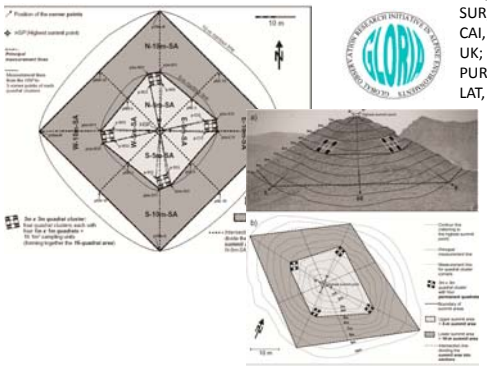
Some selected results from the long-term ecosystem research in the alpine belt of Slovakia

EU Target(s): Conserving and restoring nature
Addressing the global biodiversity crisis

Róbert Kanka, Luboš Halada, Andrej Halabuk
Institute of Landscape Ecology Slovak Academy of Sciences
Štefánikova 3, Bratislava, 814 99 Slovakia
robert.kanka@savba.sk; lubos.halada@savba.sk; andrej.halabuk@savba.sk

The European dimension of the Global Observation Research Initiative in Alpine Environments – a contribution to GTOS

LEO, Crete-Lefka Ori/Greece
SNE, Sierra Nevada/Spain
CAM, Central Apennines-Majella/Italy
CRI, Corsica-Monte Cinto Cinto/France
CAK, Central Caucasus-Kazbegi Region/Georgia
CPY, Central Pyrenees-Ordesa/Spain
NAP, Northern Apennines
AME, SW-Alps-Mercantour/France
VAL, W-Alps-Alps of Valais-Entremont/Switzerland
ADO, S-Alps-Dolomites/Italy
CRO, E-Carpathians-Rodnei Mountains/Romania
HSW, NE-Alps-Hochschwab/Austria
CTA, W-Carpathians-High Tatra/Slovakia
SUR, South Urals/Russia
CAI, Cairngorms/Scotland
UK; DOV, S-Scandes-Dovrefjell/Norway
PUR, Polar Urals/Russia
LAT, N-Scandes-Latnjajaure/Sweden



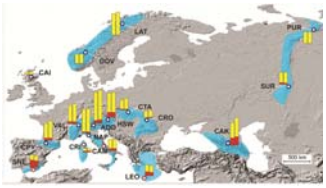
- **Recent (2001 – 2008) vascular plant species richness changes observed in a standardized monitoring network across Europe's major mountain chains suggest that species have moved upslope on average;**

- **These shifts had opposite effects on the summit floras' species richness in boreal-temperate (+3.9 species on average) and Mediterranean (-1.4 species) mountain regions, probably because recent climatic trends have decreased water availability in the European south;**

- **As Mediterranean mountains are particularly rich in endemics, a continuation of these trends might shrink the European mountain flora despite an average increase in summit species richness (Pauli et al., 2012)**

VEGETATION OF EUROPEAN SUMMITS - ALL AND ENDEMIC SPECIES

	2001	2008	E2001	E2008
CRO (E-Carpathians/Romania)	33	40	2	5
ADO (SAlps/Italy)	164	175	15	19
CAK (Central Caucasus/Georgia)	113	140	35	41
LAT (N-Scandes/Sweden	109	118	0	0
PUR (Polar Urals/Russia)	59	60	0	0
CAI (Cairngorms/UK)	10	14	0	0
DOV (S-Scandes/Norway)	49	50	1	1
CTA (High Tatra/Slovakia)	53	61	5	5
NAP (NApennines/Italy)	123	127	7	7
CRI (Corsica/France)	20	19	7	7
VAL (W-Alps/Switzerland)	96	105	12	12
CPY (Central Pyrenees/Spain)	88	102	12	12
CAM (Central Apennines/Italy)	57	57	13	13
HSW (NEAlps/Austria)	130	134	27	27
SUR (SUrals/Russia)	62	62	9	7
LEO (Lefka Ori-Crete/Greece)	58	54	22	19
SNE (Sierra Nevada/Spain)	65	60	39	35



- **Climate warming is expected to shift species' ranges to higher altitudes;**

- Improving knowlegde about the rare and sensitive alpine ecosystems
- To detect and forecast climate change
- To observe a change in population dynamics of endemic species

Effects of experimentally increased nitrogen deposition on alpine grasslands in Western Tatra Mts. (Slovakia)

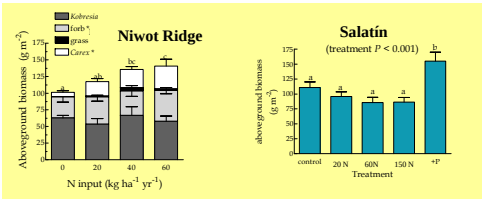
To investigate whether the alpine of the Western Tatra Mountains in Slovakia exhibit similar responses to fertilization as the alpine of the southern Rocky Mountains.

This site (and probably others in central Europe as well) had reached a transition stage in which Fe dominates buffering of soils, and current levels of N deposition inhibit plant growth due to a combination of loss of base cations and Al and Fe toxicity.
Bowman et al., Nature Geosciences 2008

This can have negative consequences to the integrity of ecosystem services provided by the alpine and high-mountain ecosystems

The cumulative effect of high acid deposition over six decades causes regions such as Tatra Mts. sensitive to elevated rates of N deposition and brought them dangerously close to toxic conditions.

Biomass response to N & P fertilization



Effect of experimental warming and increased nitrogen deposition on alpine meadow ecosystem

- **The experimental treatments include temperature enhancement, N addition (20 g m^{-2} NH_4NO_3 in solution), their interaction and an untreated control;**
- **Totally, 24 experimental 2*2 m plots were established (3 replicates of each treatment in 2 blocks);**
- **The temperature is manipulated by 1.5 m diameter and 0.5 heights hexagonal OTCs constructed with 3-mm thick polycarbonate sheet. Near-surface temperature and air humidity is registered by continuous automatic sensors and loggers (HOBO Pro/Temp; VIRRIB logger) at 2-h intervals;**

This research was funded by the VEGA project 2/0025/13