Changes in Protected Areas: the ECOPOTENTIAL view

This project is funded by the European Union (Grant agreement No. 641762)

Antonello Provenzale, Carl Beierkuhnlein, Cristina Domingo, Silvia Giamberini, Simona Imperio, Arnon Karnieli, Carmela Marangi, Joan Maso, Elisa Palazzi, Gianna Vivaldo

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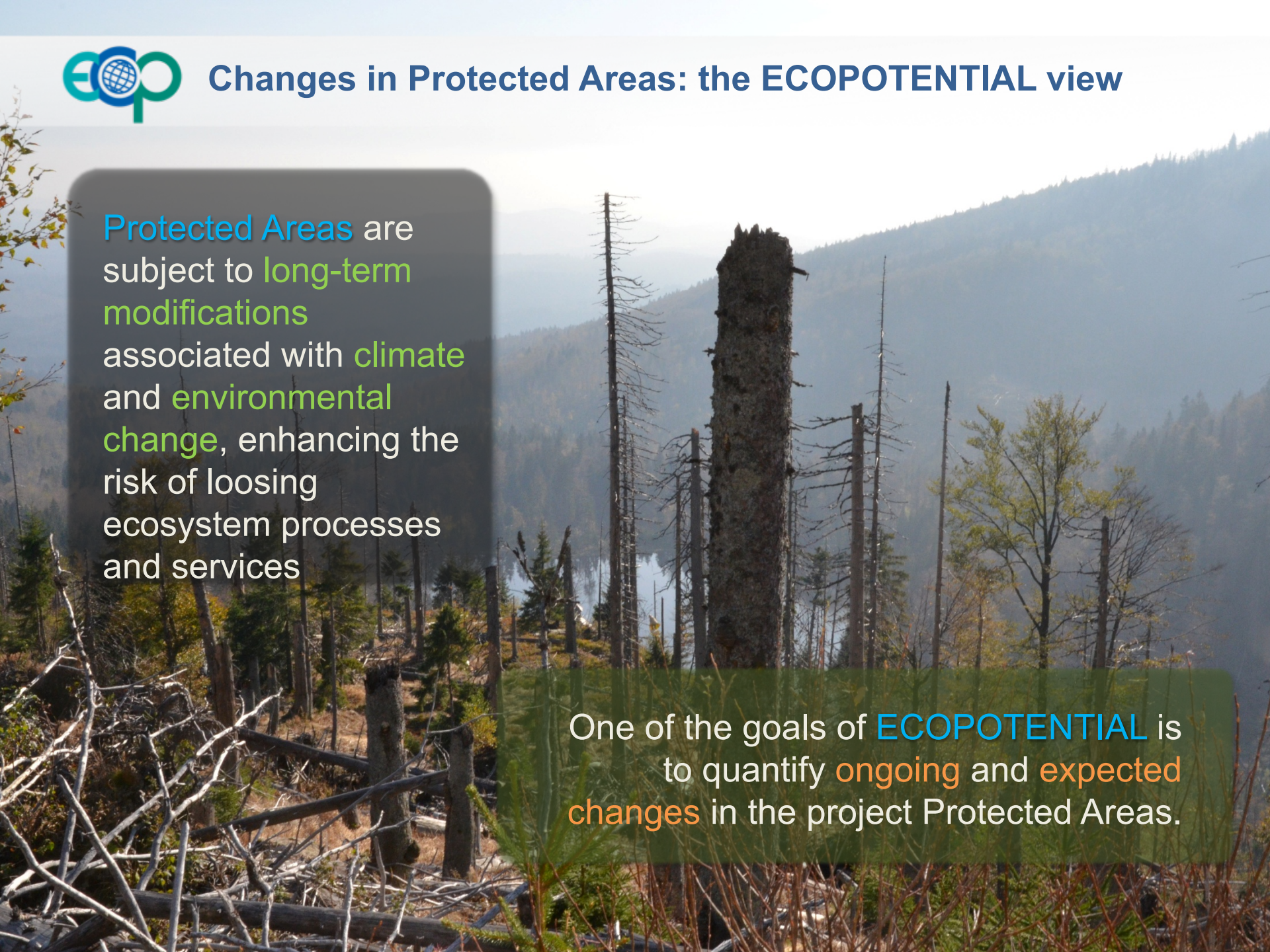

Protected Areas are subject to long-term modifications associated with climate and environmental change, enhancing the risk of loosing ecosystem processes and services

One of the goals of ECOPOTENTIAL is to quantify ongoing and expected changes in the project Protected Areas.

ECOPOTENTIAL

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Working in partnership with Protected Areas in Europe and beyond

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

ILTER, 2-4 October 2017, Nantes, FR

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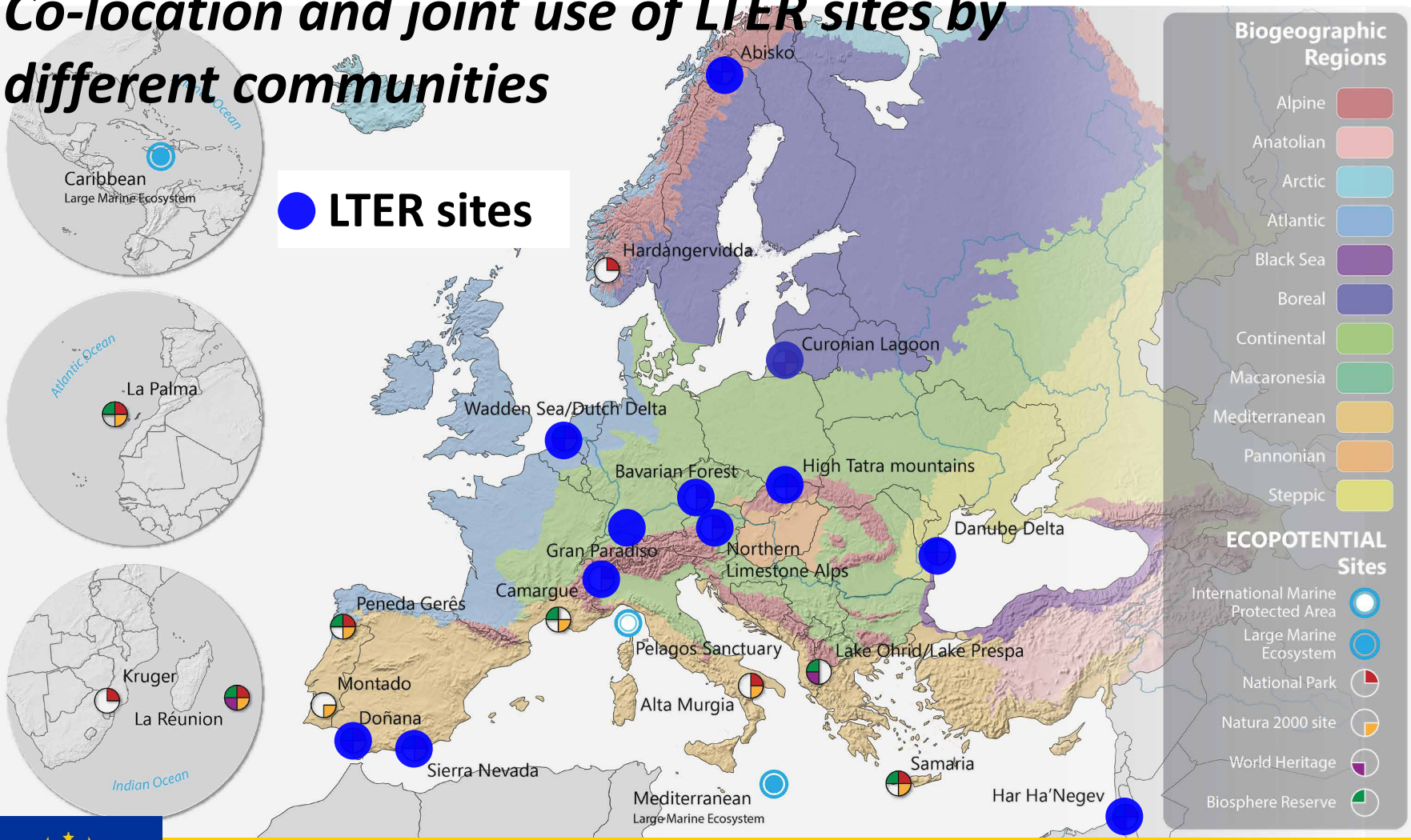
Working in partnership with Protected Areas in Europe and beyond

