Argus

The “Argus” utility determines visibility zones on a map based on terrain elevation and observer height - such as aircraft, dominant heights, and ground observation posts.

To visualize the data, the “Argus” program uses a web browser and can operate in both online and offline modes.

The general view of the screen is shown in Figure 1 and consists of the following components:

- The area displaying the terrain relief, visibility zones, and shadow (the main section in the center).
- The color scale of elevations and depths, located in the upper left corner.
- The menu for setting visualization parameters (upper right part of the window).
- Text in the lower left corner of the screen, showing the coordinates of the observation point and the visibility area.

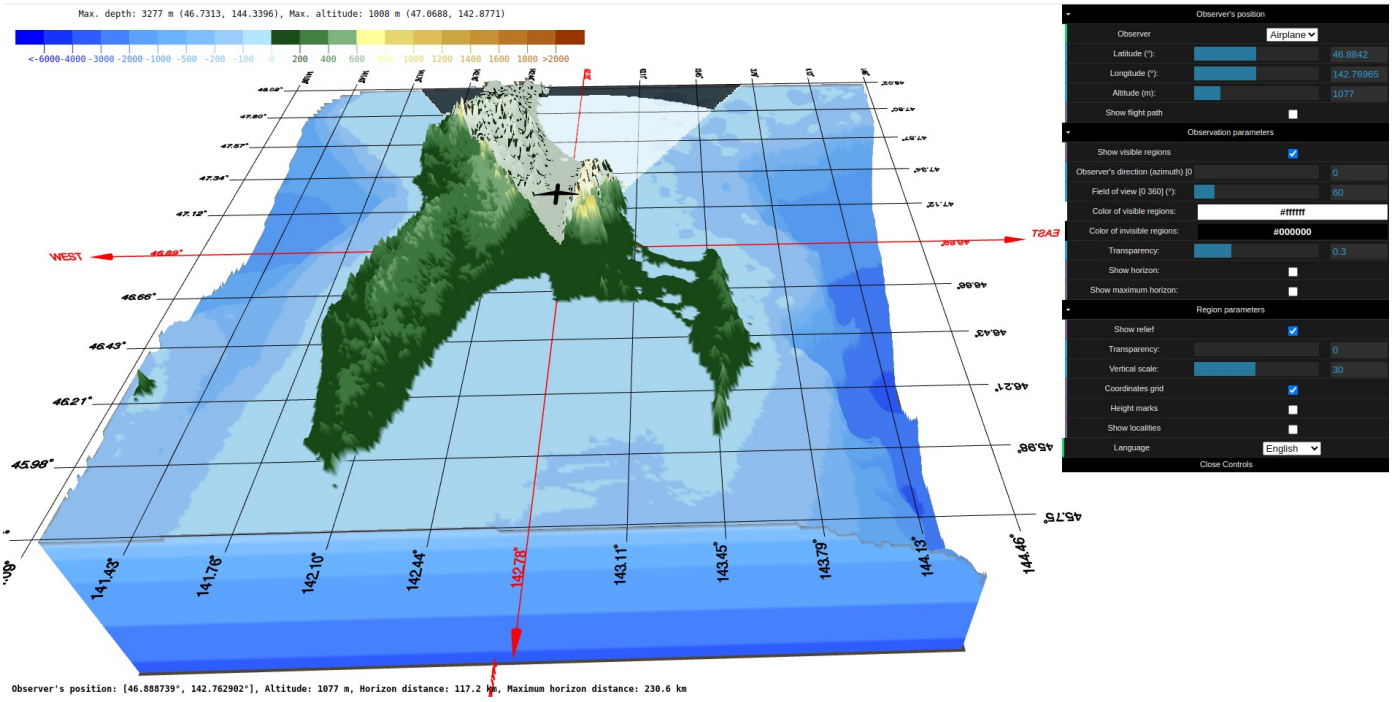

Fig. 1 General view of the “Argus” utility.

The observer’s position is set either using the mouse or through the menu. All menu options are divided into the following categories:

1. Observer’s position
2. Observation parameters
3. Region parameters

The functions of all menu options are described below.

Observer’s position

In this submenu, the **latitude**, **longitude**, and **altitude** of the observation point are set. The observer’s position can be displayed as a **point**, **aircraft**, or **radar** (via the "**Observer**" option). After setting the latitude, longitude, and altitude values, the utility calculates which parts of the terrain are visible from that position and which are not.

The observer point can be set by dragging the aircraft icon with the mouse to the desired location. Alternatively, the observer's position can be defined by double-clicking on the terrain surface. If the specified position is below sea level or terrain level, its altitude will be automatically adjusted to 2 meters above the terrain/sea surface.

The **Show flight path** option displays the aircraft's trajectory as a blue line with yellow waypoint nodes (see Fig. 2).

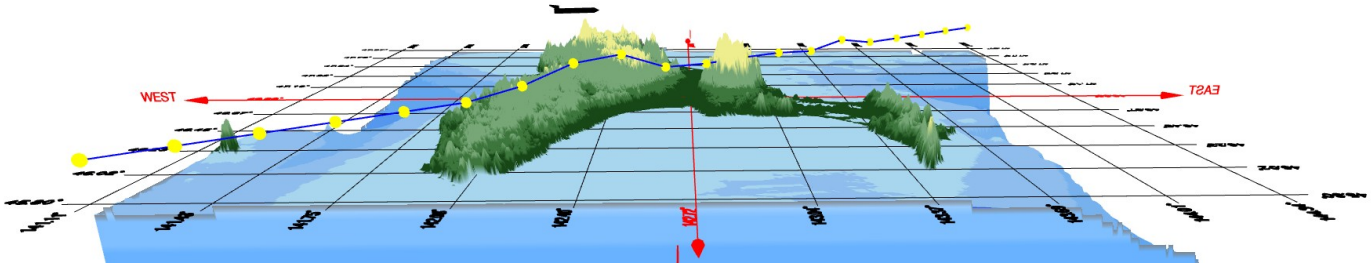

Fig. 2 Flight route over the selected region.

