

GEO Mountains General Meeting



27 November 2020, 15-17h CET



<https://www.mountainresearchinitiative.org/activities/projects/geo-mountains>

Housekeeping

- ☐ Please kindly mute yourselves when not speaking
- ☐ Please “raise your hand” to request the floor
- ☐ The meeting is being recorded for internal purposes; please say now if you don’t agree to this
- ☐ If the meeting is disrupted for whatever reason, please disconnect and further instructions will follow by email
- ☐ A PDF of this presentation and key outcomes (notes) will be circulated to all participants afterwards

Agenda and Objectives

- ☐ Welcome and introductions
- ☐ Background and recent developments
- ☐ Revised implementation plan
- ☐ Recent and ongoing activities
- ☐ Forthcoming regional consultations
- ☐ Outreach and communication

Objectives

- ☐ To provide an opportunity for us to share **progress on our activities** and **future plans**
- ☐ Discuss **possibilities** for **collaboration and engagement**

Welcome and Introductions



What is GEO Mountains?



The Global Network for Observations and Information in Mountain Environments

A Group on Earth Observations (GEO) Work Programme Initiative that seeks to facilitate access to a diverse array of observational data and information pertaining mountain regions globally



Co-led by the Mountain Research Initiative (MRI) and the Institute of Atmospheric Sciences and Climate, National Research Council of Italy (ISAC-CNR), and coordinated by the MRI



Dr. Carolina Adler
GEO Mountains Co-lead
Executive Director, MRI



Dr. Elisa Palazzi
GEO Mountains Co-lead
Researcher, ISAC-CNR



Dr. James Thornton
GEO Mountains Project Officer
MRI

**Whether you are new to our Initiative or have been involved for some time,
it's great to have you with us!**

Background and recent developments



Brief historical background and context

- ❑ The International Geosphere-Biosphere Programme (IGBP), together with the International Human Dimensions Programme (IHDP) and the Global Terrestrial Observation System (GTOS), proposed the MRI as a joint initiative to *"achieve an integrated approach for observing, modeling and investigating Global Change phenomena and processes in mountain regions, including the impacts of these changes and of human activities on mountain ecosystems"* (UN Assembly 2000: 8)
- ❑ Subsequently, numerous initiatives and efforts were started within this framing in response to this objective, which include (but are not limited to):
 - ❑ The Symposium on Climate Sciences of the North and South American Cordillera, or CONCORD (Diaz et al., 2006*), and the subsequent American Cordillera Transect (ACT);
 - ❑ Collaborations with the UNESCO Man and Biosphere Programme on mountain biosphere reserves;
 - ❑ MRI-convened workshops on Mountain Observatories, in Reno (2014), Crested Butte (2015), USA; and others;
 - ❑ Work on Elevation Dependent Warming (2012), followed by numerous workshops starting with Payerbach, Austria (2014);
 - ❑ The Global Network of Mountain Observatories (GNOMO), (2015);
 - ❑ The Group on Earth Observations - Global Network on Observations and Information in Mountains Environments (GEO-GNOME, 2016), now GEO Mountains (2020), which integrates GNOMO;
 - ❑ MRI Working Groups on Elevation Defendant Climate Chage and Mountain Observatories (since 2018);
 - ❑ And many, many, many others!

We seek to fully acknowledge, integrate the outcomes, and build on these and many other considerable past community efforts

* Diaz, H., Villalba, R., Greenwood, G. and Bradley, R., 2006. *The Impact of Climate Change in the American Cordillera*. EOS **87**(32): 315.

Important recent developments

For 2019-2023, GEO Mountains receives considerable support from the Swiss Agency for Development and Cooperation (SDC) under its Adaptation at Altitude Programme

This has enabled a dedicated Project Officer (James) to be employed at 80% FTE to help coordinate and work with the network in order to achieve our objectives

Numerous calls and opportunities to contribute to diverse knowledge needs across local, regional and global scales, that rely on relevant data and information.

Current examples include:



<https://adaptationataltitude.org/adaptation-at-altitude>



Adler, C., Pomeroy, J., & Nitu, R. (2020). High Mountain Summit: Outcomes and Outlook. WMO Bulletin, 69(10): 34-37.

<https://public.wmo.int/en/resources/bulletin/articles-by-themes?tid-type-bulletin=589>

The revised Implementation Plan 2020-2022: Objectives, tasks, and how you can help!