Co-location and joint use of LTER sites by different communities



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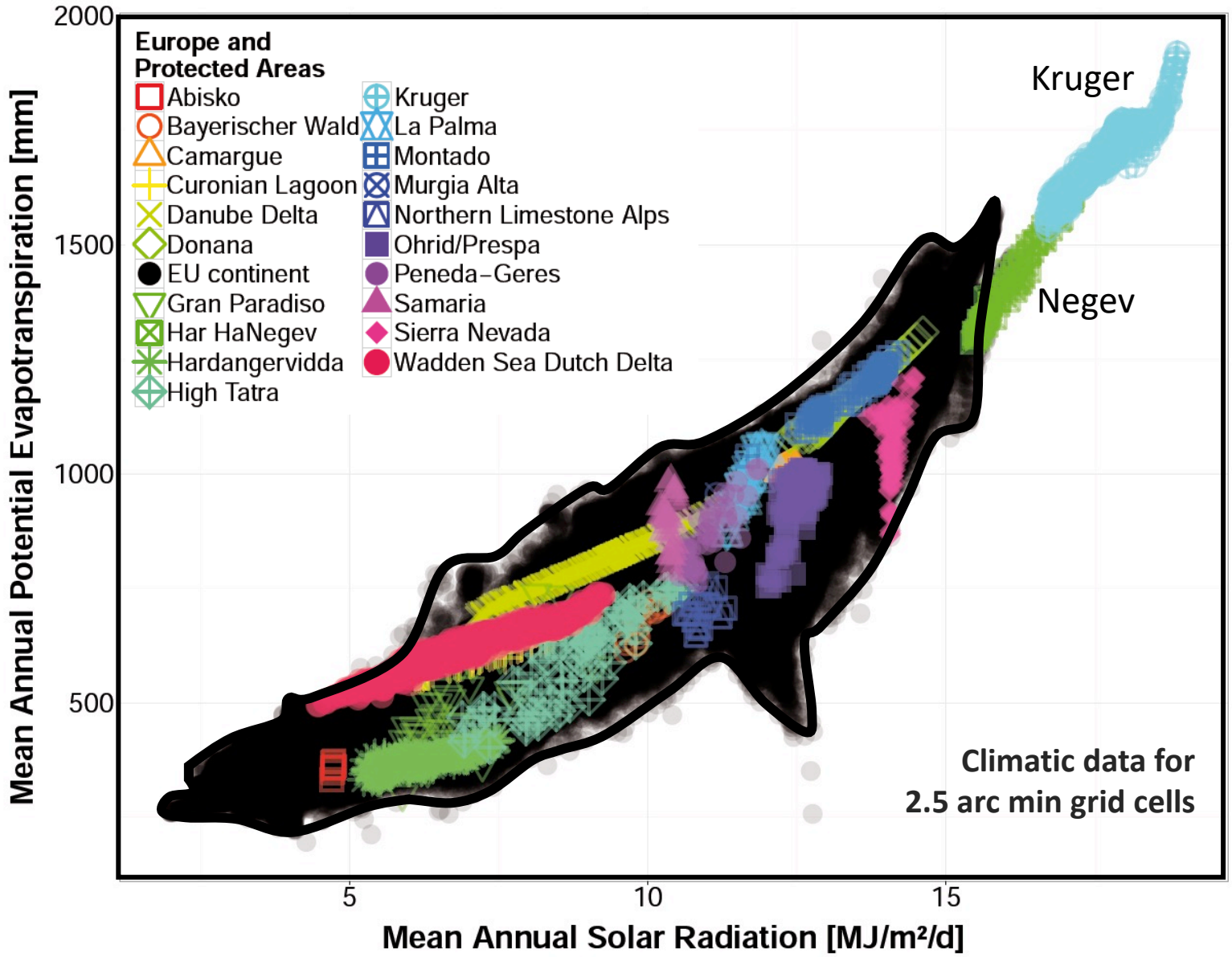
ECOPOTENTIAL PAs and climate

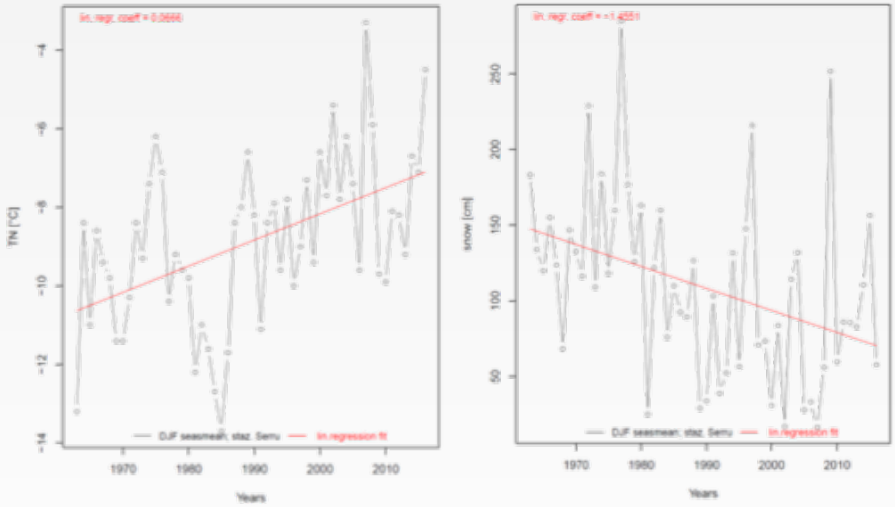
Hoffmann et al, 2017, submitted



Changes in Protected Areas: the ECOPOTENTIAL view

We use gridded climatic datasets and *in situ* meteo-climatic data to assess changes in ecosystem drivers

E-Obs, a European daily high-resolution gridded dataset of surface temperature and precipitation



Trends in winter temperature and snow from Serrù weather station, Gran Paradiso National Park, Italy