The flight trajectory can be adjusted using the mouse - by clicking and dragging any of the waypoint nodes to the desired location. The selected point changes color to red (see Fig. 3). IIts position can now also be adjusted using the latitude/longitude/altitude options.

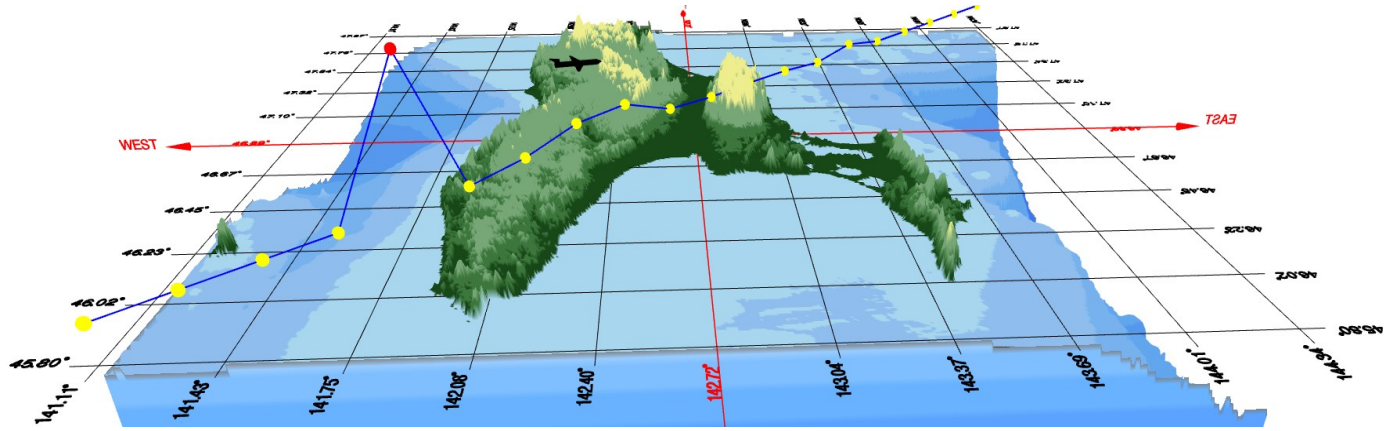

Fig. 3 Modifying the flight route using the mouse or the menu.

When double-clicking on any of the waypoints, the aircraft icon will move to that position, and the visibility zone will be recalculated according to the new location, as shown in Figure 4.

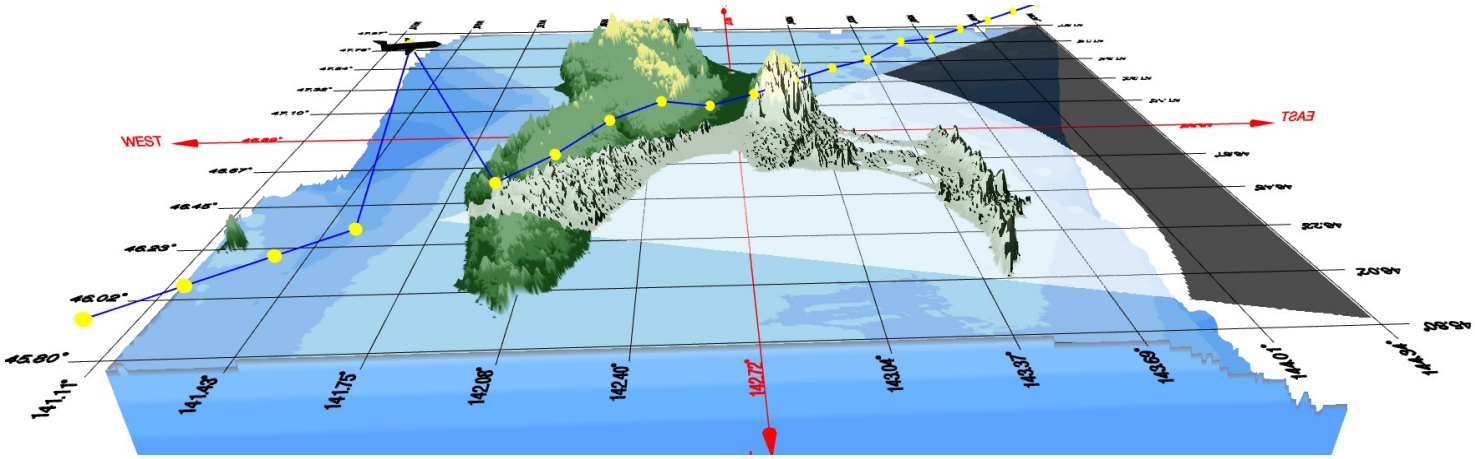

Fig. 4 Visibility zone for the modified flight route.