Revised Implementation Plan

The Implementation Plan covering the present GEO Work Programme Period has been completely revised

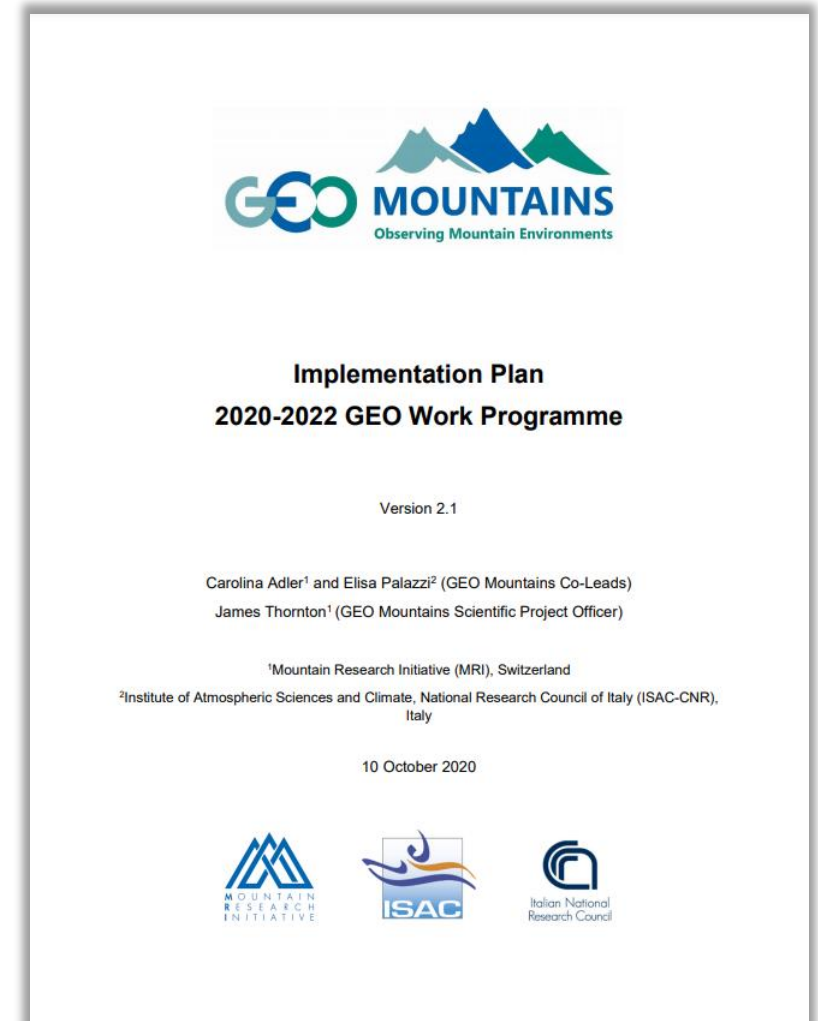
In summary:

- ☐ Tasks specified under Adaptation at Altitude have been integrated
- ☐ Successfully completed tasks have been highlighted and archived
- ☐ Important incomplete tasks have been carried over

Available on the Initiative's webpage:

https://www.mountainresearchinitiative.org/images/Projects/GEO_GNOME/GEO-GNOME_WP_Updated_20201020.pdf

We would like to solicit your expressions of interest / commitments to lead or contribute to some of the tasks, as your expertise and availability allows



Overall aims

To **identify, collate and make accessible transboundary and inter- and transdisciplinary data and information** – from a variety of providers – pertaining to **environmental/ecological and societal change in mountainous regions globally**, and thereby:

- ☐ Enhance the ease with which the scientific research community, local, national, and regional decision makers, and other interested parties can access and use such data
- ☐ Ensure that mountains as a context assume and retain a prominent position in all major global policy agendas (UN 2030 Agenda - SDGs/UNDRR - Sendai/UNFCCC – Paris Agreement, IPCC), as well as regional and local assessments

Primary objectives and tasks

Three primary objectives (2020 – 2022 Work Programme period):

1. Identify the data needs of a diverse range of users, and as far as possible satisfy them
2. Improve the monitoring and understanding of mountain processes
3. Build, connect, and communicate with the community, and develop collective reporting capacity that responds to policy needs

One idea is to form “Task Groups” around each of these tasks and/or objectives: feedback and suggestions?