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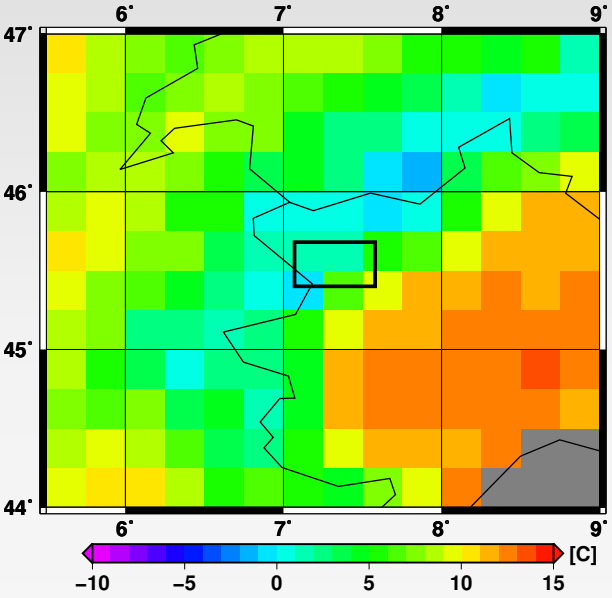
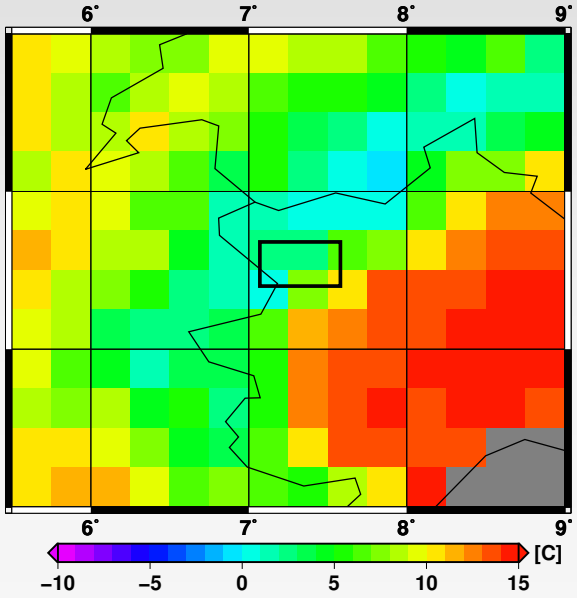
GRAN PARADISO NATIONAL PARK – E-Obs