Observation parameters

The **Observation parameters** option displays which areas of the terrain are visible from the observation point and which are not. The coloring of the visibility and shadow zones can be set using the **Color of visible regions** and **Color of invisible regions**, respectively. In Figure 5, red is used to indicate the visible areas of the terrain, while green represents the invisible (shadow) regions.

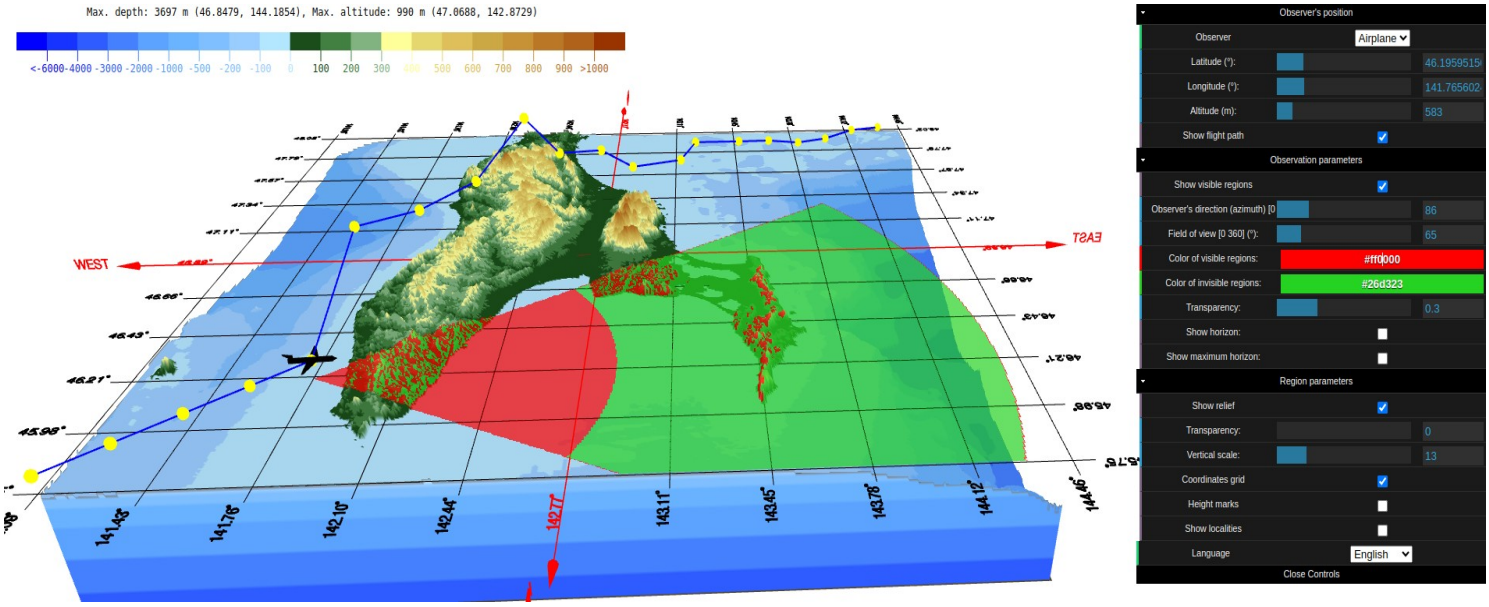

Fig. 5 Applying color mapping to terrain regions based on their visibility status.

The **Transparency** option controls the opacity level of terrain regions that are visible or hidden from the observer's position, on a scale from 0 to 1. For example, in Figure 6, the transparency is set to 0.7, allowing the terrain relief to remain visible through both the visible and hidden zones.