- ☐ For example: i) undertaking preparatory work for the workshop on Essential Socio-ecological Mountain Variables, ii) developing a “K4” layer, and iii) establishing deeper links and data exchange with the paleo-science community are all task that are probably best “community led”
- ☐ There are likely to be others: please let us know which tasks interest you (note also that we do not wish to replicate the functions of the MRI’s existing Working Groups; where so, contributions to GEO Mountains might be on a more operational level

Benefits associated with involvement

- ☐ Being part of fulfilling this important mission; have policy and practical impacts
- ☐ Be part of a community with key strategic connections and partnerships that offer opportunities to support and scale individual efforts: Opportunity to collaborate with diverse colleagues across disciplines and regions
- ☐ Prospect of maintaining the legacy, sustainability, and impact of shorter-term projects and efforts (Open Data & Science)
- ☐ Enhanced personal / institutional recognition and visibility: we are interested to hear your views on how we can provide this on our new website and other means
- ☐ Maintain continuity of global assessments, monitoring, and reporting (e.g. IPCC, SDGs, etc.)
- ☐ GEO Mountains provides eligibility for funding calls associated with GEO (with MRI as a Participating Organisation)
- ☐ Others?

Recent and ongoing activities



Towards a definition of Essential Mountain Climate Variables

- ❑ Little consensus exists regarding which variables should be considered absolute observation priorities for monitoring and understanding the drivers, responses, and impacts of ongoing change in global mountains
- ❑ As a first step, we identified 25 key processes and ranked over 80 corresponding variables according to their perceived importance
- ❑ Defining corresponding observation requirements (e.g. spatial resolution etc.) in mountain areas is an important task that requires further work
- ❑ Establishing better mountain observatories, making use of Data Cube technologies, and integrating in situ and remotely sensed data alongside numerical models may further improve the situation
- ❑ Potential for a larger, more representative survey to follow
- ❑ "Perspective paper" under revision with the journal *One Earth*



Towards a definition of Essential Mountain Climate Variables

Thornton, J.M.^{1,2}, Palazzi, E.³, Pepin, N.C.⁴, Cristofanelli, P.³, Essery, R.⁵, Kotlarski, S.⁶, Giuliani, G.^{7,7}, Guigoz, Y.^{7,8}, Kulonen, A.¹, Li, X.^{9,10}, Pritchard, D.⁹, Fowler, H.J.⁹, Randin, C.F.¹¹, Shahgedanova, M.¹², Steinbacher, M.¹³, Zebisch, M.¹⁴ and Adler, C.¹

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³Institute of Atmospheric Sciences and Climate, National Research Council, Italy

⁴School of the Environment, Geography and Geosciences, University of Portsmouth, UK

⁵School of GeoSciences, University of Edinburgh, UK

⁶Federal Office of Meteorology and Climatology MeteoSwiss, Switzerland

⁷Institute for Environmental Sciences/enviroSPACE, University of Geneva, Switzerland

⁸GRID-Geneva, Science Division, UN Environment Programme, Geneva

⁹School of Engineering, University of Newcastle, UK

¹⁰Guangdong Province Key Laboratory for Climate Change and Natural Disaster Studies, Sun Yat-sen University, China

¹¹Department of Ecology and Evolution, University of Lausanne, Switzerland

¹²Department of Geography and Environmental Science, University of Reading, UK

¹³Air Pollution / Environmental Technology, EMPA, Switzerland

¹⁴Institute for Earth Observation, Eurac Research, Italy

Global in situ observation infrastructure metadata repository: first steps



Interdisciplinary mountain observations: data standards and sharing

Thornton, J.M.¹, Pepin, N.², Palazzi, E.³, Shahgedanova, M.⁴, and Adler, C.¹

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²School of Environment, Geography and Geosciences, University of Portsmouth, Portsmouth, UK

³Institute of Atmospheric Sciences and Climate – National Research Council (ISAC-CNR), Torino, Italy

⁴Department of Geography and Environmental Science, University of Reading, Reading, UK



WMO DATA CONFERENCE
EXCHANGE OF EARTH SYSTEM DATA
IN THE 21ST CENTURY
16 - 19 NOVEMBER 2020
VIRTUAL CONFERENCE
#WMO2020

GEO Mountains is an initiative of the Group on Earth Observations (GEO) that seeks to improve the availability and use of a wide range of data pertaining to global mountain regions

Research Question

To what extent are data measured at global *in situ* mountain observatories, station networks, and experimental basins freely accessible?

