WATER BODIES DETECTION ON A PORTAL

Radar Satellite Sentinel-1 products for detection and analyses of water surfaces and flood areas in Slovenia. Users are Slovenian Environment Agency and other professionals.

The challenge

GeoCodis Ltd. and ZRC SAZU, the Slovenian Academy of Science and Arts, are working together to provide services for receiving up-to-date satellite images, for the detection and analysis of water surfaces and flood areas, and to provide the right information for users. The main challenge of the whereiswater.at portal was using the Sentinel-1 radar data for detection of water bodies in Slovenia. We succeeded in establishing an automatic processing chain by downloading raw data from the Hub, processing images in several steps, storing results into a database and delivering it to a web-based application. The main aim of the system is monitoring of bodies of water in Slovenia, providing historical statistics and supporting water related environment monitoring. The initial goal of the system was to create an additional independent source for flood prediction monitoring at Slovenian Environment Agency.

The space based solution

Sentinel-1 data are fully compliant for the detection of bodies of water but need to be carefully analysed and combined with precise terrain data and with samples of existing bodies of water on the surface. Whereiswater.at portal stores and analyses satellite data from the very start and creates its own archive of bodies of water. Users can search the observed data on the map where all acquisitions are marked. Additional functionalities help users to select data only for the specific area. More advanced users can create their own polygons and create a statistical graph with the percentage of water area in the region. It can be of special interest for flood frequency over a long-time period. The final interesting functionality is the water heatmap that shows the number of days covered by water since Sentinel-1 tandem became operational.

It happens that some of the results are wrongly classified and therefore we establish the possibility to mark these data and exclude them form the further analyses. However, these data could be valuable for other purposes, e.g. for monitoring wet snow conditions in the mountains or to detect other water related phenomena, like watering golf courses or football pitches.

Benefits to Citizens

The portal is fully operational and is consulted as an information source for water specialists and for the general public. Besides the regional overview of present and past conditions of bodies of water, it also provides additional and sometimes even unexpected information such as detected wetness which remains after the watering or spreading of liquid manure on agriculture fields, or wetness on frequently watered golf courses, etc. The most valuable applicability of the portal is seen in the monitoring and evaluation of the large flood events and observing conditions of wetlands. It is also possible to monitor the extent of water inside large hydroelectrical or agricultural accumulations. Additionally, it can be used for identifying drought or dry conditions of soil on
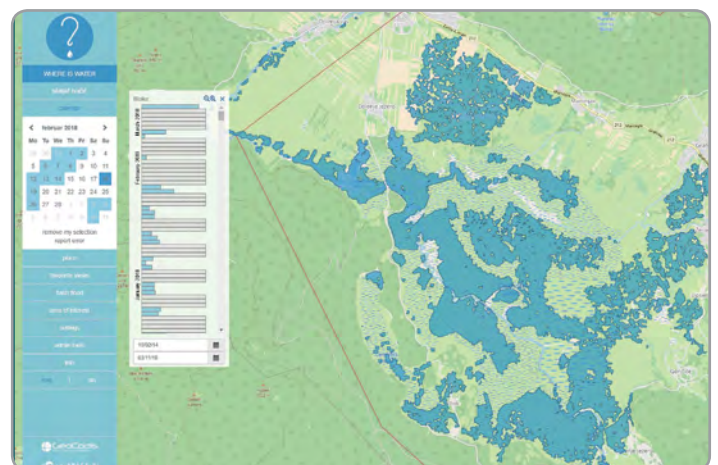
WhereIsWater.at portal shows Cerknica lake, Slovenia and toolbox with customized services.

Thematic Area	Region of Application	Sentinel mission used	Copernicus Service used	Usage Maturity Level
CLIMATE, WATER AND ENERGY	SLOVENIA	S1	–	4/5

large agricultural areas. Until now, whereiswater.at service has only covered Slovenia and some nearby areas but can be extended to other areas where regular water monitoring is not established. Various professionals can derive huge advantages from using our services for their specific needs. The Slovenian Environment Agency uses this portal for analysing standing water, lakes and for monitoring flooded karst fields, as well as for evaluating the forecast on rivers. Based on satellite imagery, it can confirm or reject the alert values of the flood warning process. It has made a significant contribution to increasing knowledge about remote geographical areas.

Outlook to the future

There are still many areas for further development including spatial statistics of water conditions, combination with ground sensors and validation of flood prediction systems. We would like to extend the use to other countries and to compare the results with other similar Sentinel 1 based applications. Whilst Sentinel 1 data are available only every 4th to 6th day we could combine data with Sentinel 2 products. There are still windows of opportunity to improve the accuracy of the provided data. The mobile app is also under development and should be available in the near future.

Heatmap of intermittent Lake Cerknica, southern part of Slovenia, from autumn 2014 – beginning of 2018.

"The WhereIsWater portal has made a significant contribution to increasing knowledge about water conditions and has helped to improve the flood alert warning system."

Mojca Robič, hydrologist,
Slovenian Environment Agency

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