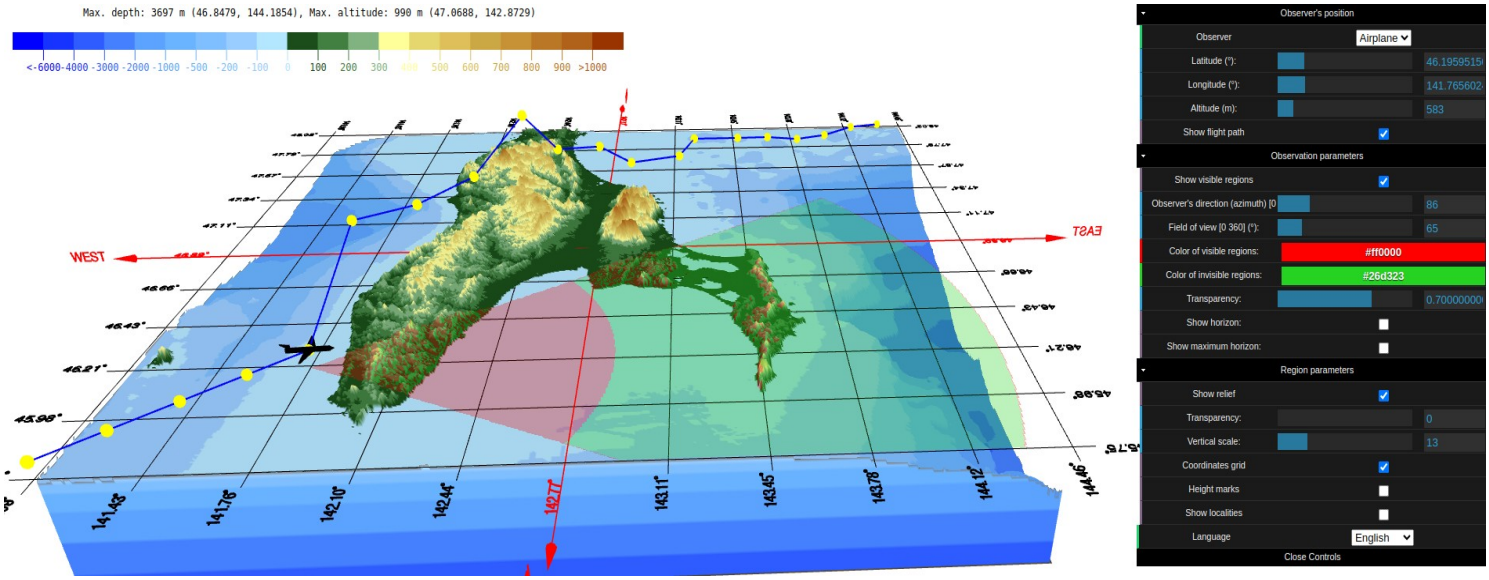

Fig. 6 Setting the transparency level of visible and shadow zones.

The **Azimuth** and **Field of View** options set the observer's direction and viewing angle. For example, in Figure 7, the azimuth is set to 0° and the field of view to 60°, while in Figure 8, the azimuth is 90° and the field of view is 120°. To enable a full 360° panoramic view of the terrain, set the field of view to 360° (see Figure 9).

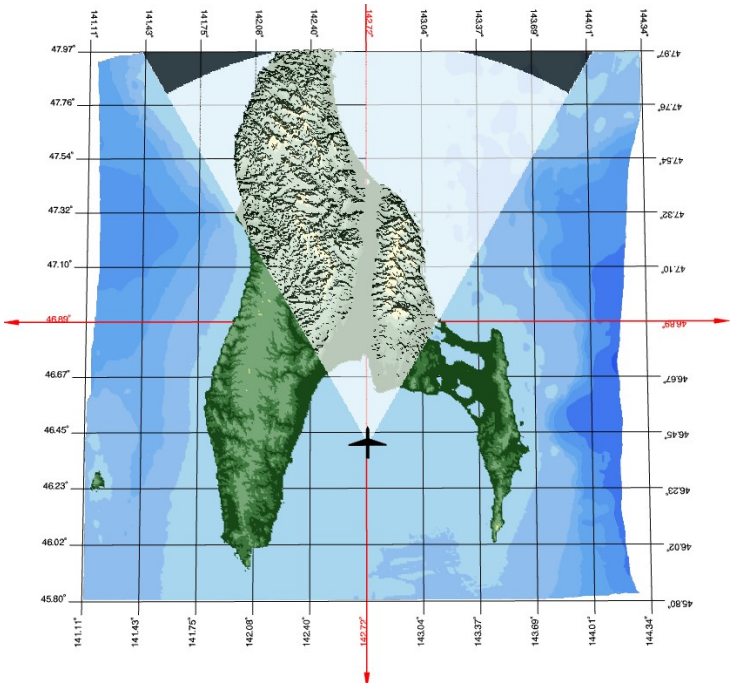

Fig. 7 Azimuth 0°, field of view 60°.

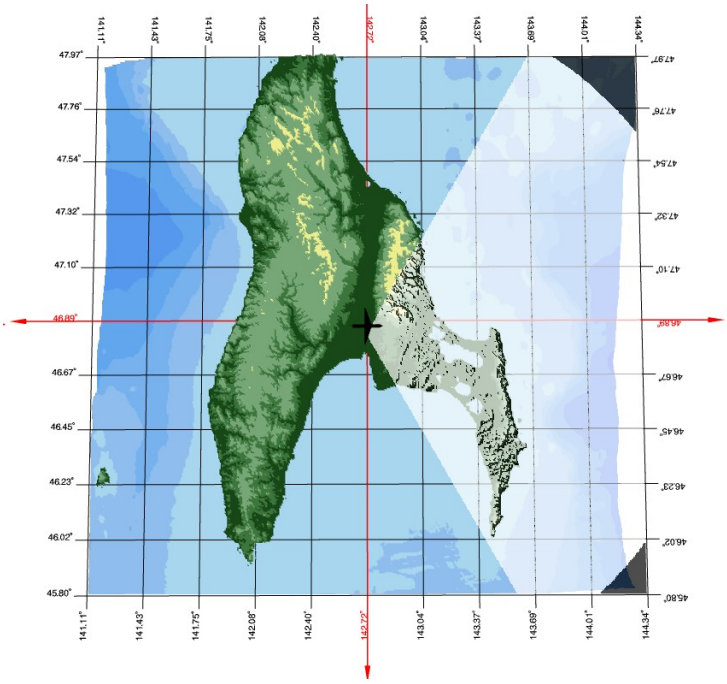

Fig. 8 Azimuth 90°, field of view 120°.