Methods

Compile a comprehensive database listing such sites and map them according to whether or not links to freely downloadable datasets can easily be found

Results

- ☐ 37% of the ~700 sites/networks provide information/links clearly indicating that at least some data are available for direct download
- ☐ There are considerable geographical differences in the extent to which data are shared (Fig. 1)
- ☐ Positive recent trends related to i) the establishment of observation networks with common standards/approaches, and ii) better curation and increased sharing of research-derived data (and indeed Open Science more generally) are apparent
- ☐ Few sites explicitly state which observational standards / protocols they follow, potentially limiting data intercomparability and reuse

Outlook and Conclusions

- ☐ The forthcoming GEO Mountains GEOSS Community Portal could provide one means by which data that is not currently shared might eventually be
- ☐ Developing a common, overarching network of interdisciplinary global mountain observatories could also prove fruitful, although many challenges related to the existing heterogeneity in observational and metadata standards, data policies, technological capabilities, etc. are considerable (Shahgedanova et al., under review)
- ☐ The definitions of “essential” and “additional” variables required specific consideration in mountainous contexts (Thornton et al., under review)

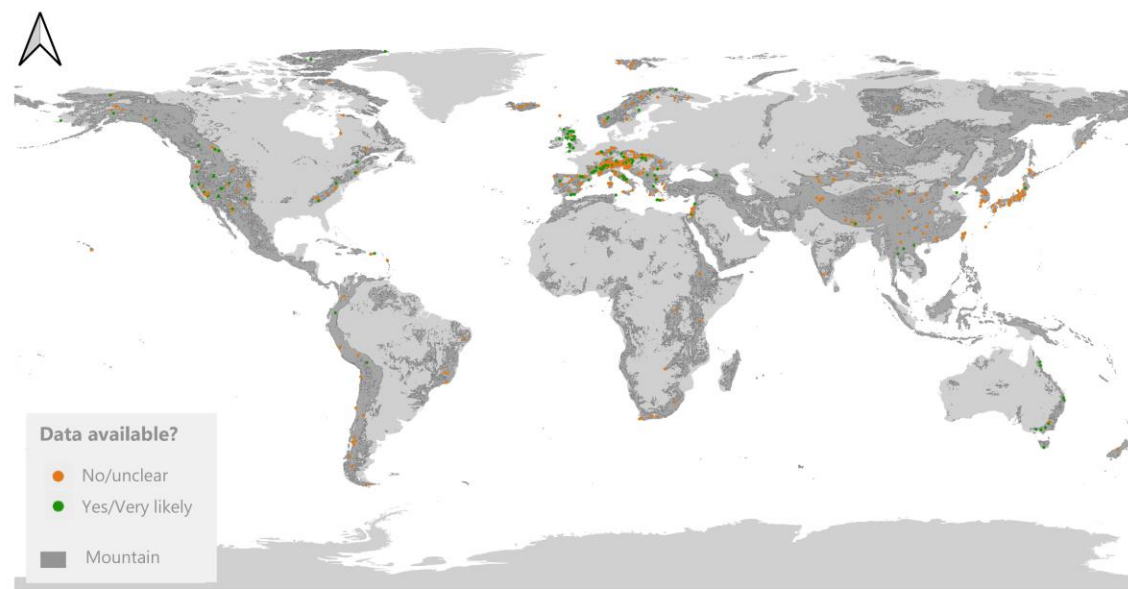


Figure 1. Global distribution of mountain observatories, station networks, experimental basins, and similar infrastructures, colour coded according to whether or not the corresponding data are clearly freely accessible for download. To be included, the coordinates provided/obtained had to fall within at least one of the delineation of global mountain regions presented by Sayre et al. (2018). Note that a site being shaded in orange does not necessarily mean that no data are available, just the data availability is uncertain and/or there are barriers to access (e.g. email contact must be made, a lengthy registration process completed, or a licence agreement made). Likewise, no assurance can be given that all the data measured at sites shown in green are available. The database underlying this map will shortly be shared via GEO Mountains such that the community can add any missing sites, verify and/or update attributed. A “live” version of the table and map will be maintained on the new, dedicated GEO Mountains website (currently in development).

Global in situ observation infrastructure metadata repository: first steps

Underpinned by a preliminary analysis of ~700 mountain observatories, networks of stations, experimental catchments etc.

