# Creation of Digita l Surface Models using Resurs-P Stereo Pairs

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Two spacecrafts of Resurs-P"type (spacecraft №1 was launched on June 25, 2013, spacecraft №2 was launched on December 26, 2014) are operated currently. These spacecrafts are manufactured for a wide range of tasks (map updating, supporting of activity of different federal, regional, municipal departments and other consumers) as well as for receiving information concerning control and protection of the environment.

The Resurs-P spacecrafts stereopairs are the input data for creating DSM.

The key characteristic of a stereo pair is the B / H ratio. The convergence angle is approximately 54 degrees for values of the B / H ratio close to 1. If stereo imaging is performed with equal deviations in pitch, the deflection angles will be about 27 degrees in this case. Pros of such parameters of stereo imaging are: a large angle of convergence allows to improve the measurement accuracy of a stereo pair, a larger area of a stereo pair. Cons are: shadow zones of mountainous areas and areas with storied buildings, additional imaging with a small angle of deviation from the nadir or use of image of a stereo pair with a deviation from the nadir more than 20 degrees is to be performed for creating orthophoto

Normally B/H ratio is in the range from 0.3 to 0.5. This ration should be reduced for mountain areas , and increased for flat areas. Thus, the convergence angles range is from 30 to 45 degrees. To create orthophoto stereo imagery can be performed with different angles of deflection of the optical axis from the nadir in pitch (for example, +20 and -10 degrees) for the purpose of using image with a lesser angle of deviation from the nadir for orthorectification.

To create a DSM stereo imaging by spacecraft Resurs-P №1 sensor GEOTON-L1 in the panchromatic band with different angles of deviations in pitch were performed.

7 images were used For creating stereo pairs . The main stereo pairs (by the imaging on the same orbit pass) and additional (matched to the angle of convergence). The result was 8 stereo pairs for the same territory, but with different angles of convergence and B/H ratio. Data processing level 1A and 2A was used for photogrammetric processing .

Photogrammetric processing was performed by using the PHOTOMOD v.6. The block of 7 images was formed during processing. To perform the block adjustment 7 controls and 76 check points were used.

7 DSM were created after adjustment . 5 DSM were created using data processing level 1A and 2 DSM were created using data processing level 2A. Amond them 2 DSM were built using the new algorithm of PHOTOMOD — dense DSM creation (using multiple overlapping).

The results of data processing showed that images of data processing level 2A are the best for photogrammetric processing, including the creating DTM and DSM . Images of data processing level 2A have better geometric properties and lead to the DTM precision (standard deviation by height up to 3 meters).