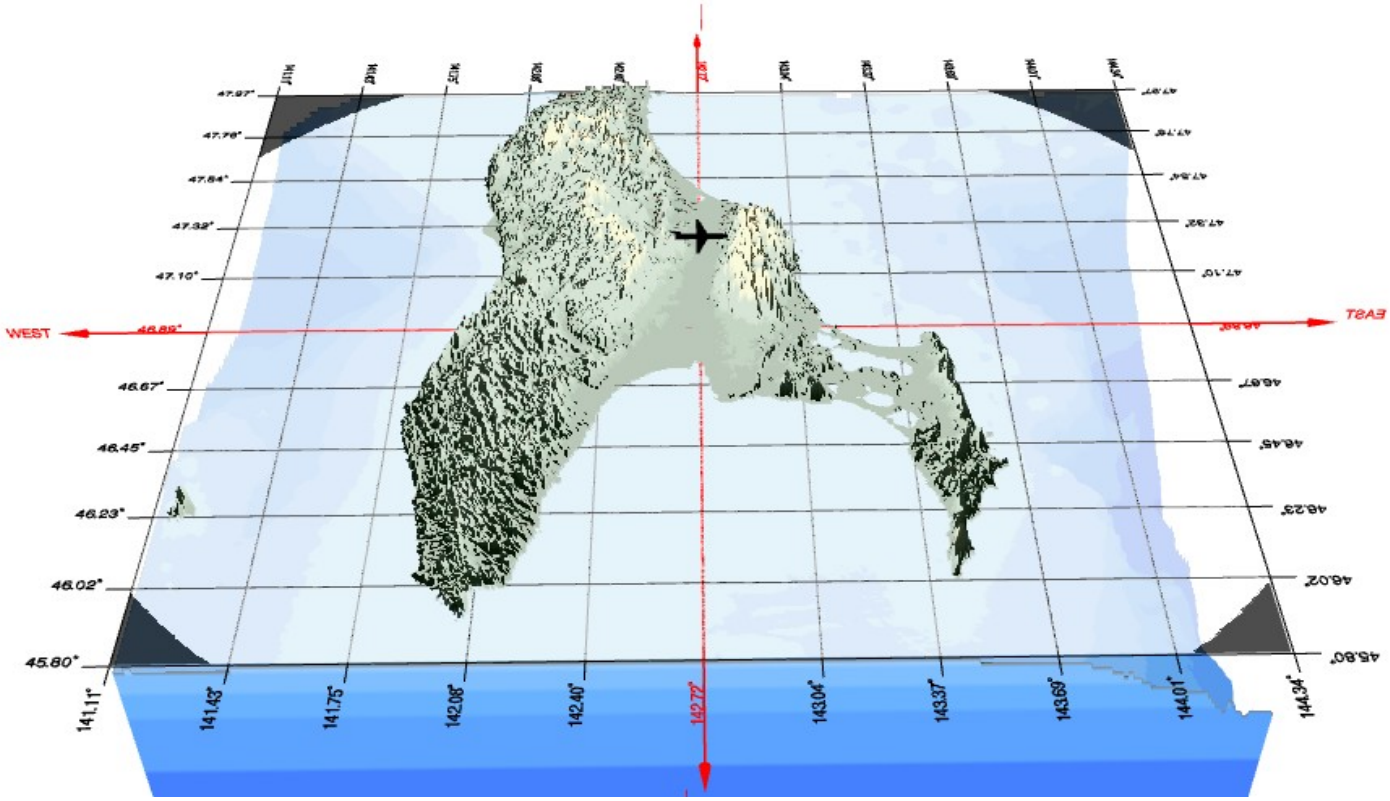

Fig. 9 Visibility and shadow zones for a 360° panoramic view.

The **Show horizon** option displays the horizon line considering the observer's height above ground level, but without accounting for the height of terrain objects. Above sea level, the horizon radius is 5 km, but a 20-meter ship mast can be seen from a distance of 21 km. Therefore, the horizon radius is 5 km, while the maximum horizon radius is 21 km. The **maximum horizon** line indicates the area within which the highest point (979 m) of the selected region is still visible from the observer's position. Figure 10 shows the circles of the horizon and the maximum horizon (dashed line). In the lower-left corner of the screen, the latitude, longitude, and elevation of the observation point, as well as the horizon and maximum horizon radii, are displayed.

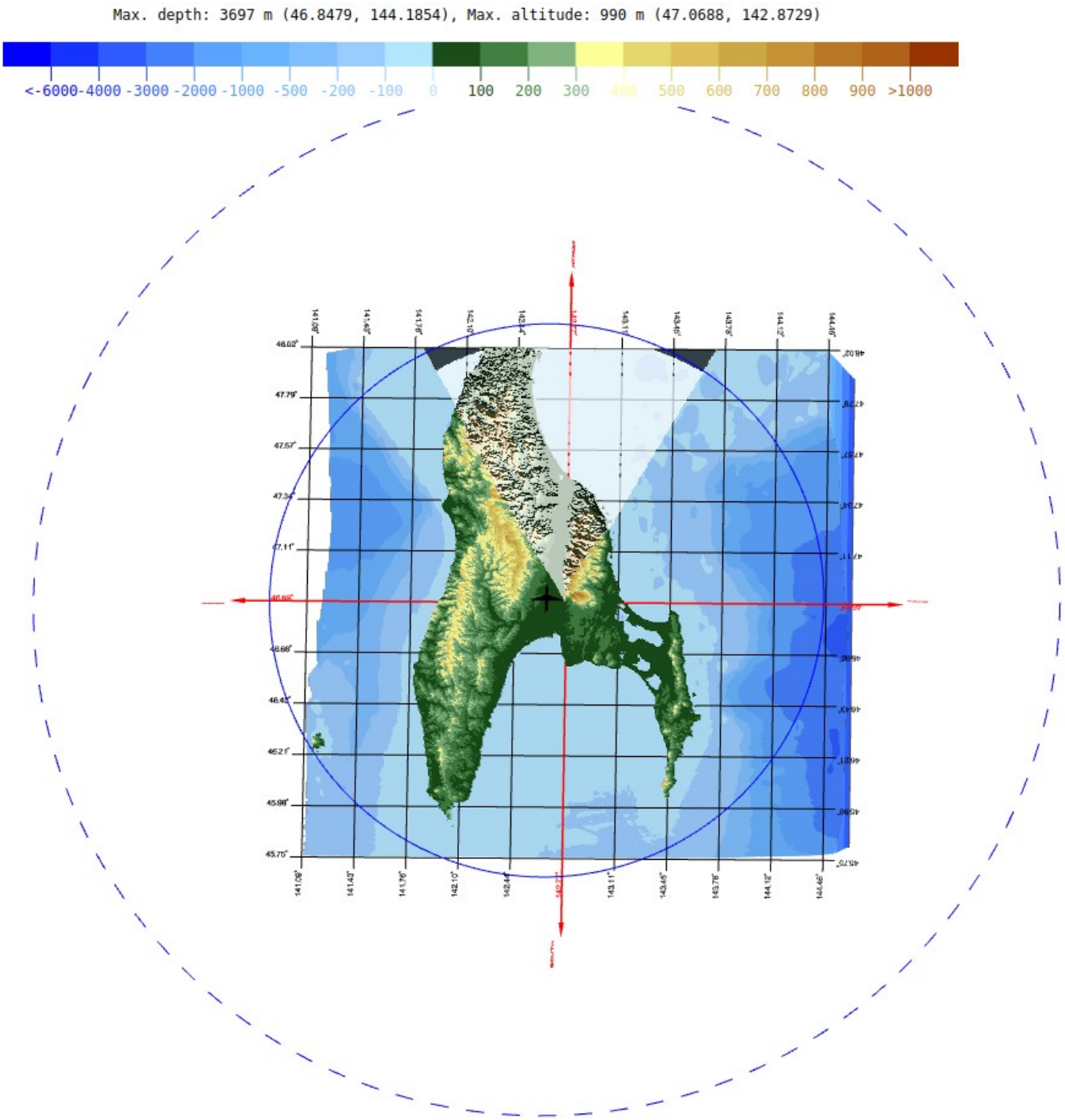

Fig. 10 Radii of the horizon and the maximum horizon.

Region parameters

This menu section contains several options to facilitate terrain visualization and coordinate determination:

Show relief. Allows you to show or hide the terrain relief. In Figure 11, the relief is not shown. Visibility zones are displayed in red, and shadows in blue.

Transparency: Sets the transparency level of the terrain relief. Figure 12 shows the same region as Figure 11, but with semi-transparent relief.

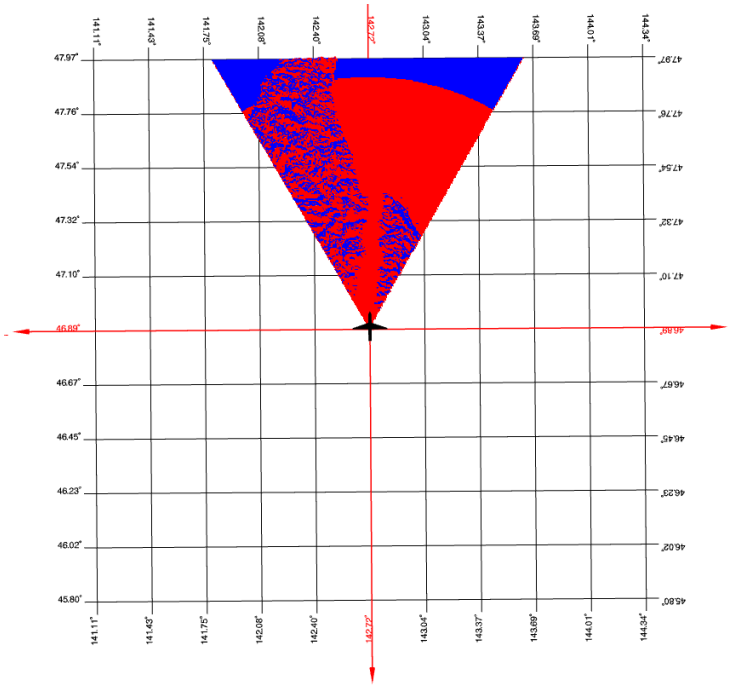

Fig. 11 Visibility and shadow zones.

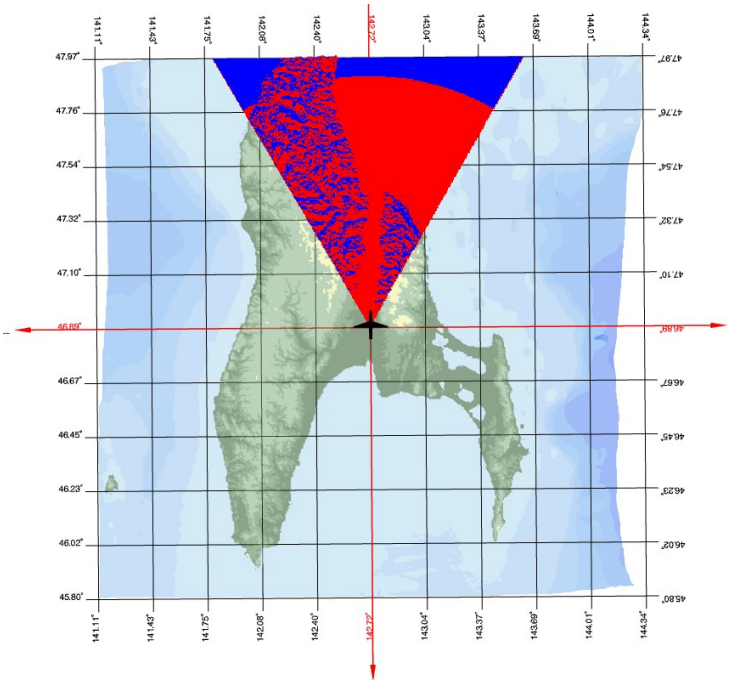

Fig 12. Visibility zones and semi-transparent terrain relief.

Vertical scale: Indicates the degree to which vertical elevations are stretched relative to horizontal distances. Figure 13 shows the terrain relief at a 1:1 scale, while in Figure 14, the vertical heights are exaggerated 50 times compared to the horizontal distances.

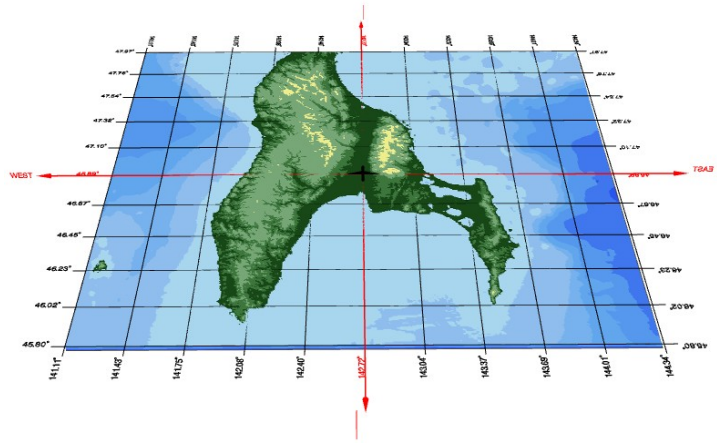

Fig. 13 Terrain relief at a 1:1 scale.

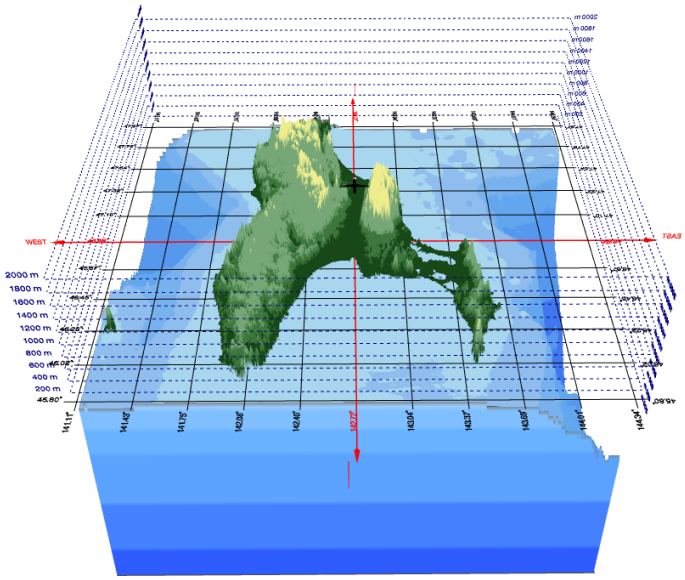

Fig. 14. Terrain relief at a 50:1 scale.

Coordinate grid. Displays geographic coordinates with equal spacing in latitude and longitude, and indicates the north-south and east-west directions.

Height marks. Used to determine the vertical coordinates of aircraft and the elevation of terrain features.

Figure 14 shows elevation markers with a 200-meter interval, a latitude and longitude coordinate grid, cardinal directions, and the 360° visibility zone.

