



# Fact Sheet

## Virtual Alpine Observatory

### Mission

The alpine region with its eight neighbouring countries and about 14 million inhabitants represents a significant economic region within Europe. From an ecological point of view the Alps belong to the most complex parts of the "System Earth" and are particularly affected by various factors driving environmental change processes.

Especially, climate change more and more leaves its mark on this system. Consequences are manifold being among the greatest threats to the ecosystem of the Alps and having far-reaching impacts for the economy, the traffic and the environment including health related issues of human beings. In order to monitor and to understand these complex processes a transnational and interdisciplinary approach is needed.

VAO serves to give coherence – where appropriate - to the various research efforts and programs undertaken by the VAO partner organisations or within their infrastructures to try to create the maximum possible scientific profits. Research activities must involve networking of top institutions

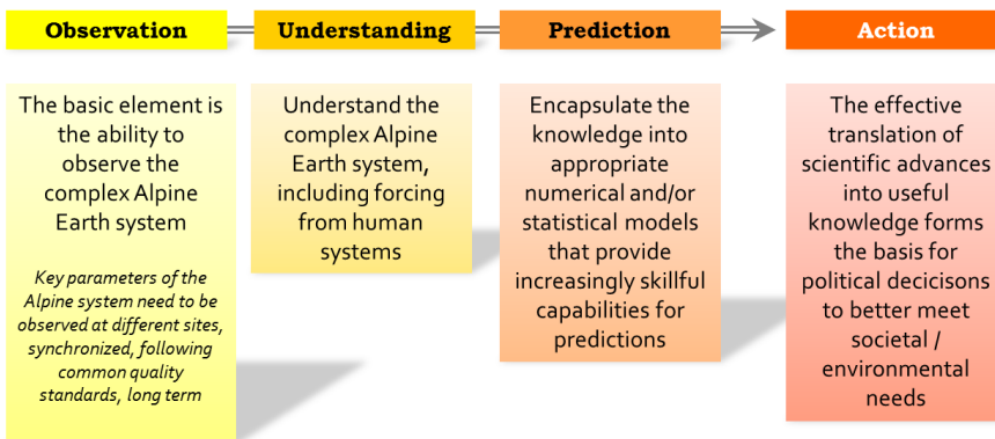
from public authorities, science and technology, as well as from industries, where appropriate. Helping to better understand environmental processes in the alpine region VAO thus makes a valuable contribution to support decision makers best balancing economic, social and environmental interests in a sustainable way. VAO is part of the European Alpine Convention as well as of the Alpine Strategy of the EU.

### Objective

The overarching objective of the VAO is to bring together already existing infrastructures (observatories, data centres, and high-performance computing centres), scientists, engineers, medical experts and technicians from various disciplines and facilities (universities, large research establishments, and public authorities). Cross-linking all these capacities therefore means a lot more than just the sum of it. The motto is: "Joining forces instead of duplicating efforts".

This permits an investigation of environment-relevant topics

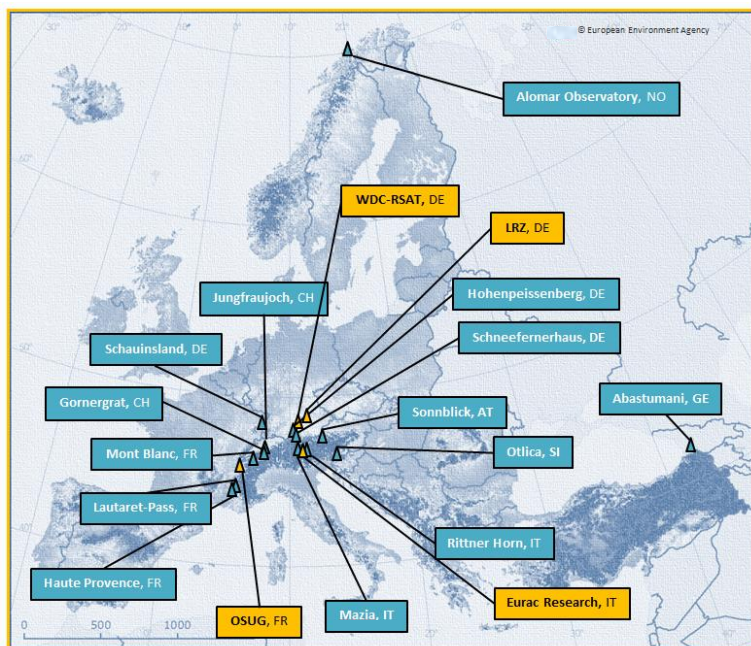
from different perspectives as it is required due to the complexity of the manifold underlying processes; it creates synergies and opens up a more comprehensive approach in formulating solutions than would otherwise be possible.