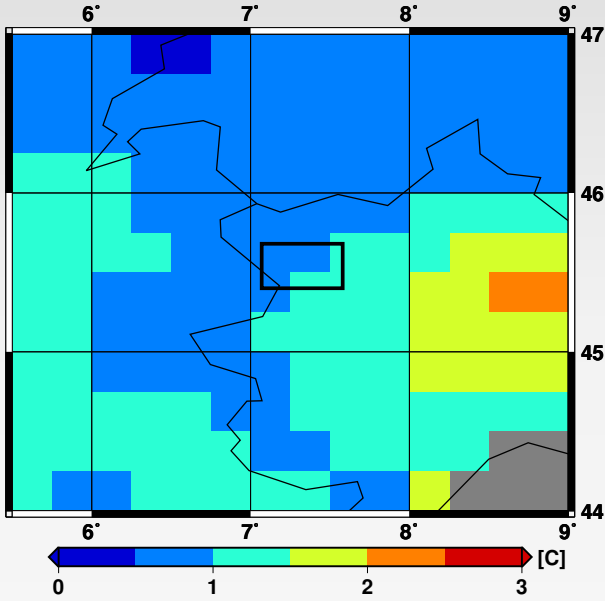
Temperature 1951–1980 average



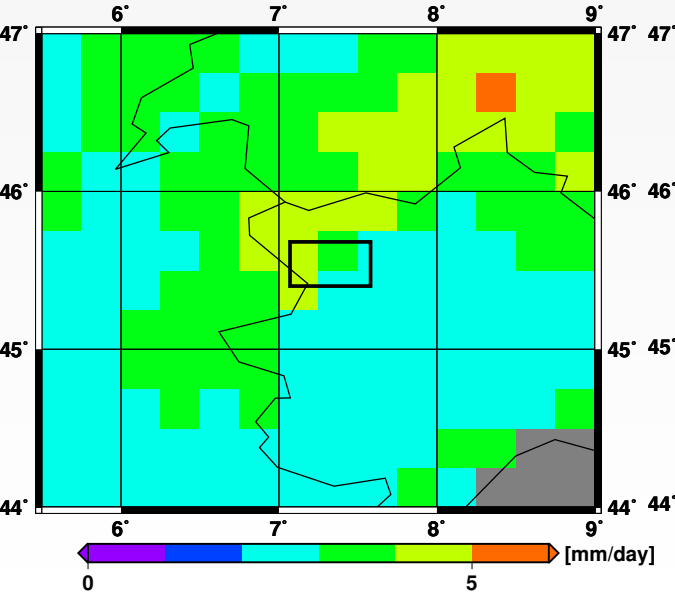
Temperature 1986–2015 average



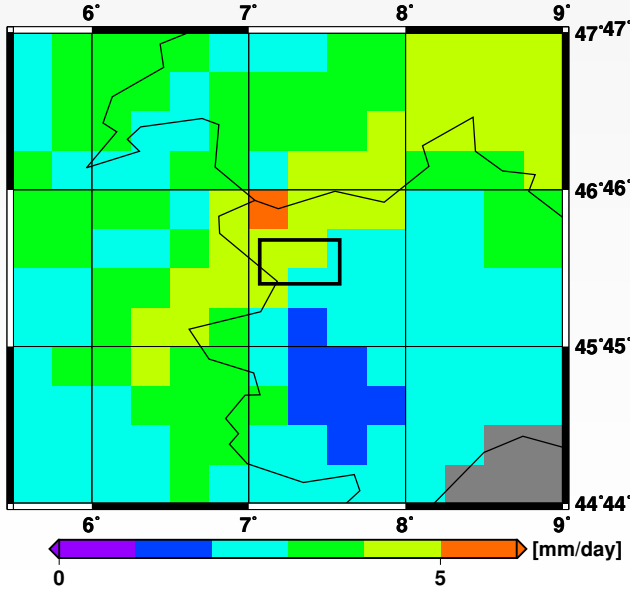
Temperature Change



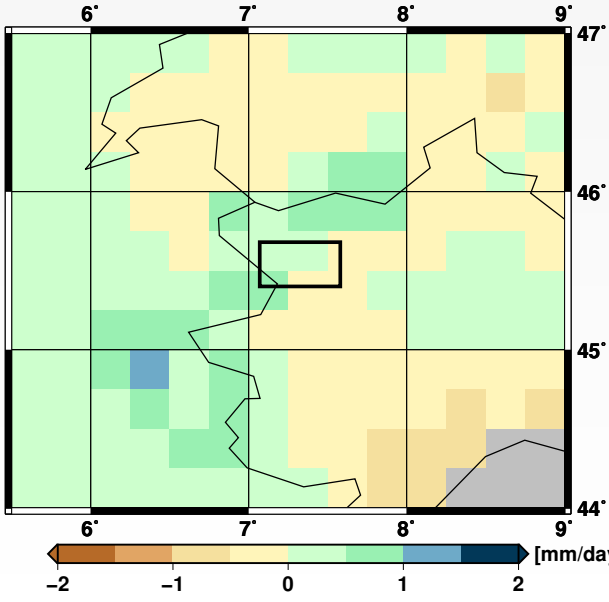
Precipitation 1951–1980 average



Precipitation 1986–2015 average



Precipitation Change

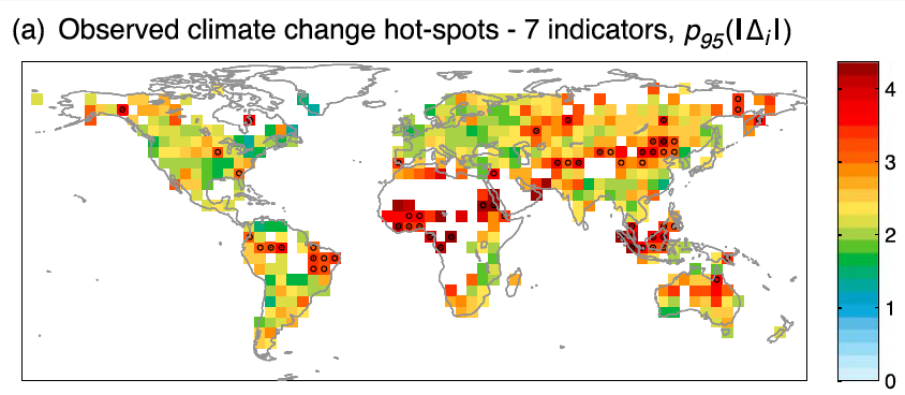


Changes in Protected Areas: from EOBS

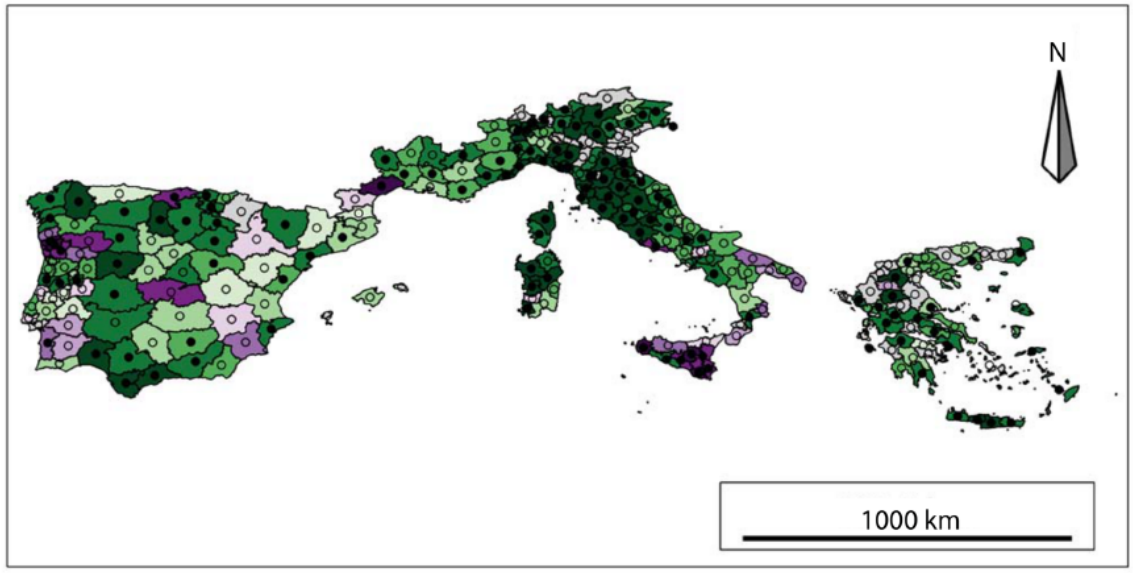
Natural Park	HDD_spring	HDD_summer	HDD_autumn	GSL	Seas_T	Seas_R	TN_ann_mean	TX_ann_mean	TG_ann_mean	RR_ann_mean
GranParadiso	0,4658	3,5837	3,6182	0,2889	0,0074	0,0415	0,0206	0,0281	0,0249	0,0102
Hardangervidda	-0,0824	0,5450	0,6552	0,2038	0,0043	0,0299	0,0253	0,0018	0,0119	0,0116
SierraNevada	8,2663	12,1388	17,7284	2,1794	-0,0869	-0,0023	0,1148	0,0173	0,0798	0,0010
Abisko	0,0241	1,1385	1,4851	0,2671	-0,0306	-0,0149	0,0382	0,0285	0,0303	-0,0027
Limestone	2,0768	5,5513	6,2342	0,3806	0,0048	-0,0100	0,0182	0,0377	0,0257	-0,0053
Bayerischer-NP	2,0658	5,5425	6,3577	0,2278	0,0072	0,0108	0,0258	0,0235	0,0271	0,0052
Camargue	4,0140	8,9040	12,1598	0,1890	0,0196	0,0082	0,0384	0,0354	0,0370	-0,0023
Curonian	2,2778	5,0909	6,1463	0,4425	0,0155	0,0014	0,0311	0,0303	0,0322	0,0052
Donana	2,6335	5,5610	7,1968	0,0024	0,0168	-0,0013	0,0222	0,0255	0,0211	-0,0008
Danube	2,1812	5,0604	6,2993	0,4216	0,0103	-0,0041	0,0180	0,0230	0,0231	0,0027
Montado	4,4676	7,9379	10,0742	0,0081	0,0062	-0,0006	0,0478	0,0271	0,0299	-0,0025
Murgia Alta	3,8949	8,1603	11,0411	0,2429	0,0125	-0,0010	0,0385	0,0293	0,0337	-0,0025
Ohrid	0,3836	2,4432	3,4411	-0,0600	-0,0088	-0,0207	0,0220	0,0118	0,0148	**-0,0090**
Peneda	3,8959	6,6377	8,8147	0,0931	-0,0014	-0,1246	0,0187	0,0377	0,0270	**-0,0356**
SwissNP	0,1666	2,4976	2,5550	0,6421	0,0117	0,0142	0,0252	0,0297	0,0233	**0,0082**
Tatra	1,5675	5,6613	6,6267	0,1354	0,0108	-0,0243	0,0358	0,0284	0,0285	**-0,0095**
WaddenSea	3,0131	5,6647	7,4528	1,0599	-0,0004	0,0080	0,0391	0,0227	0,0305	0,0043

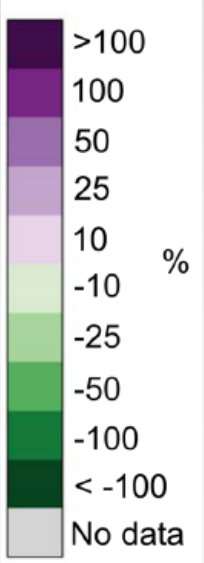
HDD: Heat Degree Days
GSL: Growing Season Length
Seas_T: Temperatur Seasonality Index
Seas_R: Precipitation Seasonality Index
TN: Minimum Daily Temperature
TX: Maximum Daily Temperature
TG: Average Daily Temperature
RR: Precipitation