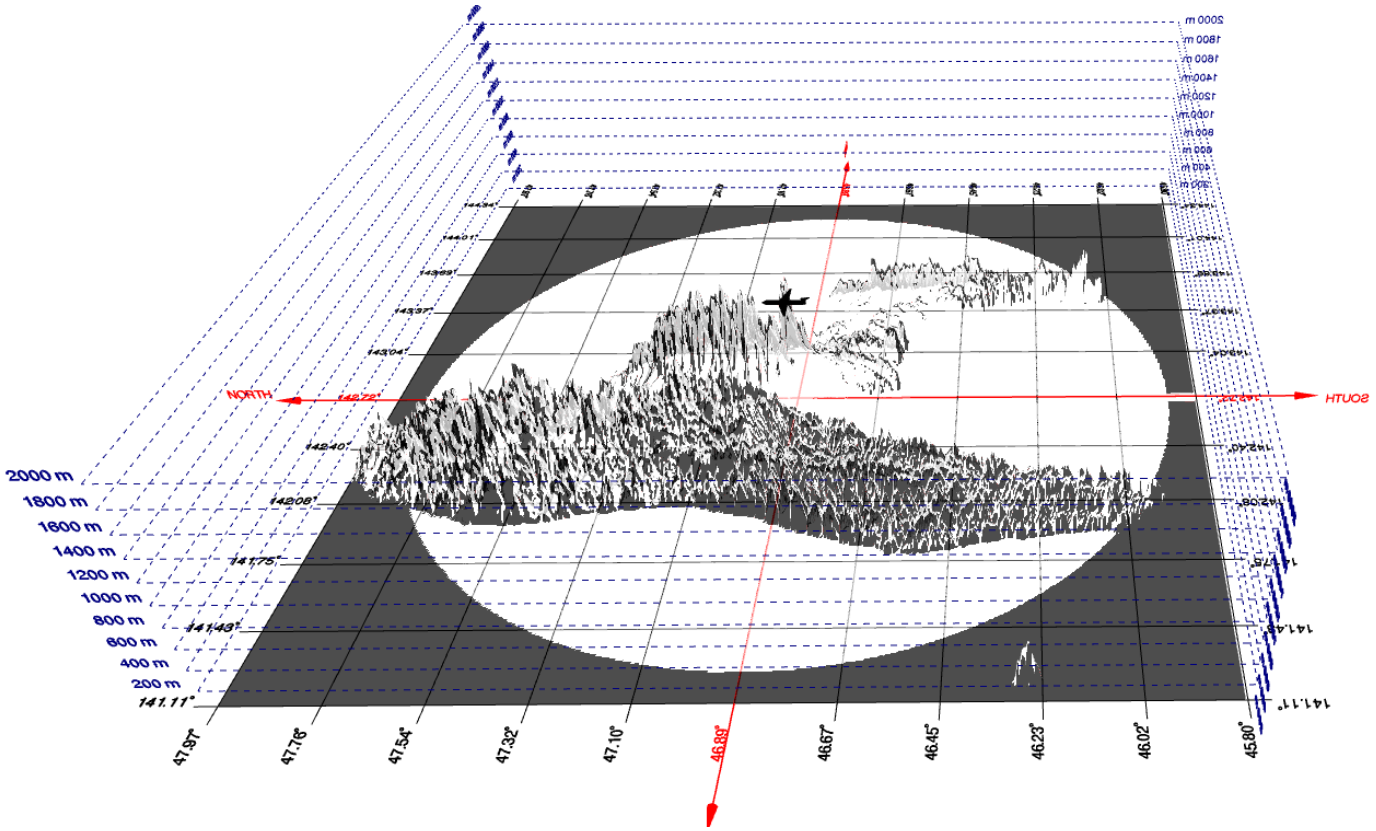

Fig. 15 Elevation markers and coordinate grid.

Elevation and depth color scale

The scale is located in the upper-left corner of the screen and indicates the color used to represent terrain elements based on their elevation or depth. Above the scale, the coordinates and values of the region's minimum and maximum elevation/depth points are displayed. When the mouse cursor moves along the scale, the corresponding region on the map is highlighted in red. For example, in Figure 16, all terrain areas with elevations between 300 and 400 meters are highlighted.

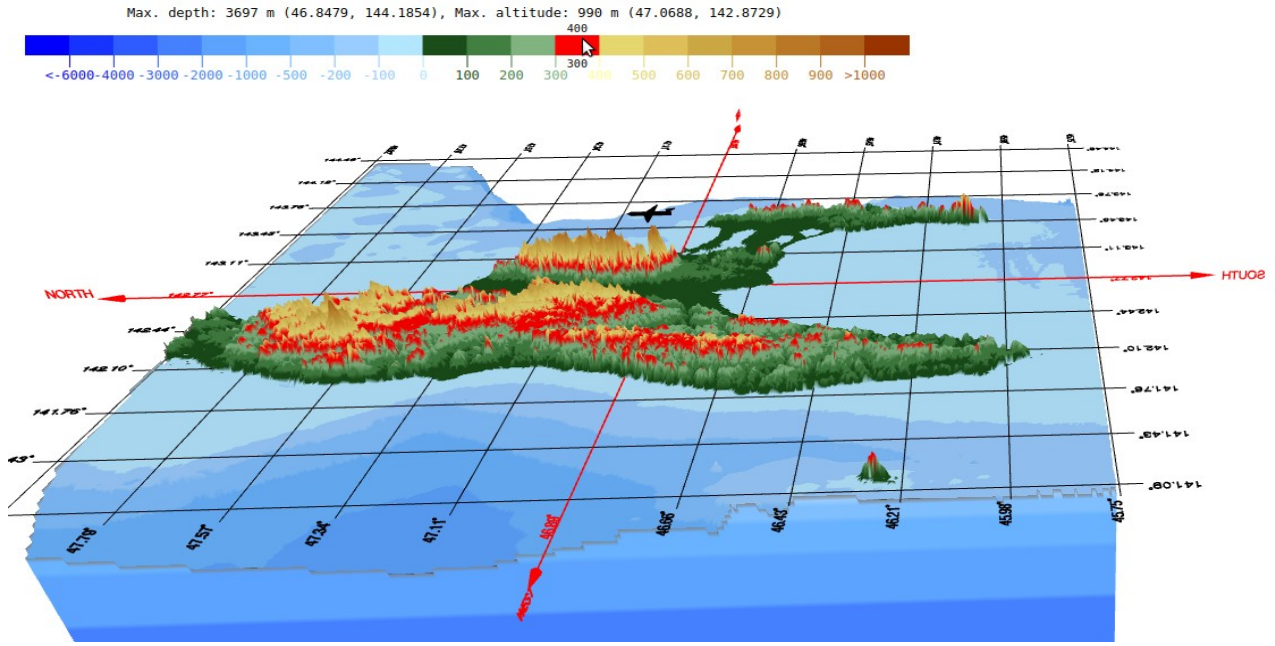

Fig. 16 Areas of the terrain with elevations between 300 and 400 meters above sea level are highlighted in red.