Case studies about the implementation of SDG targets at country & local levels

GRIDs Network

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UN environment programme

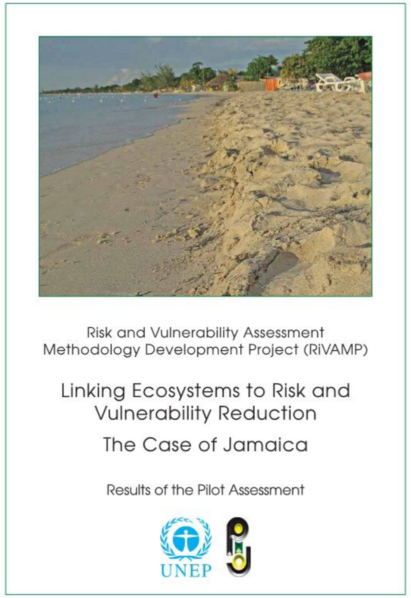
GRID Geneva

UNEP centre for analytics

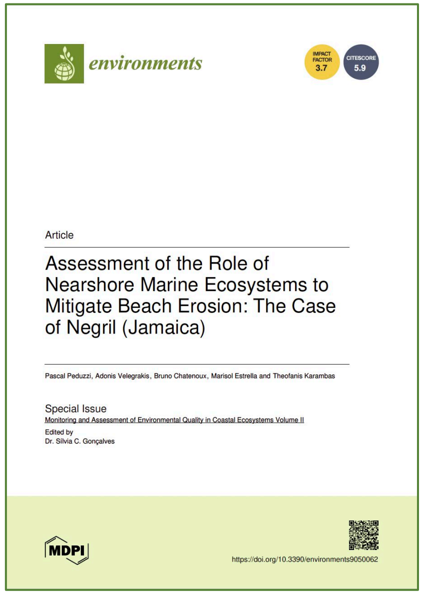
Risk and Vulnerability Assessment Methodology Development Project (RiVAMP) - Linking Ecosystems to Risk and Vulnerability Reduction (Negril in Jamaica, 2009-2012)

For the RiVAMP project, UNEP/GRID-Geneva developed a methodology to quantify the role of ecosystems for Disaster Risk Reduction (DRR); Climate Change Adaptation (CCA) as well as other benefits for sustainable development. This was first applied on the issue of beach erosion in Negril (Western Jamaica) and revealed that the main trigger of beach erosion was the decline of coastal ecosystems due to land-based pollution and direct impacts (seagrass manual removal and inappropriate fishing practices and related impacts on the reef). Capacity building was provided to transfer the methodology and the software (open source).

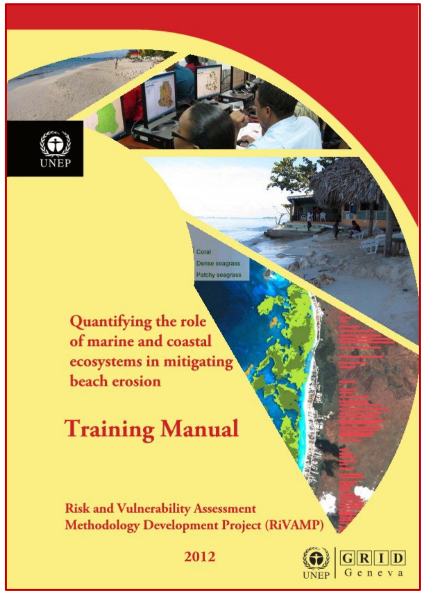
Capacity building, training provided to 20 Jamaican GIS experts on RiVAMP methodology



Project report: https://unepgrid.ch/en/resource/2A521533



Scientific publication: https://www.mdpi.com/2076-3298/9/5/62



RiVAMP training material: https://unepgrid.ch/en/activity/204F6705

Beach erosion in Negril Jamaica

Assessing high altitude glacier thickness, volume and area changes using field, GIS and remote sensing techniques: the case of Nevado Coropuna (Peru, 2004)

Coropuna is a dormant compound volcano in the Andes of southeast-central Peru. Coropuna boasts the largest ice cap in the tropics, surpassing the one previously considered the largest, the Quelccaya Ice Cap located 250 km farther northeast. A 2019-study noted that Nevado Coropuna glacier lost 24% of its mass over the past thirty years, and a 2018 estimate suggests that the ice cap will endure until approximately 2120. The retreat of Coropuna's glaciers poses a threat to the water supply for tens of thousands of people dependent on its watershed.

