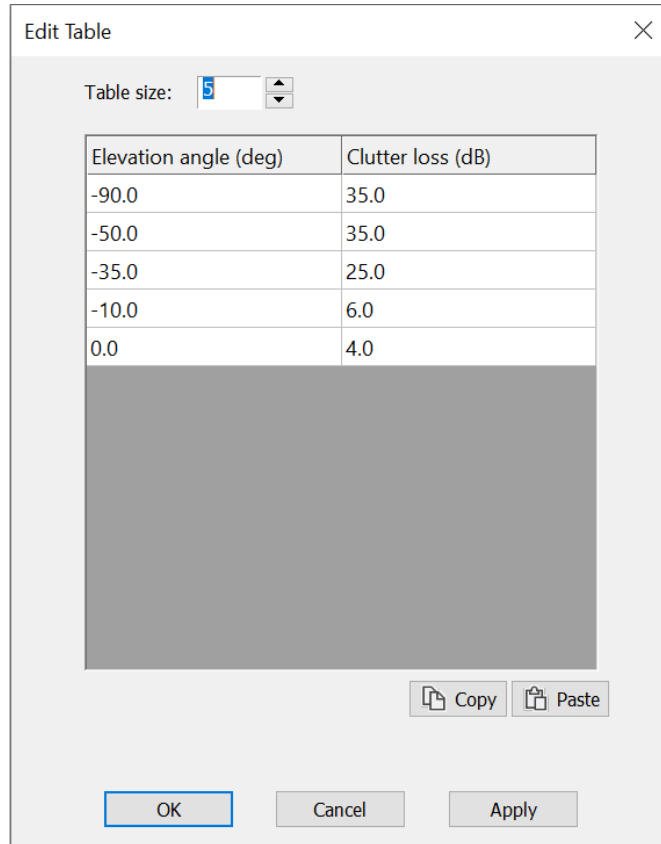
In some situations, the clutter loss can vary depending upon elevation angle. Examples include:

- For ground to air and ground to space paths, where the amount of clutter loss varies depending upon the heights of nearby obstructions such as trees and buildings and hence elevation angle at the Earth or terrestrial station
- For air to ground paths, where the attenuation due to the fuselage loss varies by elevation angle at the aircraft.

To help in these scenarios, a new Clutter Loss model was introduced that allows the clutter loss to vary by elevation angle at the transmit and/or receive ends of a link. This is available under the Extra Models:



The clutter loss can then be entered for a set of elevation angles using a table like this:



Linear interpolation is used between Clutter Loss (Elevation Angle) points.

Updates to Propagation Models

A number of ITU Propagation Models were updated during 2022 including:

- Recommendation ITU-R P.452-17 for point-to-point terrestrial paths
- Recommendation ITU-R P.528-5 for ground to air and air to air paths
- Recommendation ITU-R P.1546-6 for point-to-area terrestrial paths

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- Recommendation ITU-R P.1812-5 for point-to-area terrestrial paths
- Recommendation ITU-R P.2001-4 for Monte Carlo analysis involving terrestrial paths
- Recommendation ITU-R P.2108-1 clutter model
- Recommendation ITU-R P.2109-1 indoor-outdoor loss model.

In addition, there were updates to gain patterns and other Recommendations, such as the throughput calculation method in Recommendation ITU-R S.2131-1.

Extended number of Gain Tables for Beamforming Antennas

There has been increasing interest in using beamforming antennas for a wide range of radiocommunication systems. Not just 5G base stations, but also Earth Stations in Motion (ESIMs) and non-GSO satellite constellations are operating with beamforming antennas.

One way of modelling these types of antennas is to use the gain pattern in Recommendation ITU-R M.2101 and the optional additional extended parameters:

Edit ITU-R M.2101 Parameters ✕

Element gain: dBi

	Horizontal (columns)	Vertical (rows)	
Number of elements:	<input style="width: 60px;" type="text" value="8"/>	<input style="width: 60px;" type="text" value="8"/>	
D to Lambda:	<input style="width: 60px;" type="text" value="0.5"/>	<input style="width: 60px;" type="text" value="0.5"/>	
Beamwidth:	<input style="width: 60px;" type="text" value="65.0"/>	<input style="width: 60px;" type="text" value="65.0"/>	deg
Front to back:	<input style="width: 60px;" type="text" value="30.0"/>	<input style="width: 60px;" type="text" value="30.0"/>	dB
	-180 <= Az <= 180	-90 <= El <= +90	
Maximum scan angle:	<input style="width: 60px;" type="text" value="60.0"/>	<input style="width: 60px;" type="text" value="60.0"/>	deg
Minimum scan angle:	<input style="width: 60px;" type="text" value="-60.0"/>	<input style="width: 60px;" type="text" value="-60.0"/>	deg
Extended pattern: <input type="checkbox"/>	Subarray		
Number of elements:	<input style="width: 60px;" type="text" value="3"/>		
D to Lambda:	<input style="width: 60px;" type="text" value="0.7"/>		
Downtilt:	<input style="width: 60px;" type="text" value="3.0"/>		deg
<input style="width: 80px;" type="button" value="OK"/>			

An alternative way is to define a set of Gain (azimuth, elevation) tables, one per skew angle. This option has been extended to allow any number of tables to be entered using the Advanced Beam Options controls here:

Additional tables

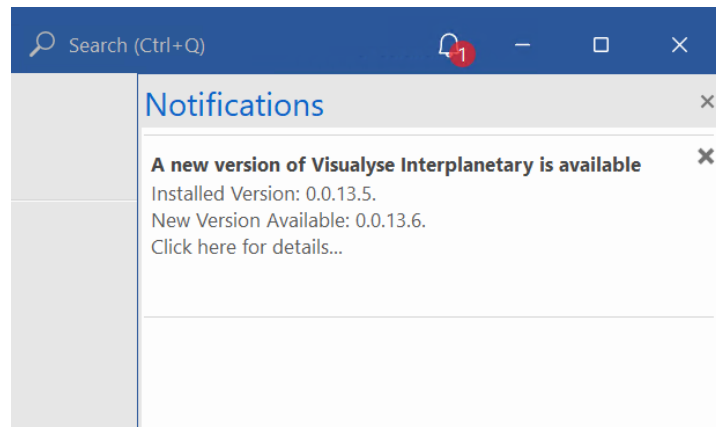
Number of Tables: ▲▼

Edit Table: ▲▼

Angle from sub-satellite point or zenith (deg):

Include new Notification Centre and Search Tool

New features for the user interface in 2022 included a Notification Centre and search tool. The Notification Centre gives updates such as when a new version is available:



The Search Tool can be used to search the user interface for specific controls, as in this example:

