Now the PHOTOMOD Radar software supports radar images from the ICEYE constellation at the SLC and GRD processing levels.

The ICEYE Constellation in early 2020 consists of three 85-kilogram radar (SAR) microsatellites orbiting in a low Earth orbit. Each satellite carries a payload that consists of a synthetic aperture radar sensor and antenna. ICEYE satellites operate in the X-band part of the electromagnetic spectrum and use an active phased array antenna that can provide electronic beam steering. The mean constellation revisit time is 20 hours at the equator. The satellite parameters are shown in Table 1.

Table 1. Technical parameters of satellites

	ICEYE SAR Satellites
Nominal Altitude	570 km
Ground track repeat	18 – 22 days
Circular Error Probable 90 (CEP90)	5.7 m – 9 m
Carrier frequency	9.65 GHz (X-band)
Antenna size	3.2 meters (along-track 'X-axis') x 0.4 meters
Polarization	VV
Pulse Repetition Frequency	2-10 kHz

Imaging ICEYE modes: Spotlight, Spotlight High, Stripmap, Stripmap High. The imaging mode parameters are shown in Table 2.

Table 2. Parameters of imaging modes

PARAMETER	STRIPMAP	STRIPMAP HIGH	SPOTLIGHT	SPOTLIGHT HIGH
Nominal swath width	30 km	30 km	5 km	5 km
Nominal product length	50 km	50 km	5 km	5 km
Incidence angle [scene centre]	15-30°	15-30°	20-35°	20-35°
Slant range resolution [m]	0.5 -1.5	0.5	0.5	0.5
Slant azimuth resolution [m]	2.5 - 3.0	2.5 - 3.0	0.5	0.25
Ground range resolution	3.0	3.0	1.0	1.0
Ground azimuth resolution	3.0	3.0	1.0	1.0

ICEYE constellation is growing by 4 more satellites in 2020. Throughout 2021, 8 additional satellites will be launched in specialized orbital planes designed to provide a near persistent fine resolution view of the Earth's surface. The main goal is to provide a repeated survey of any point on Earth every few hours.

As an example, we used an ICEYE radar satellite image from 07.04.2020 covering an area in Greece. Processing level - SLC (single look complex), mode - StripMap (ground resolution 3x3 m, scene size 30x50 km), polarization - VV. You can download test data from the ICEYE official website.

The process of importing ICEYE data from .XML format into the internal PHOTOMOD Radar .rdp format:
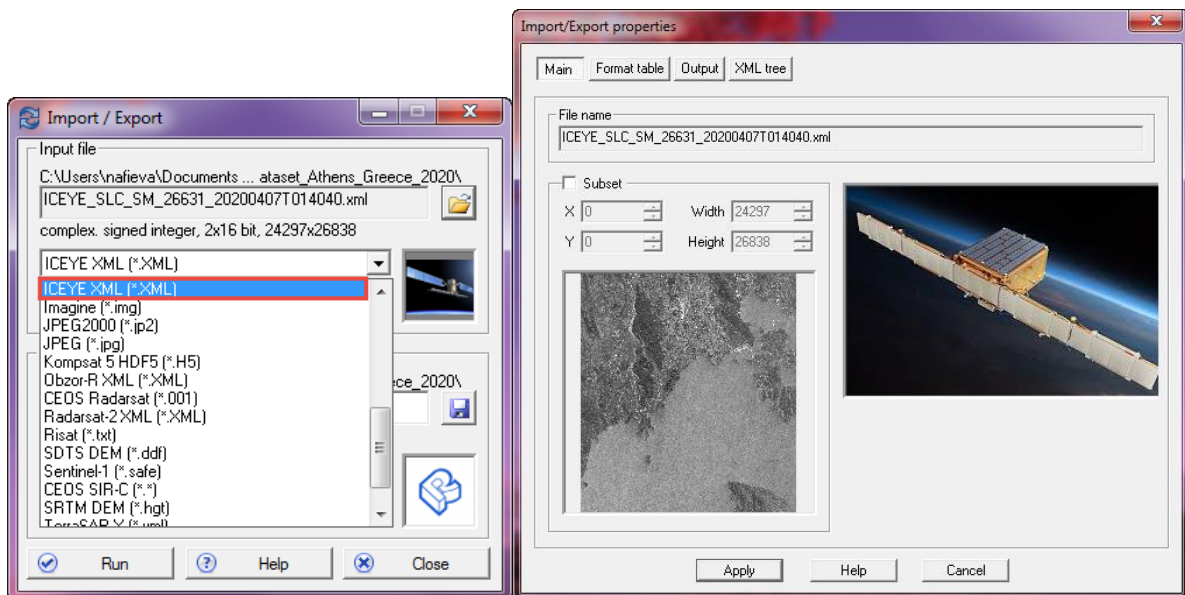

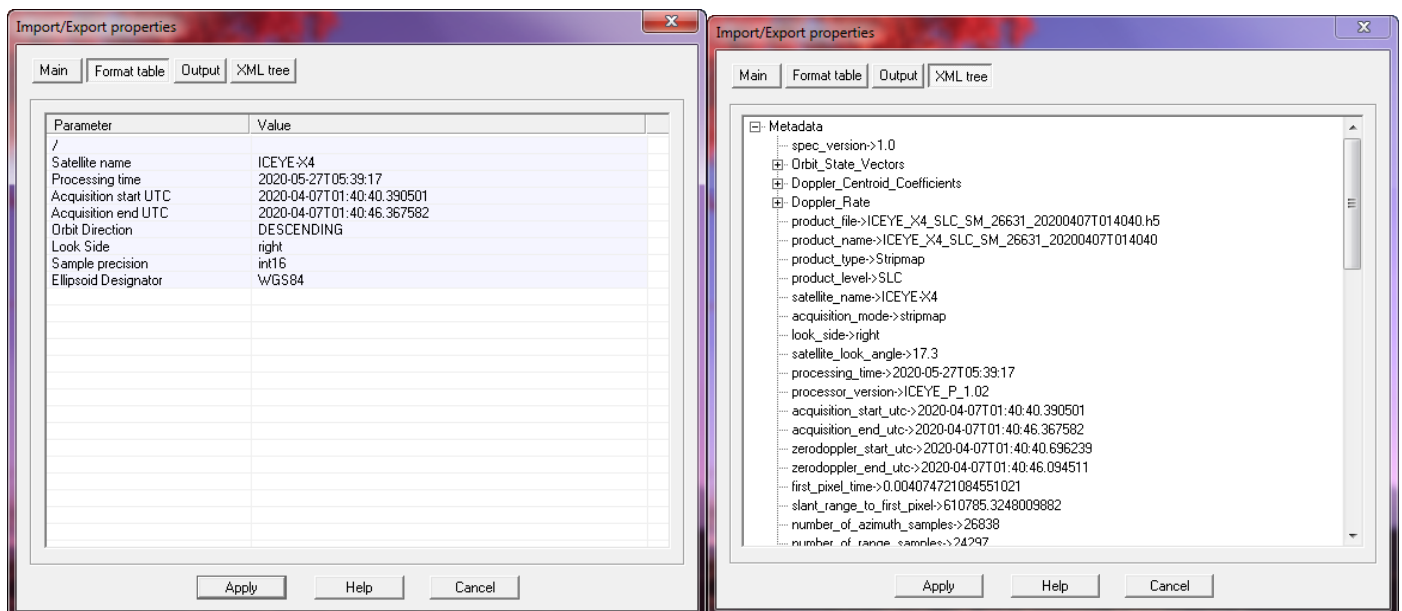Fig.1. Dialog box for selecting the format and fragment of the image

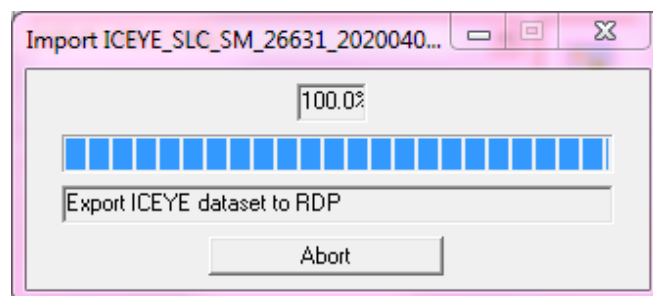Fig.2. Information box and ICEYE images metadata

Fig.3. Process of exporting ICEYE data to RDP format

The geocoding process is designed to transform the initial radar image from one coordinate system (time - slant range) to the WGS-84 coordinate system.
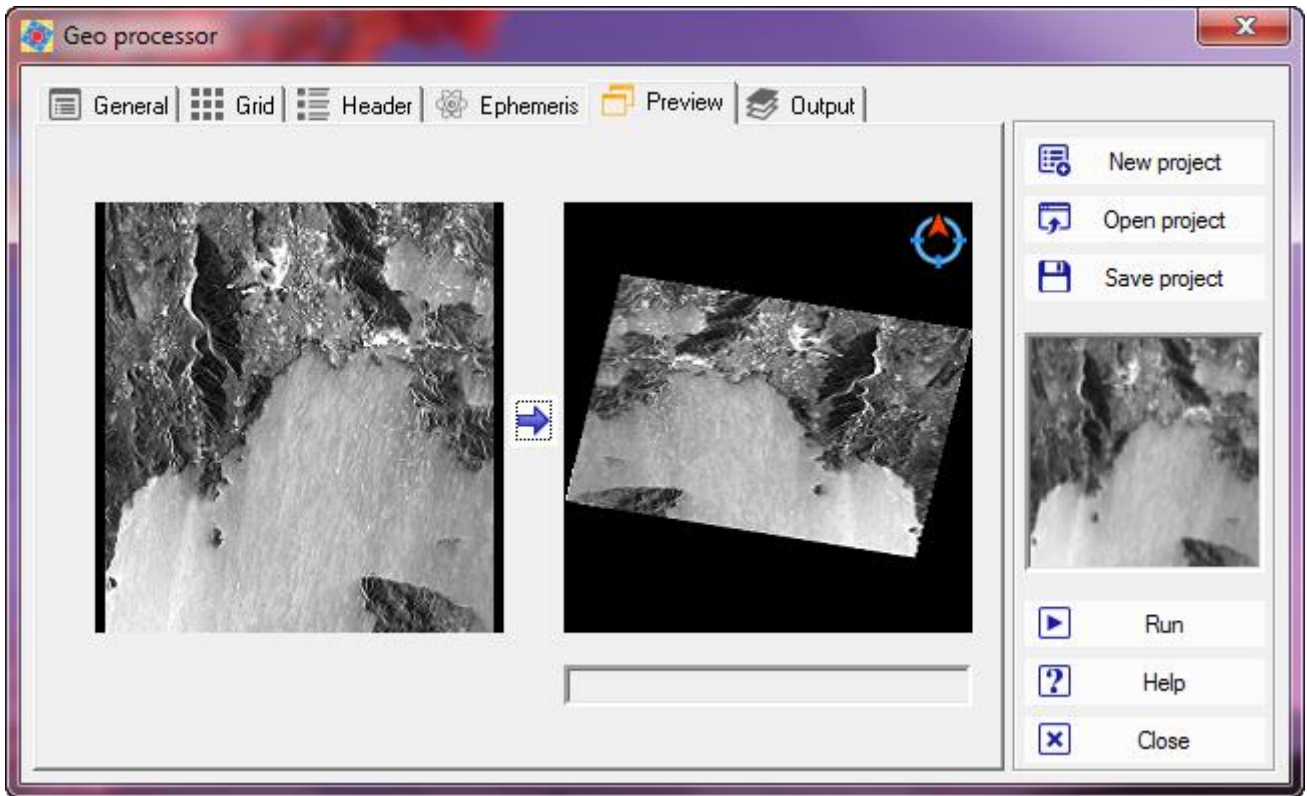
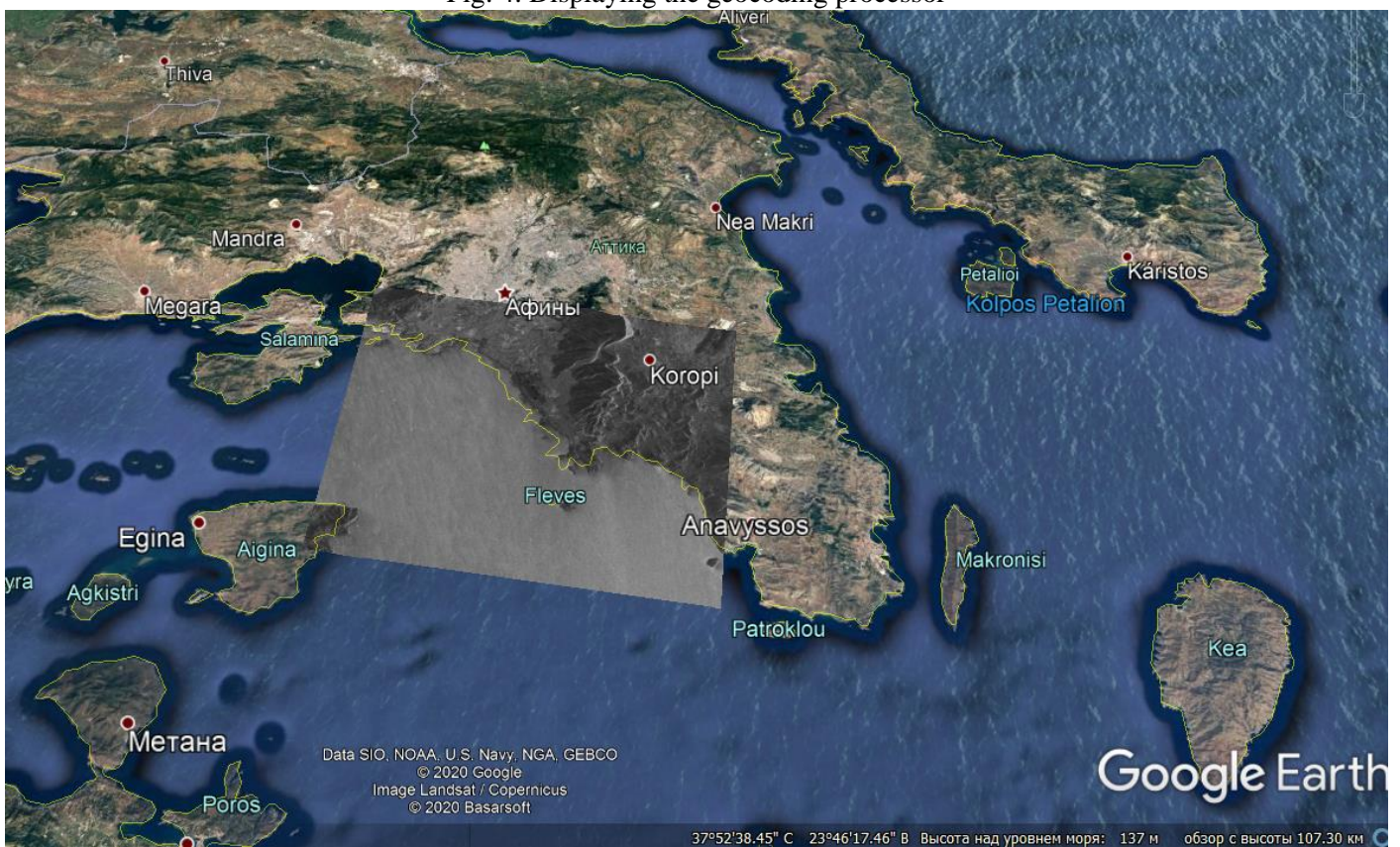Fig. 4. Displaying the geocoding processor

Fig. 5. Displaying ICEYE image on Google Earth background

Useful links:

Detailed information on ICEYE products: https://www.iceye.com/hubfs/Downloadables/ICEYE-SAR-Product-Guide.pdf

The official company website: https://www.iceye.com/

More about PHOTOMOD Radar: https://en.racurs.ru/program-products/photomod-radar/

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