GRID-Geneva did a field mission in 2004 to measure the remaining volume of ice using geo-radar and GIS modelling and remote sensing techniques.

The Cryosphere, 4, 313–323, 2010
www.the-cryosphere.net/4/313/2010/
doi:10.5194/tc-4-313-2010

The Cryosphere

Assessing high altitude glacier thickness, volume and area changes using field, GIS and remote sensing techniques: the case of Nevado Coropuna (Peru)

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Abstract. Higher temperatures and changes in precipitation patterns have induced an acute decrease in Andean glaciers, thus leading to additional stress on water supply. To adapt to climate changes, local governments need information on the rate of glacier area and volume losses and on current ice thickness. Remote sensing analyses of Coropuna glacier (Peru) delineate an acute glaciated area decline between 1955 and 2008. We tested how volume changes can be estimated with remote sensing and GIS techniques using digital elevation models derived from both topographic maps and satellite images. Ice thickness was measured in 2004 using a Ground Penetrating Radar coupled with a Ground Positioning System during a field expedition. It provided profiles of ice thickness on different slopes, orientations and altitudes. These were used to model the current glacier volume using Geographical Information System and statistical multiple regression techniques. The results revealed a significant glacier volume loss; however the uncertainty is higher than the measured volume loss. We also provided an estimate of the remaining volume. The field study provided the scientific evidence needed by COPASA, a local Peruvian NGO, and GTZ, the German international cooperation agency, in order to alert local governments and communities and guide them in adopting new climate change adaptation policies.

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1 Introduction

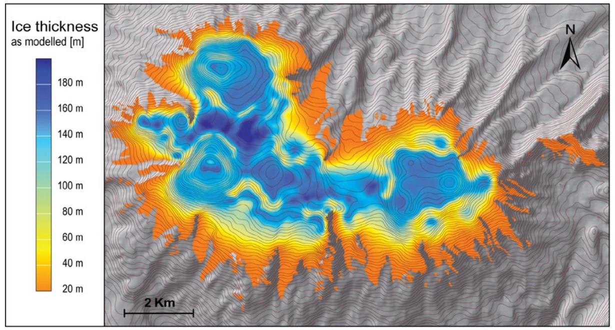
1.1 General context

Changes in glaciers and ice caps are good indicators of climate change (Zemp et al., 2008) and the current trend shows that a majority of the world glaciers have undergone a reduction in their mass at an accelerating rate. The mass loss was greater in the period 1990/91 to 2003/04 than in the previous period 1960/61 to 1989/90 (Bates et al., 2008). This is of concern given that about one-sixth of the world's population depend on glacier and snow melting for their water supply (Bradley et al., 2006).

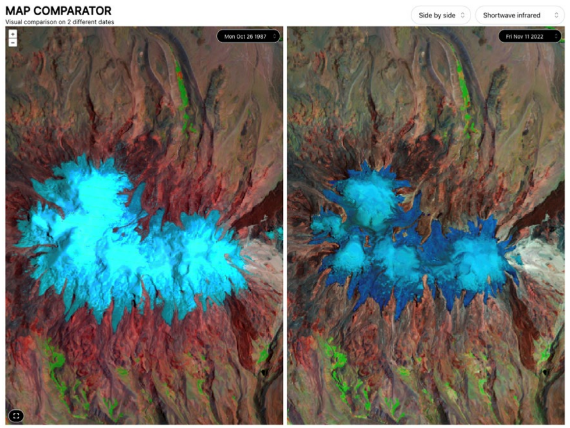
In Peru, the population growth and rising water demand for agriculture, domestic and economic activities generate an increased pressure on water resources. As the rainy season is concentrated during four months of the year, the role of glaciers is crucial for spreading out the water supply during the dry season. Higher limit between rain and snow precipitation reduces the buffering role of ice and snow, thus increasing flood risk during the wet season and reducing dry-season water supplies. This is of concern particularly in China, India and Asia, but also in the South American Andes, where a large fraction of the population relies on the glacial melt for water supply and hydropower (Barnett et al., 2005). In the South American region, the glacier monitoring for the period 1970–1996 revealed an acute retreat of Andean glaciers, with glacier coverage decreasing from 725 km^2 in 1970 to 60 km^2 in 1996 in Cordillera Blanca, Peru (Silverio and Jaquet, 2005).

Published by Copernicus Publications on behalf of the European Geosciences Union.

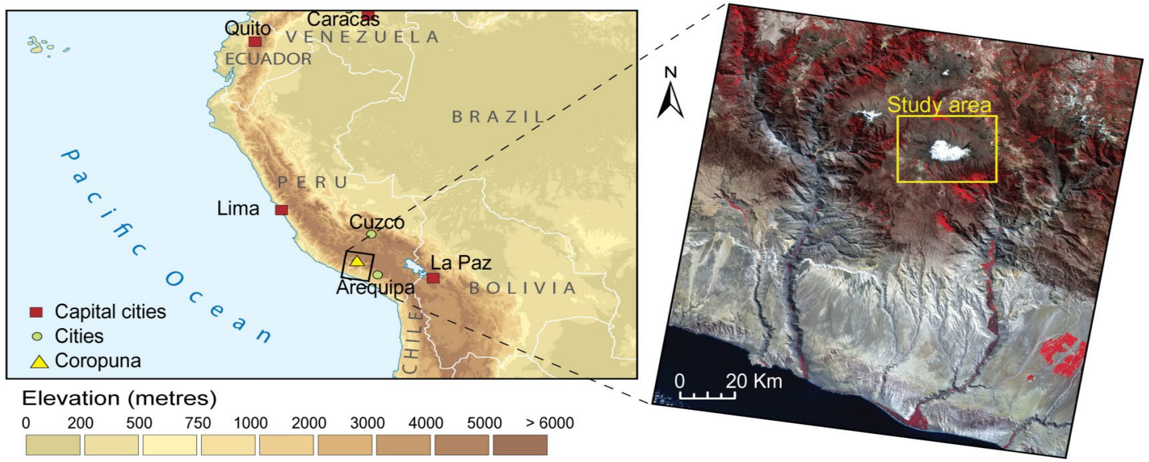
Scientific publication:
https://tc.copernicus.org/articles/4/313/2010/tc-4-313-2010.pdf