<b>VAO:</b>	Network of European Alpine and associated Observatories, research facilities, data archives and supercomputing centres with cross-linked infrastructure and joint research topics
<b>Motto:</b>	Scientific cooperation – joining forces and resources to avoid duplicate work
<b>Goal:</b>	Conducting joint efforts in order to observe understand and predict the impact of (climate) change on the alpine (mountainous) region with respect to the environment including health related issues of human beings, economy, and traffic.
<b>Countries participating:</b>	Austria, France, Germany, Italy, Slovenia, Switzerland
<b>Countries associated:</b>	Georgia, Norway
<b>Elements of innovation:</b>	+ Data-on-Demand + Computing-on-Demand + Operating-on-Demand + Service-on-Demand + Open Hardware

<b>A) VAO-Partners:</b>		
Research stations/institutions in the VAO:	Country:	Altitude:
Environmental Research Station Schneefernerhaus (UFS)	Germany	2.650m
Schauinsland Observatory	Germany	1.284m
Hohenpeißenberg Observatory	Germany	975m
Observatoire de Haute-Provence	France	650m
Station Alpine Joseph Fourier, Lautaret-Pass	France	2.058m
Vallot Observatory, Mont Blanc	France	4.362m
Sentinel Alpine Observatory, Ritten	Italy	2.260m
Eurac-LT(S)ER site Macia/Matsch	Italy	2.700m
Sonnblick Observatory	Austria	3.106m
High Altitude Research Station Jungfrauoch (HFSJG)	Switzerland	3.580m
High Altitude Research Station Gornergrat (HFSJG)	Switzerland	3.135m
Otlica Observatory	Slovenia	945m
<b>Supporting research infrastructures:</b>		
Leibniz Supercomputing Centre (LRZ), Garching	Germany	
World Data Centre for Remote Sensing of the Atmosphere (WDC-RSAT), Oberpfaffenhofen	Germany	
Observatoire des Sciences de l'Univers de Grenoble (OSUG)	France	
European Academy of Bolzano (EURAC Research)	Italy	
<b>B) Associated VAO-Partners:</b>		
Research stations/institutions in the VAO:	Country:	Altitude:
Abastumani Astrophysical Observatory	Georgia	1.700m
Alomar Observatory	Norway	380m

### VAO research stations and supporting research infrastructures



### Scientific challenges

The overarching scientific challenges that the VAO will address in the upcoming decade are part of the following research fields:

<b>I) Atmospheric and climatic variability</b>	
<b>Challenge 1</b>	Understanding the coupling mechanisms among atmosphere, clouds and land surface and their changes in view of impact on the greenhouse effect
<b>Challenge 2</b>	Understanding the impact of the Alps (mountains) on atmospheric dynamics in the middle atmosphere (10-100km height)
<b>Challenge 3</b>	Understanding if there is an impact of climate change on the characteristics of cosmic radiation in the atmosphere
<b>Challenge 4</b>	Monitoring and understanding of the contamination of the Alps
<b>Challenge 5</b>	Impact of meteorological extremes in the Alps and surrounding regions on natural hazards
<b>II) Climate impact on Alpine environment, hazards and risks</b>	
<b>Challenge 6</b>	Understanding the dynamics of the Alpine vegetation in response to climate (change)
<b>Challenge 7</b>	Interrelation of the environment with seismic activity
<b>III) Alpine water cycle</b>	
<b>Challenge 8</b>	Understanding the Alps as a water tower for the pre-Alpine regions under climate change conditions
<b>IV) Environment and human health</b>	
<b>Challenge 9</b>	Understanding the impact of pollutants, radiation and meteorological stress on human health
<b>V) Improving the Infrastructure</b>	
<b>Challenge 10</b>	Improving the validation of satellite-based measurements through in-situ and remote sensing measurements
<b>Challenge 11</b>	Establish a powerful IT-linkage between all observatories, high-performance computing centres and data repositories (e.g. further develop AlpEnDAC)

### Vision

The vision of VAO is characterized by at least within five dimensions:

- setting new standards in terms of commonly developing new instrumentation ("**open hardware**") often in cooperation with industries,
- providing information products and data analysis tools tailored to the scientists needs ("**computing-on-demand**"),
- scheduling measurement procedures harmonised between various measurement sites and customised to a specific application ("**operating-on-demand**"),
- archiving and delivering data (and meta-data) as well as value added information adjusted to specific requirements ("**data-on-demand**"),
- delivering services addressing especially – but not exclusively - public needs ("**service-on-demand**")