No.	Name	What	Lat (if applicable)	Long (if applicable)	Elevation and/o Country	Operating Organization	URL	Email/other contact	Measurement method	Are data clearly and freely available for download	Link to data	Comment(s) (";" separate)
1	Sonnblick Integrated Site	Network or Group of Sites/Stations			1500-3600 Austria	ZAMG (Central Institute for Meteorol	https://www.sonnblick.net	https://www.sonnblick.net	WMO Technical Re	Yes	https://www.sonnblick.net	CryoNet Cluster; FAIR prin
2	Goldbergkees	Site/Station	47.03000	12.47000	2800; 2500-3100 Austria	ZAMG (Central Institute for Meteorol	https://www.sonnblick.net	https://www.sonnblick.net	GTN-G/WGMS	Yes	https://www.sonnblick.net	Belongs to Sonnblick Inte
3	Kleinfleisskees	Site/Station	47.05000	12.95000	2850; 2700-3100 Austria	ZAMG (Central Institute for Meteorol	https://www.sonnblick.net	https://www.sonnblick.net	GTN-P	Yes	https://www.sonnblick.net	Belongs to Sonnblick Inte
4	Kolm Saigurn	Site/Station	47.10000	12.99000	1650 Austria	ZAMG (Central Institute for Meteorol	https://www.sonnblick.net	https://www.sonnblick.net/en/contact/		Yes	https://www.sonnblick.net/en/contact/	Belongs to Sonnblick Inte
5	Pasterze	Site/Station	47.06000	12.72000	2800; 2200-3450 Austria	ZAMG (Central Institute for Meteorol	https://www.sonnblick.net	https://www.sonnblick.net	GTN-G/WGMS	Yes	https://www.sonnblick.net	Belongs to Sonnblick Inte
6	Wurtenkees	Site/Station	47.04000	13.02000	3200; 2600-3200 Austria	ZAMG (Central Institute for Meteorol	https://www.sonnblick.net	https://www.sonnblick.net	GTN-G/WGMS	Yes	https://www.sonnblick.net	Belongs to Sonnblick Inte
7	Sonnblick Observatory	Site/Station	47.05	12.96000	3105 Austria	ZAMG (Central Institute for Meteorol	https://www.sonnblick.net	https://www.sonnblick.net	WMO Technical Re	Yes	https://www.sonnblick.net	Belongs to Sonnblick Inte
8	Wintergasse	Site/Station	47.04000	13.00000	2600; 2500-2750 Austria	ZAMG (Central Institute for Meteorol	https://www.sonnblick.net	https://www.sonnblick.net/en/contact/		Yes	https://www.sonnblick.net/en/contact/	Belongs to Sonnblick Inte
9	AWS Fraganter Scharte	Site/Station	47.04000	12.99000	2750 Austria	ZAMG (Central Institute for Meteorol	https://www.sonnblick.net	https://www.sonnblick.net	CIMO	Yes	https://www.sonnblick.net	Belongs to Sonnblick Inte
10	AWS Kleinfleisskees	Site/Station	47.05000	12.94000	? Austria	ZAMG (Central Institute for Meteorol	https://www.sonnblick.net	https://www.sonnblick.net	"According to agre	Yes	https://www.sonnblick.net	Belongs to Sonnblick Inte
11	AWS Pasterze	Site/Station	47.10000	12.70000	2650 Austria	ZAMG (Central Institute for Meteorol	https://www.sonnblick.net	https://www.sonnblick.net	"According to agre	Yes	https://www.sonnblick.net	Belongs to Sonnblick Inte
12	Qilian Shan Station of Glaciology and Ecolog	Network or Group of Sites/Stations			4180; 2500-5483 China	Institute of Cold and Arid Research, C	http://www.horn.ac.cn/ter/sdb@itpcas.ac.cn		Not specified	No		CryoNet Cluster comprise
13	laohugou Station	Site/Station	37.50000	96.50000	4180 China	Institute of Cold and Arid Research, C	http://www.horn.ac.cn/ter/sdb@itpcas.ac.cn		WMO Technical Re	No		Belongs to QSSGEE; CryoN
14	Suli station	Site/Station	38.50000	98.30000	3900 China	Institute of Cold and Arid Research, C	http://www.horn.ac.cn/ter/sdb@itpcas.ac.cn		WMO Technical Re	No		Belongs to QSSGEE; CryoN
15	Qilian / Hulu Watershed	Experimental Ba	38.27208	99.88519	3034; 2960-4810 China	Institute of Cold and Arid Research, C	http://hhsy.casnw.net/	hancht@lzb.ac.cn	WMO Technical Re	No	http://hhsy.casnw.net/	Also CryoNet Station; som
16	Rabben Station Ny-Alesund	Site/Station	78.92000	11.93000	8 Svalbard	Arctic Environment Research Center (AERC), Japan		aerc-kikaku@nipr.ac.jp		No		Some data may be availab
17	Antisana 15 alfa	Site/Station	-0.48000	-78.14000	4820-5760 Ecuador	Instituto Nacional de Meteorología e	http://globalcryosphereweb.bolivarc.inamhi.go		UNESCO; GTN-G/V	No		CryoNet Station
18	Zongo Glacier	Site/Station	-16.25000	-68.16700	4900-6100 Bolivia	Université Grenoble Alpes, France?	http://globalcryosphereweb.antoine.rabatel@uni		UNESCO; GTN-G/V	Yes	https://glaci	CryoNet Station; Maybe s
19	Morenas Coloradas Rockglacier	Site/Station	-32.95500	-69.37065	3560; 3560-3770 Argentina	?	http://globalcryosphereweb.dtrombot@mendoza		GTN-P	No		Focus here is on a rock gla