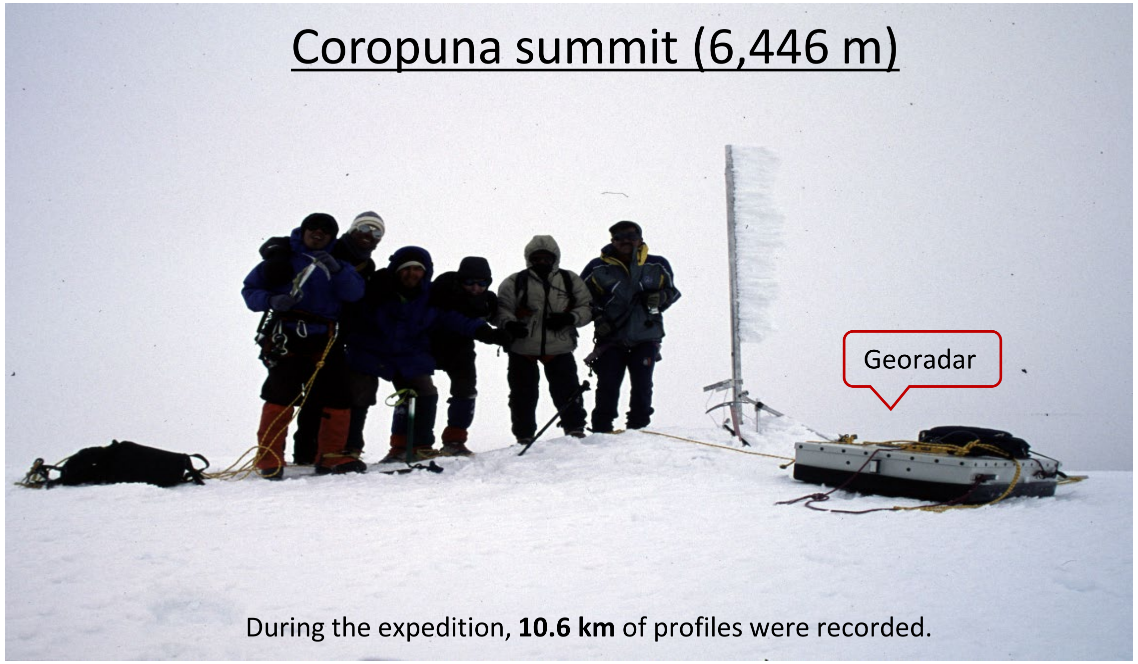


Modelling remaining ice, using GIS and multiregression analysis



Source: https://hotspots.unepgrid.ch/site/coropuna





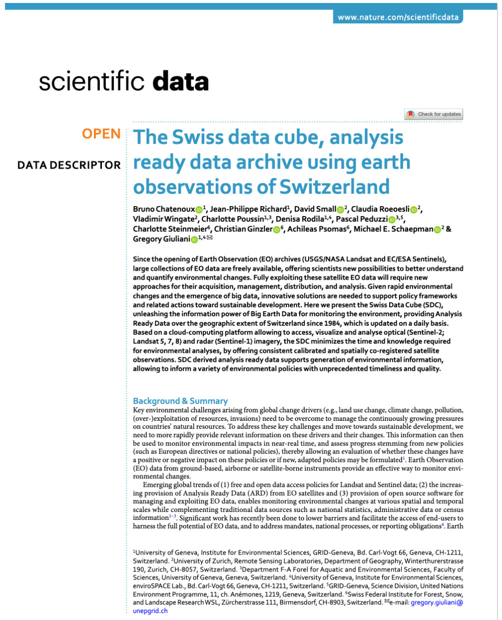
During the expedition, **10.6 km** of profiles were recorded.

The Swiss Data Cube

With satellite images going back to 1972 (1984 at 30m) it is possible to track changes through time.

Earth Observation (EO) Data Cubes (DC) are a new paradigm aiming to realise the full potential of EO data by lowering the barriers caused by these Big data challenges and providing access to large spatio-temporal data in an analysis ready form.

The main objectives of the Swiss Data Cube (SDC) is to support the Swiss government for environmental monitoring and reporting and enable Swiss scientific institutions (e.g., Universities) to facilitate new insights and research using the SDC and to improve the knowledge on the Swiss environment using EO data. GRID-Geneva ingested 80,000 satellite images over Switzerland, from 1984 to now.



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DATA DESCRIPTOR

The Swiss data cube, analysis ready data archive using earth observations of Switzerland

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Since the opening of Earth Observation (EO) archives (USGS/NASA Landsat and EC/ESA Sentinels), large collections of EO data are freely available, offering scientists new possibilities to better understand and quantify environmental changes. Fully exploiting these satellite EO data will require new approaches for their acquisition, management, distribution, and analysis. Given rapid environmental changes and the emergence of big data, innovative solutions are needed to support policy frameworks and related actions toward sustainable development. Here we present the Swiss Data Cube (SDC), unleashing the information power of Big Earth Data for monitoring the environment, providing Analysis Ready Data over the geographic extent of Switzerland since 1984, which is updated on a daily basis. Based on a cloud-computing platform allowing to access, visualize and analyse optical (Sentinel-2; Landsat 5, 7, 8) and radar (Sentinel-1) imagery, the SDC minimizes the time and knowledge required for environmental analyses, by offering consistent calibrated and spatially co-registered satellite observations. SDC derived analysis ready data supports generation of environmental information, allowing to inform a variety of environmental policies with unprecedented timeliness and quality.

Background & Summary

Key environmental challenges arising from global change drivers (e.g., land use change, climate change, pollution, (over-)exploitation of resources, invasions) need to be overcome to manage the continuously growing pressures on countries' natural resources. To address these key challenges and move towards sustainable development, we need to more rapidly provide relevant information on these drivers and their changes. This information can then be used to monitor environmental impacts in near-real time, and assess progress stemming from new policies (such as European directives or national policies), thereby allowing an evaluation of whether these changes have a positive or negative impact on these policies or if new, adapted policies may be formulated[1]. Earth Observation (EO) data from ground-based, airborne or satellite-borne instruments provide an effective way to monitor environmental changes.