Protected Areas and Climate Change Hotspots



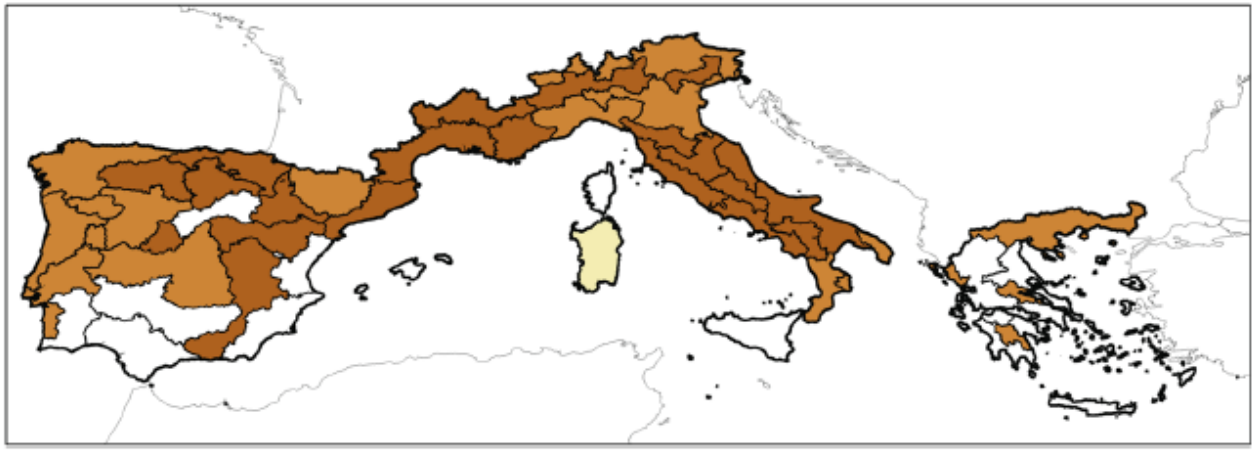
Changes in Fire Occurrence in the Mediterranean: Burned Area





Turco et al, PLOS ONE 2016

Turco et al, Scientific Reports 2017



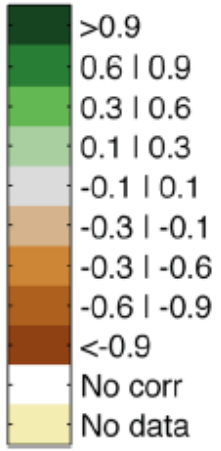


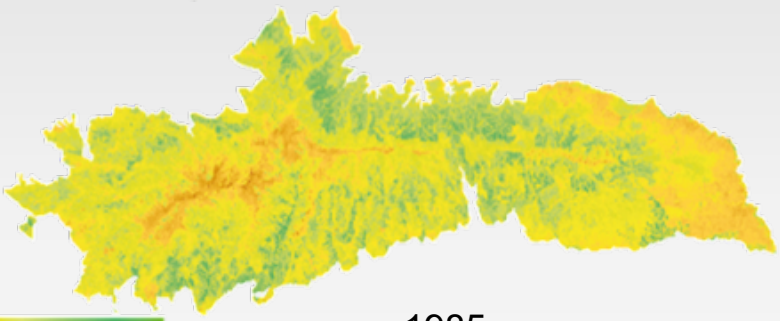
Figure 1. Correlations between detrended log(*BA*) and $SPEI_3(0, 8)$, the SPEI for an accumulation time scale of 3 months and calculated in August (8) of the coincident summer (i.e. with the time lag of 0 year). Only correlations that are collectively significant from an FDR test[45] are shown. This figure is created with Matlab version R2012a (http://www.mathworks.com/).

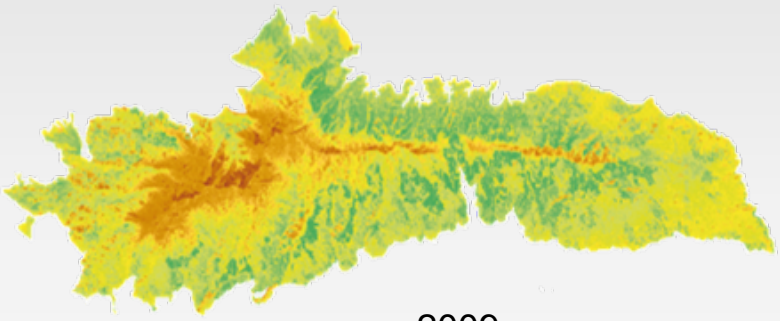
Remote sensing variables

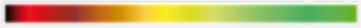
Type of ecosystem	RS variable	Period	Frequency	Spatial resolution	Satellite	Referent expert
Mountains	NDVI	2000-2017	Daily averages	250 m	MODIS TERRA/AQUA	BGU, CREAF
	Snow cover (duration)	2002-2016	yearly	250 m (EURAC) 500 m (MODIS)	MODIS TERRA/AQUA	EURAC, FORTH
	Land surface temperature	2000-2017	Daily averages	1 km	MODIS TERRA/AQUA	FORTH
Arid ecosystems	NDVI	2000-2017	Daily averages	250 m	MODIS TERRA/AQUA	BGU, CREAF
	Albedo	2000-2015	Yearly	500 m	MODIS	FORTH
	Land surface temperature	2000-2017	Daily averages	1 km	MODIS TERRA/AQUA	FORTH
Marine	Chlorophyll a	1998-2015	monthly	4 km	Several	ISPRA
	Sea Surface Temperature	1986-2016	Daily	2 km-4km	Several	ISPRA
	Total suspended solids /Turbidity	From 1984	16 day images (if available and no clouds)	30 m	Landsat /Sentinel 2	EBD-CSIC provides software not product
Common to all PAs - Global	GPP proxy	2002-2016	Yearly	250 m	MODIS	UFZ
	Phenological metrics	2002-2016	Yearly	250 m	MODIS	UFZ

Changes in Protected Areas: the ECOPOTENTIAL view

Sierra Nevada National Park, Spain: NDVI







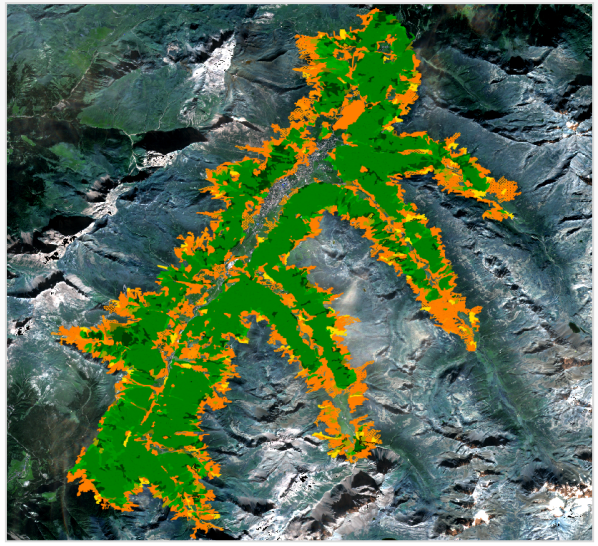
0.58 0.72

1985 2009

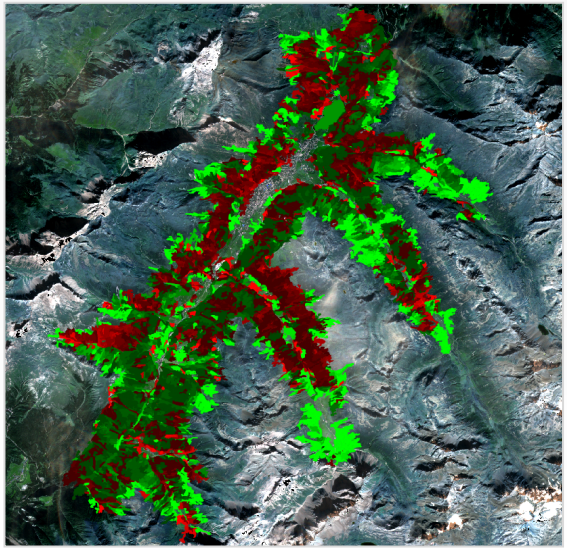
Density of green leaves

DAVOS, Switzerland: evidence of deforestation and regrowth 2003 – 2012

Change in land cover (woody vegetation)



Biomass change (woody vegetation)



Spatial-temporal dynamics of savanna ecosystems in and around Kruger National Park (A. Ramoelo et al, CSIR)

SoE	Indicator	Method [reference] (type)*
Distribution of grazing and browsing resources in the semi-arid environments	amount of grass per unit area (biomass)	empirical techniques [Ramoelo et al. 2015] (M)
	percentage of nutrients in dry matter (leaf N (%))	empirical techniques [Ramoelo et al. 2012; 2015] (M)
	percentage of tree cover per unit area (%)	field, LiDAR and SAR empirical techniques [Mathieu et al. 2013, Naidoo et al. 2014, Urbazaev et al. 2015] (M)
	above ground woody biomass per unit area (ha) & woody volume as biomass proxy	field, LiDAR and SAR empirical techniques [Mathieu et al. 2013, Naidoo et al. 2014] (M)

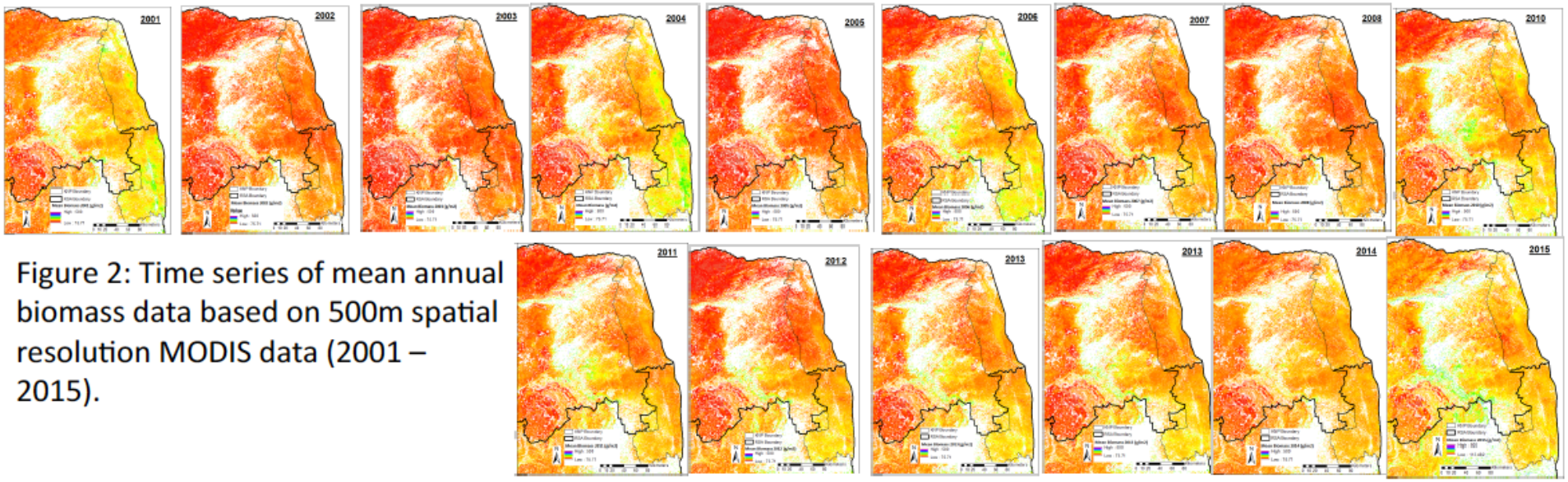


Figure 2: Time series of mean annual biomass data based on 500m spatial resolution MODIS data (2001 – 2015).

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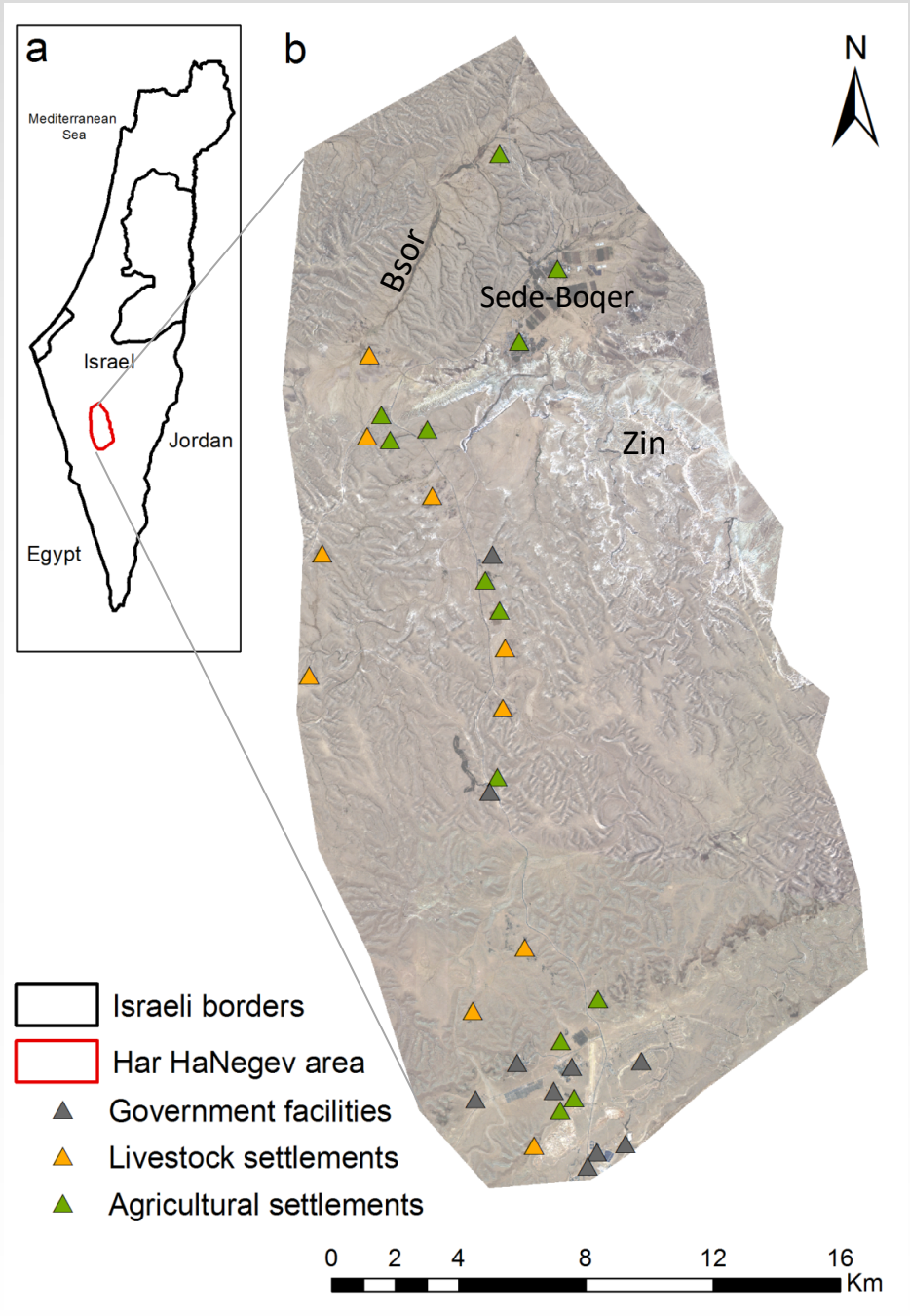
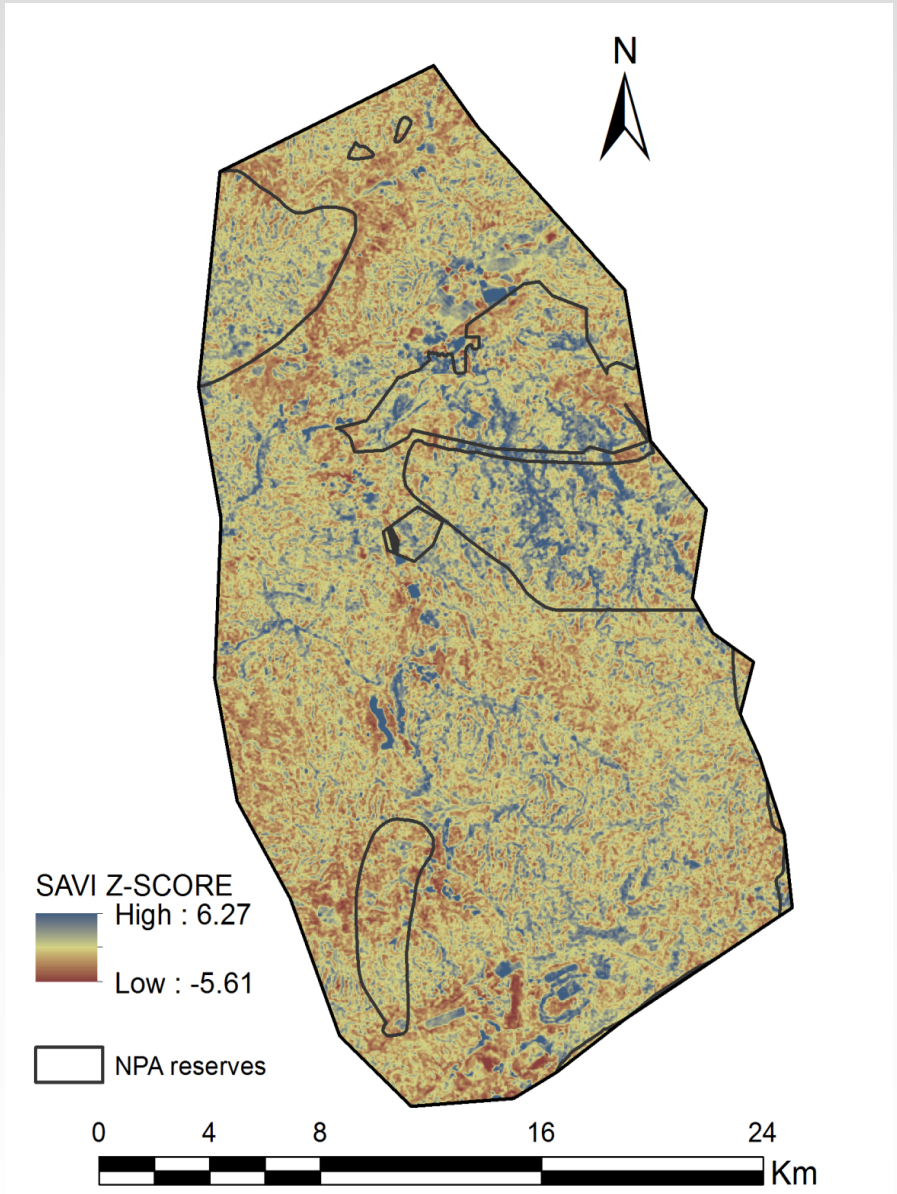
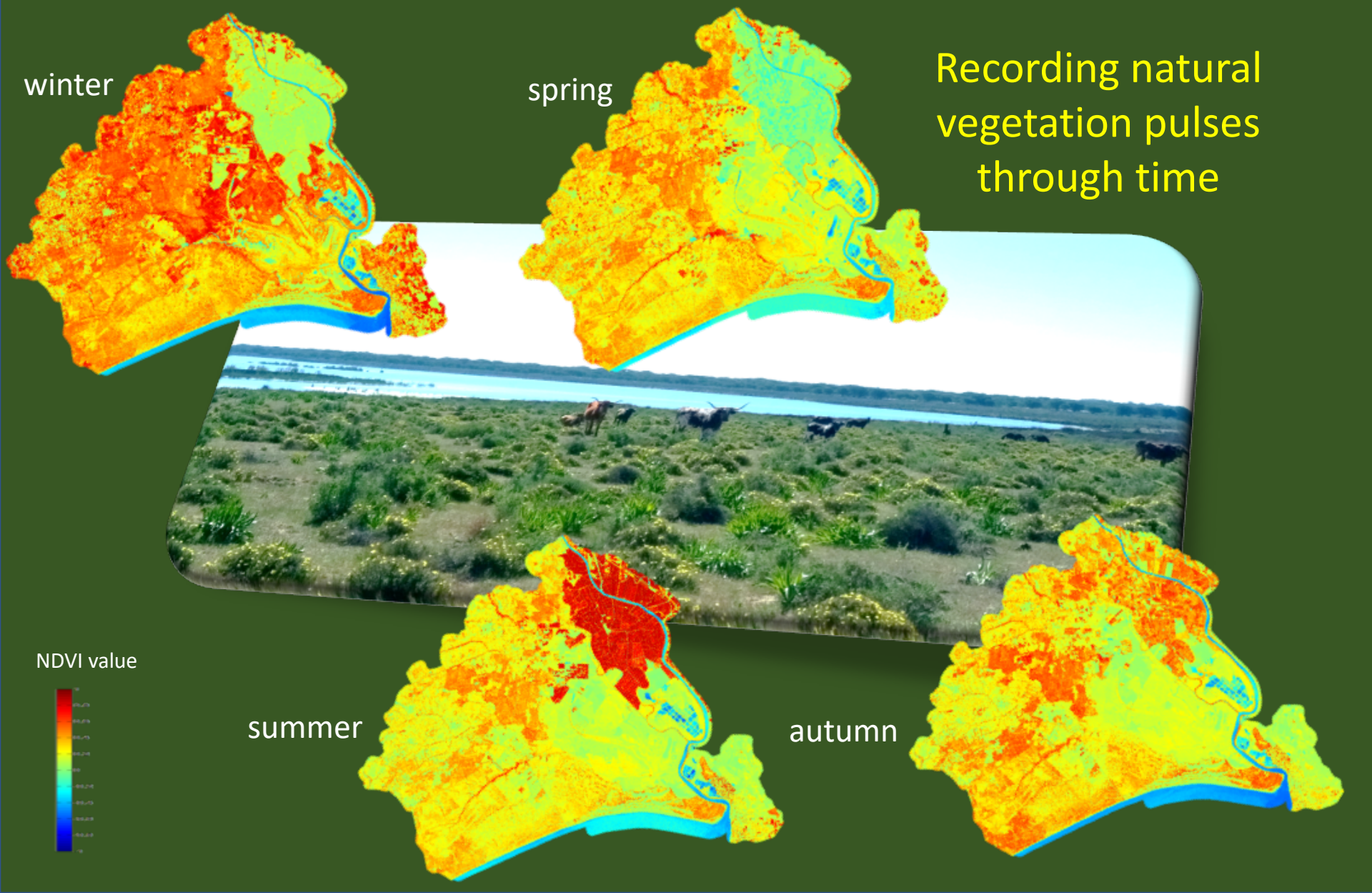
HarHaNegev (Karnieli et al, BGU)