Global in situ observation infrastructure metadata repository: first steps

Underpinned by a preliminary analysis of ~700 mountain observatories, networks of stations, experimental catchments etc.

We will shortly post this online as a “product” of GEO Mountains and seek community assistance (“local knowledge”) to improve it:

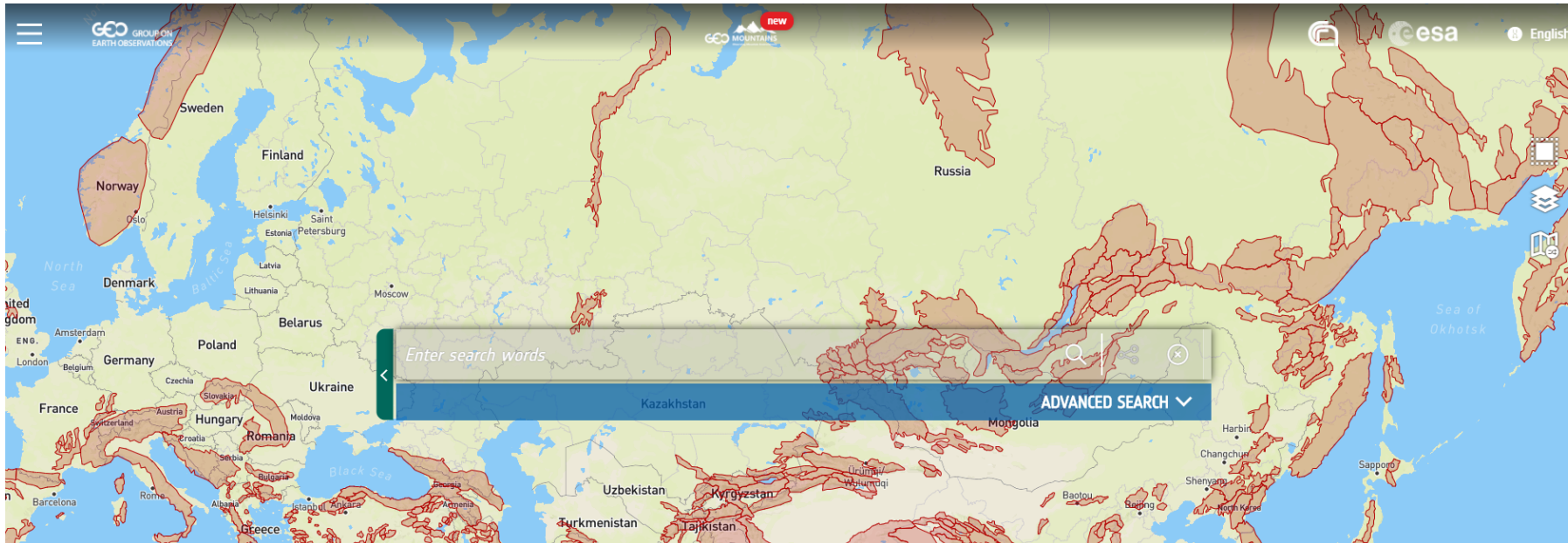
- ☐ Add sites
- ☐ Provide links to data
- ☐ Add additional fields (for discussion: perhaps temporal coverage, whether ongoing, variables observed, etc.)
- ☐ Specify observational and metadata standards where not already done so, etc.