Emerging global trends of (1) free and open data access policies for Landsat and Sentinel data; (2) the increasing provision of Analysis Ready Data (ARD) from EO satellites and (3) provision of open source software for managing and exploiting EO data, enables monitoring environmental changes at various spatial and temporal scales while complementing traditional data sources such as national statistics, administrative data or census information[1–3]. Significant work has recently been done to lower barriers and facilitate the access of end-users to harness the full potential of EO data, and to address mandates, national processes, or reporting obligations[4]. Earth

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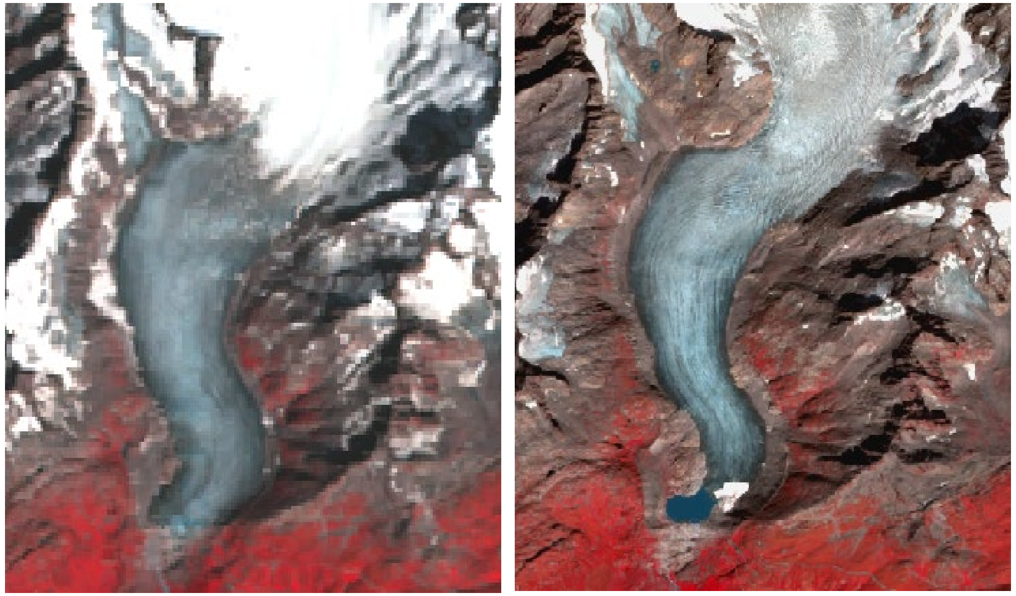
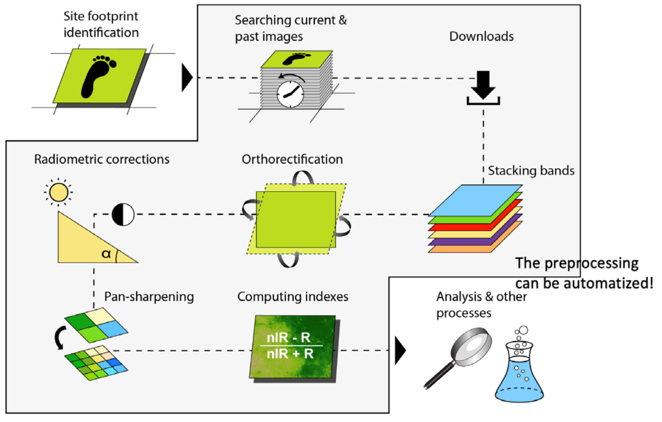
Generation of a data cube of satellite imagery for Switzerland

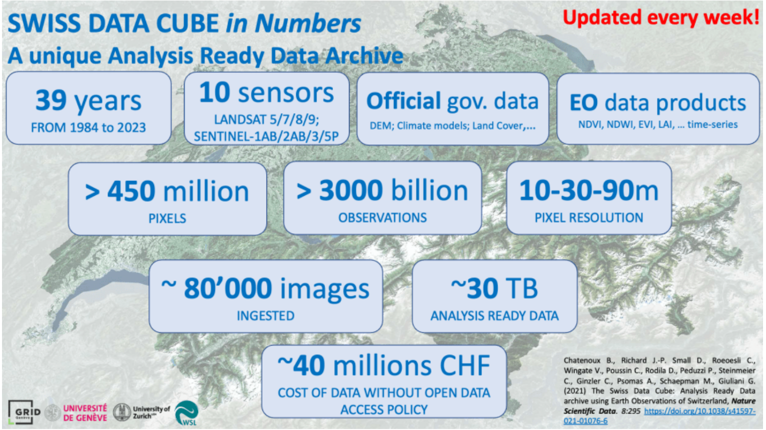
Scientific publication (in Nature): https://www.nature.com/articles/s41597-021-01076-6



Example of change detection using the Swiss Data Cube: Reduction of the Glacier Area, (Rhône glacier, Switzerland) between 1985 and 2018



Automatic transformation from raw data to analysed data



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Date	News and Stories
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