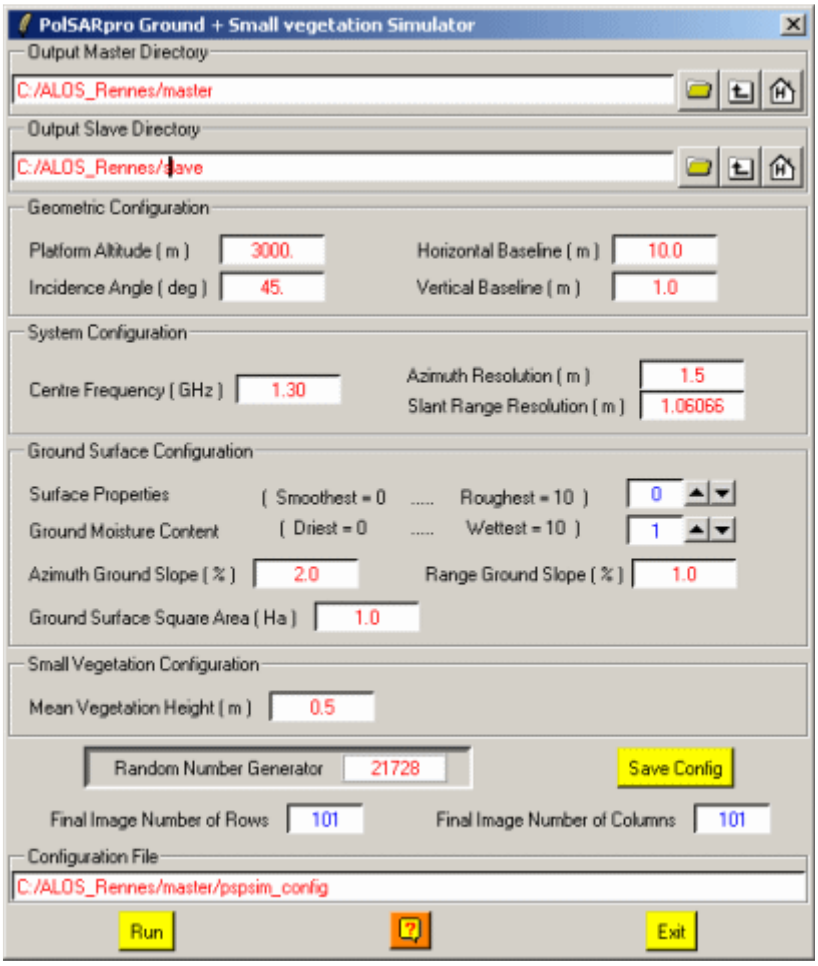
PolSARpro Simulator – Ground + Small Vegetation



Description:

PolSARproSimVeg calculates simulated Synthetic Aperture Radar (SAR) imagery of ground surface covered with small vegetation. **PolSARproSimVeg** is an educational tool: providing simulated test data of sufficient fidelity to be used within the tutorial package of **PolSARpro v4.0**. The simulated imagery can be used to illustrate the concepts of the PolInSAR lecture course.
This simulator is part of the **PolSARproSim** developed by Mark Williams © for simulation of forest stands.

Comments:

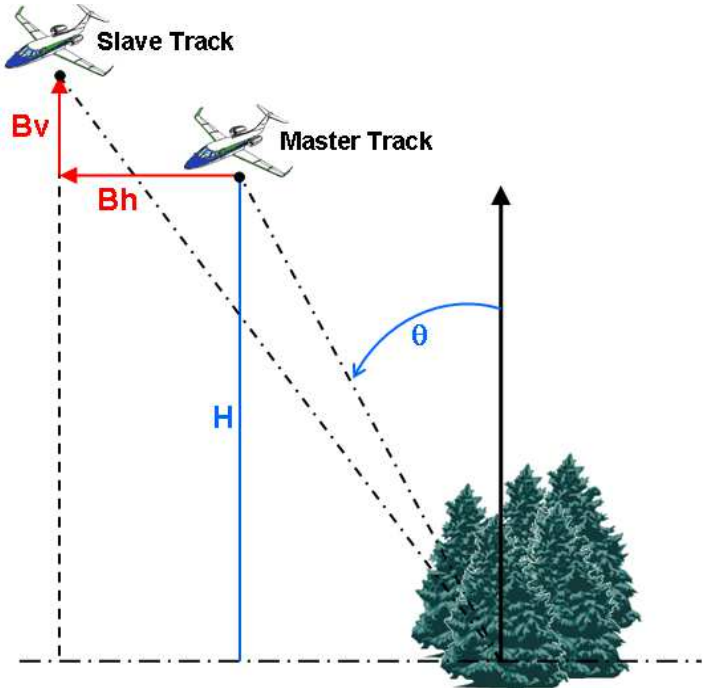
Parameters written in Red can be modified directly by the user from the keyboard.