Guiding concepts:

- ☐ Make historical time-series and other datasets available (the sharing part is comparatively cheap / easy), potentially to feed global NWP efforts
- ☐ Improve observational and metadata standards, and fill geographical gaps

GEO Mountains GEOSS Community Portal

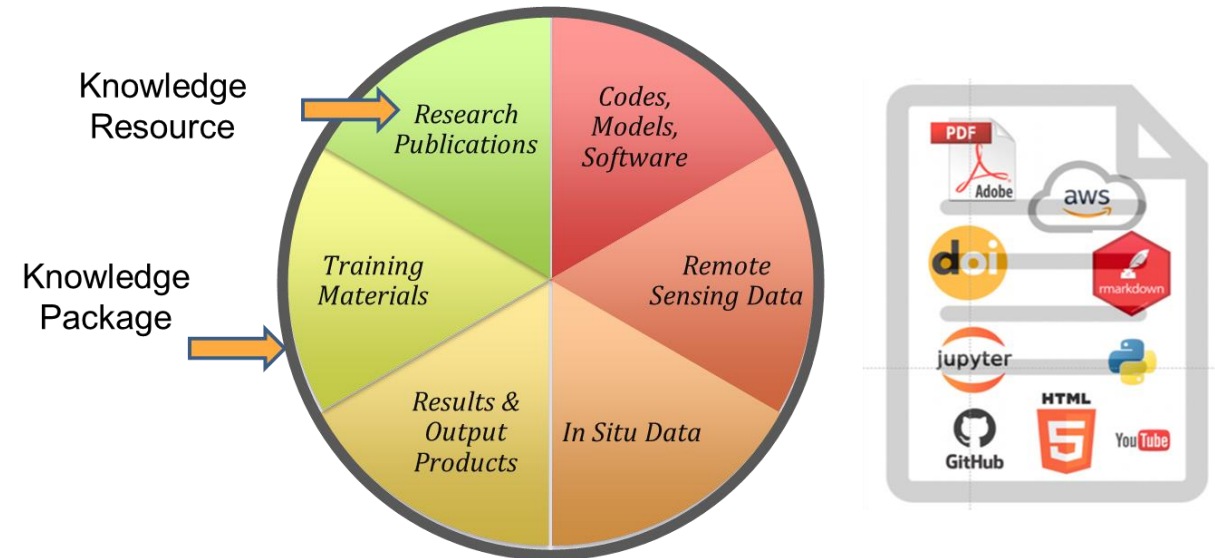
<https://geoss.uat.esaportal.eu/community/geo-mountains>



- ❑ Currently in Beta
- ❑ This is one (mountain-specific) means by which most datasets are shared
- ❑ Still some question marks regarding capabilities, file limits, etc; further discussion with community needed

GEO Knowledge Hub (GKH)

- ❑ A project initiated by the GEO Secretariat, to help Initiatives valorise their activities
- ❑ Tied to the GEOSS Platform: Transition from *data* to *knowledge*
- ❑ Knowledge “packages”: fully self-contained sets of documentation, data, code, examples etc., that could be applied with few modifications to different regions, similar datasets etc.
- ❑ Hence potentially important for capacity development, implementation of research



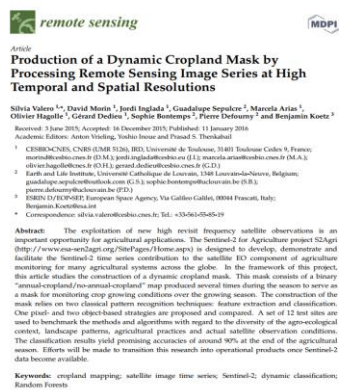
- ❑ **GEO Mountains is an “early adopter”:** We have the potential to help shape the concept and platform, as well as contribute some of the first packages

GEO Knowledge Hub (GKH): an example

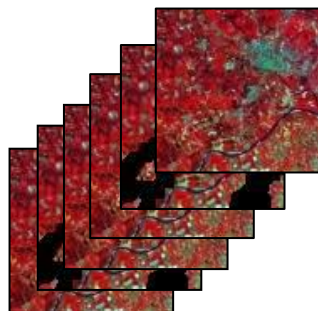
Sen2Agri operational EO Solution for Cropland Monitoring:



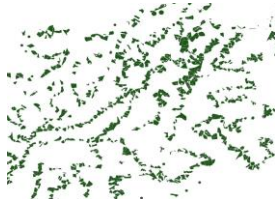
Publication



Remote Sensing Input Data



In Situ Input Data



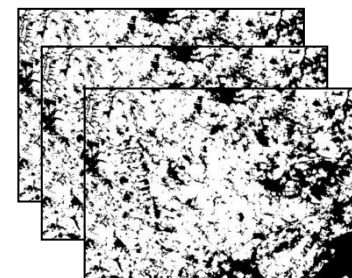
Open Software-Open Code



Training Material



Crop Land Mask



Ongoing Project (Dr. Marc Zebisch, EURAC Research)

<https://ai4ebv.eurac.edu/>

- ❑ Project submitted by a consortium compiled by GEO Mountains to the GEO BON / Microsoft “EBVs on the Cloud” call was successfully funded
- ❑ Aims to derive accurate, high-resolution maps of mountain ecosystem extents by exploiting the advanced feature extraction capabilities provided by AI-based algorithms and the computational power of cloud-based platforms
- ❑ Specifically, for two study regions – the Central European Alps and the Himalayas – we will assess the accuracy of the World Terrestrial Ecosystems (WTE) map (Sayre et al., 2020; right) and explore whether Earth Observation data can be used to improve its spatial resolution and thematic content



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science for a changing world

MOUNTAIN
RESEARCH
INITIATIVE



Forthcoming regional consultations: User data requirements and portal needs



Scoping workshops and surveys



- ❑ As our scope is potentially so vast, we require the guidance of the community regarding what to prioritise first:



1. What requirements/wishes do users of mountain data have with respect to an online portal through which mountain data will be made available? and;

GEO Mountains Scoping Workshops and Surveys 2021: Data portal requirements and user data needs

2. What are the major gaps experienced by users with respect to the discoverability, accessibility, and usability of the datasets themselves?

- ❑ Virtual workshops and subsequent surveys will be held in early 2021 in each of the following regions:

Andes, East Africa, Hindu Kush Himalaya, South Caucasus, North America (e.g. Rockies), Europe (e.g. European Alps, Pyrenees, Carpathians)

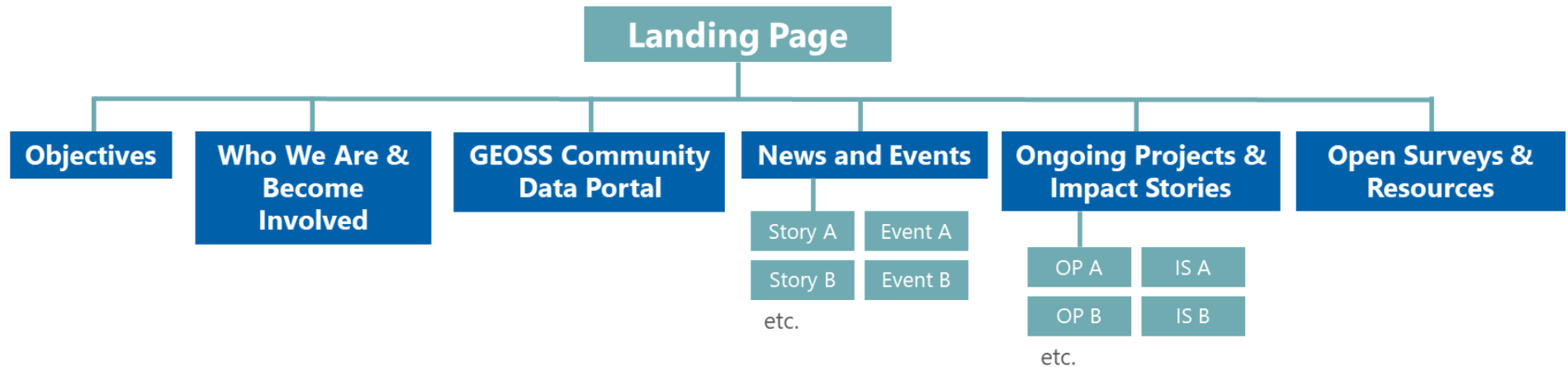
- ❑ **We require your help in reaching out to your network get the largest and more representative involvements**
- ❑ Recommendations regarding the portal will be passed on to the GEOSS development team, but their implementation is somewhat beyond our control

Communication and Outreach



Communication and Outreach

- ❑ As you have seen, we have changed our “short name”, and have a new logo!
- ❑ We are planning to launch a new, dedicated website, along the lines of other GEO Initiatives (e.g. <http://earthobservations.org/geoglam.php>, <https://www.geoglows.org/>; <https://geobon.org/>)



Open Q&A



james.thornton@unibe.ch