EO FOR BIOTOPE-TYPE MAPPING IN THE ALPINE ZONE IN AUSTRIA

Sentinel-2 time series analysis supports alpine habitat assessment (1) by indicating changes in sensitive areas and (2) as a planning tool for designing in-field mapping.

The challenge

The alpine zone above the closed forest line hosts habitats for numerous ecological sensitive plant and animal communities in natural to near natural conditions. As a consequence of the tough environmental characteristics of alpine regions (large area, undulating to steep topography, fast changing weather conditions, short snow free period) field mapping of biotope- and habitat-types is cost- and time intensive. However, nature conservation legislation of Austrian federal states demands area wide biotope-mapping, whereas habitat assessment is required within the EU-wide Fauna-Flora-Habitat Directive (Natura 2000 network).

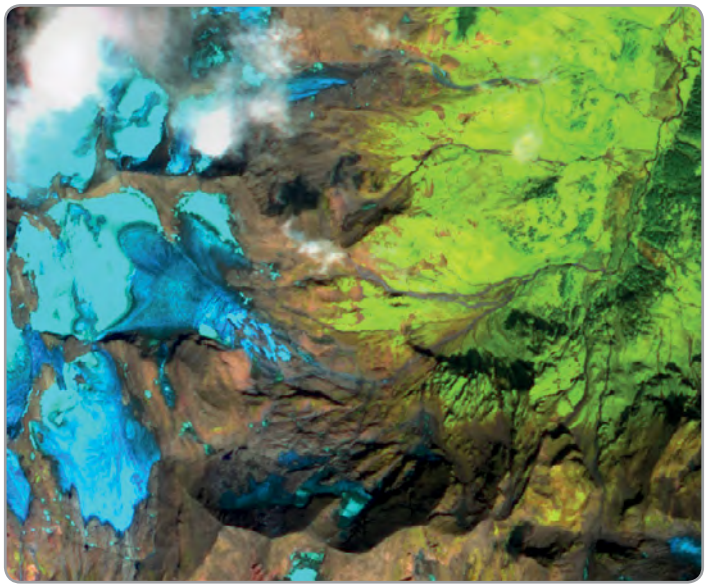
The space based solution

In order to monitor alpine habitats at the fine level of biotope-types and group of biotopes a stratified habitat mapping strategy was developed based on the usage of recent remote sensing (RS) sources and earth observation (EO) techniques. First Sentinel 2 time series analysis supports decision making on alpine habitat mapping strategies (vegetation period, snow coverage, seasons of cloud free satellite imagery, etc.) and provides rough information on areas with a high degree of potential changes, as well as areas with than stable conditions. This knowledge is then used for tasking VHR (very high resolution, < 1 x 1 m pixel size) satellite imagery, ideally cloud free and within the vegetation period, to derive biotopes with a high spatial resolution and thus meeting the legal regulations for conservation management needs. Lastly, in-field mapping is coordinated based on the HR & VHR satellite derived information, assessing biotopes, which are hard to uncover with RS techniques or even unclear, and and is also used for validating the satellite derived information.

Benefits to Citizens

Biodiversity loss threatens the provision of ecosystem services to human society. With respect to alpine ecosystems the society benefits from services like natural resources, the supply of fresh water, carbon sequestration, tourism and recreation, amongst others. Thus, several national and international programmes aim to monitor the decline of biodiversity and try to halt or at least slow down these adverse effects by specific nature protection practices.

Remote or inaccessible areas, such as alpine areas, are challenging for nature conservation authorities since the ambitions of regularly monitoring and realising nature conservation management activities increase both efforts and costs, whilst the available resources are getting more and more limited.



Sentinel-2 image (band combination 11, 8a, 2), Fuschertal valley, at mapping season (August) revealing: vegetation (green), rocks (brown), glacier (dark blue), snow (light blue), clouds (white).
Credit: Contains modified Copernicus Sentinel data [2017]

Thematic Area: BIODIVERSITY AND ENVIRONMENTAL PROTECTION

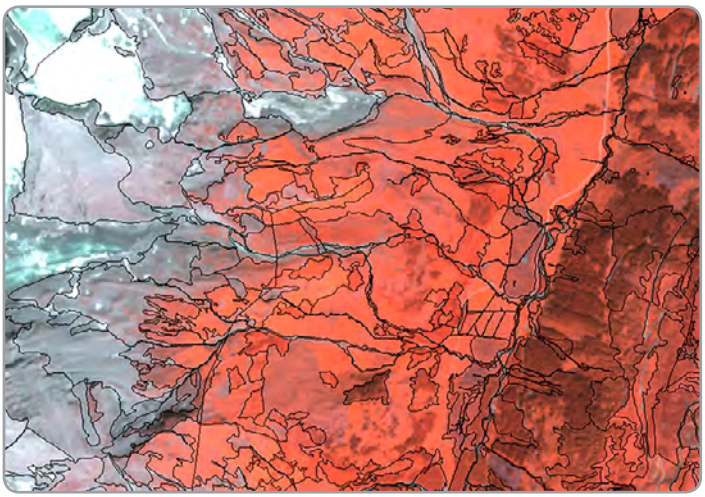
Region of Application: SALZBURG

Sentinel mission used: S2

Copernicus Service used: –

Usage Maturity Level: 3/4

Use of recent RS imagery and EO analysis techniques foster a more standardised, transferable and economically viable solution for biotope- / habitat-mapping, which are less biased towards human perception than traditional in-field mapping. Moreover, high temporal and adequate spatial resolution of Sentinel-2 facilitates regular updating of habitat changes and establishes timely, continuous and region wide comparable monitoring, which e. g. is required every six years by the European Habitat Directive. Thus, the Prov. Govt. of Salzburg – Dept. 5/06 explores EO-based solutions for biotope mapping to improve the efficiency of the monitoring procedure in alpine areas.



Traditional in-field biotope map (glaciers to valley floor), Fuschertal valley (AUT), uncovering biotope structures on false colour Sentinel-2 satellite imagery (band combination 8, 4, 3).
Credit: Contains modified Copernicus Sentinel data [2017]

> "We currently explore satellite data to accelerate the procedure of biotope mapping taking into account the goals of EU Biodiversity Strategy COM(2011)244 final and of EU Directive 92/43/EWG."
>
> ***H. Hinterstoisser,***
> ***Prov. Govt. of Salzburg, Austria – Dept. 5/06***

Outlook to the future

The implementation of EO based biotope/ habitat-mapping techniques into existing monitoring systems becomes more feasible with an increased availability of adequate RS data meeting the temporal and spatial resolution of nature conservation monitoring needs. However, forthcoming big EO data challenges have to be tackled with elaborated strategies whilst the existing regional to international monitoring systems need to be adapted to include RS derived information.

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This Copernicus User Story is extracted from the publication "**The Ever Growing use of Copernicus across Europe's Regions: a selection of 99 user stories by local and regional authorities**", 2018, Edited by NEREUS, the European Space Agency and the European Commission.
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