Input/Output Arguments:

Output Master Directory Indicates the location of the output data **Main Master Directory (M-MD)**.

Output Slave Directory Indicates the location of the output data **Main Slave Directory (M-SD)**.

Geometric Configuration:



Platform Altitude The **Platform Altitude** (**H**) of the Master Track is specified in metres.

Incidence Angle The **Incidence Angle** (***θ***) is specified in degrees and is defined as the angle between the global vertical direction and the Master Track radar line of sight as shown.

Horizontal Baseline The **horizontal baseline** (**Bh**) is specified in metres and is the difference in ground range between the Master Track and the Slave Track.

Vertical Baseline The **vertical baseline** (**Bv**) is also specified in metres and is the difference in **Platform Altitude** between the Master Track and the Slave Track.

Note: The horizontal and vertical baseline red arrows in the diagram indicate the directions of positive baseline values.

System Configuration:

Centre Frequency The **Centre Frequency** is specified in gigahertz (GHz).

Azimuth Resolution The **Azimuth Resolution** is specified in metres. For the purposes of **PolSARproSim**, **Azimuth Resolution** is defined to be the width in azimuth of the point spread function at half height power.

Range Resolution The (slant) **Range Resolution** is specified in metres. For the purposes of **PolSARproSim**, **Range Resolution** is defined to be

the width in slant range of the point spread function at half height power.
Note: The slant range resolution is the same for each track, corresponding to constant system bandwidth. Typically, better resolutions require longer computations.

Ground Surface Configuration:

Surface Properties — This parameter has the minimum value zero (0), corresponding to the smoothest surface, and the maximum value ten (10), corresponding to the roughest surface. This value is translated into values for surface height standard deviation and correlation length within **PolSARproSim**.
Note: Roughening the surface reduces the strength of ground-volume scattering.

Ground Moisture Content — This parameter has the minimum value zero (0), corresponding to the driest surface, and the maximum value ten (10), corresponding to the wettest surface. This value is translated into a value for soil surface moisture content within **PolSARproSim**.
Note: wetter surfaces reflect more microwave energy.

Azimuth Ground Slope — The **Azimuth Ground Slope** is a dimensionless quantity expressed as a percentage (%). It specifies the slope of the underlying mean terrain in the azimuth direction.

Range Ground Slope — The **Range Ground Slope** is a dimensionless quantity expressed as a percentage (%). It specifies the slope of the underlying mean terrain in the ground range direction.
Note: both slopes affect the strength and focus of ground-volume scattering terms.

Small Vegetation Configuration:

Vegetation Height — The mean height of the small vegetation specified in metres.

Random Number Generator — This value is used to seed the random number generator.
Note: a random number is automatically generated when this function widget is launched, but the user may change the value as desired.

Save Config — Save the parameters for input to **PolSARproSim** in the **Configuration File** (a text file with the extension "**.sar**"), and calculate the dimensions of the SAR images.
Note: computation time increases with increasing image dimensions. To reduce image dimensions you may increase resolution lengths, or reduce the stand area. Image dimensions also depend upon the height of the forest stand, and the incidence angle

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Output Files

The file *config.txt* is output by **PolSARpro** to both the **Output Master Directory** and the **Output Slave Directory.**

PolSARproSimVeg stores the 2 × 2 complex Sinclair matrix in the binary data files s11.bin, s12.bin, s21.bin and s22.bin.

PolSARproSimVeg generates a graphic image of the simulated area and stores it in **BMP** format as the file *vegetation_image.bmp* in the **Output Master Directory**.

In addition, in the **Output Master Directory**, **PolSARproSimVeg** also creates the text files "*configfile_prefix*_**call.txt**", "*configfile_prefix*.**out**" and "*configfile_prefix*.**log**", where configfile_prefix is the file name entered by the user in the **Save Config** section. These files form a record of **PolSARproSimVeg** activity, but are not required for the **PolInSAR tutorial**.