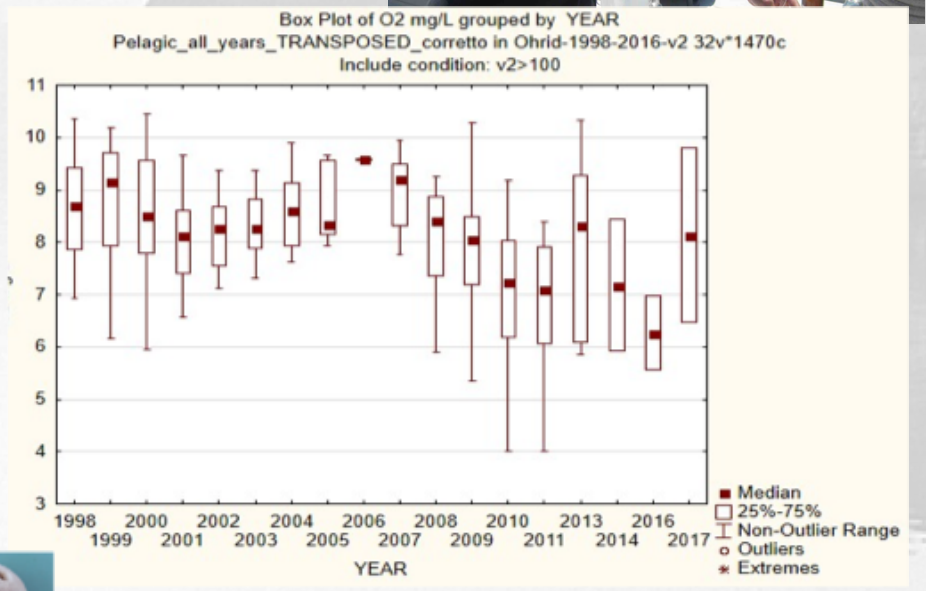
SAVI Z-SCORE map

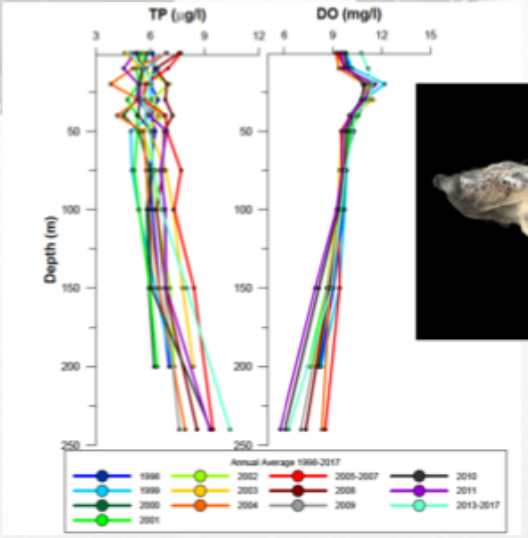
Camargue – I. Manakos et al



Changes in Protected Areas: in situ data (e.g., Lake Ohrid)

Habitat for endemic species is endangered by eutrophication in the most diverse lake in the world

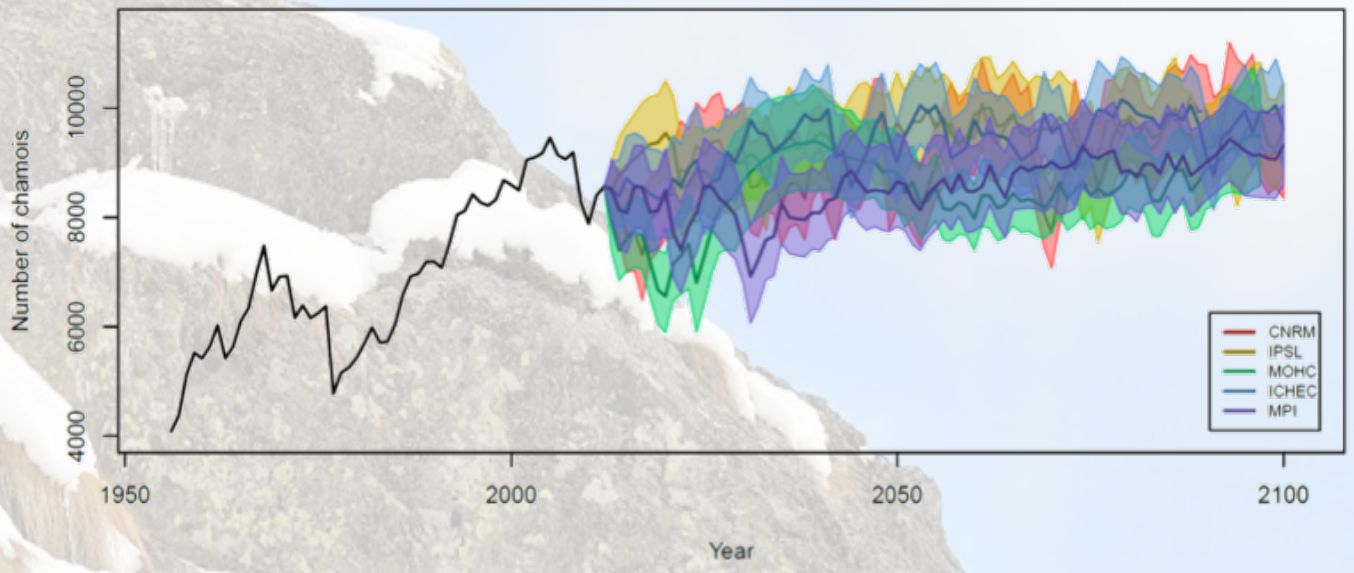




DEIMS

Changes in Protected Areas: the ECOPOTENTIAL view

Finally, downscaled climate scenarios are used to estimate how the changes are projected into the next decades.



Gran Paradiso National Park: projections of chamois population according to CORDEX climate models for the RCP4.5 scenario

Changes in Protected Areas: the ECOPOTENTIAL view

Results will be useful to Administrators and Park managers in order to develop conservation and management plans

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Stay tuned, and thanks for your attention