

Induced algal community changes by UV radiation and nutrients inputs: A long-term experimental study in lake La Caldera (Sierra Nevada, Spain)

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INTRODUCTION



Is the dominance of mixotrophs in these ecosystems determined by the high UVR fluxes or by the low nutrient availability?

Can the structure of the algal community be modified by the joint effects of an increase in UVR and nutrients in a global change scenario?

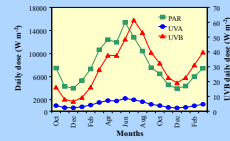
Study site

To help answer these posed questions we chose to study a high mountain lake (3050 m):

- Located in the Mediterranean area, with frequent episodes of drought.
- Receiving considerable fluxes of UV radiation.
- Receiving frequent inputs of P-rich Saharian dust.



Lake La Caldera



EXPERIMENTAL DESIGN

+UVR

Control 20 30 40 60 $\mu\text{g P L}^{-1}$

-UVR

Control 20 30 40 60 $\mu\text{g P L}^{-1}$

Incubation time

Nutrients Pulse: 1-Aug, 3-Aug, 11-Aug, 20-Aug, 1-Sep, 11-Sep, 24-Sep, 10-Oct

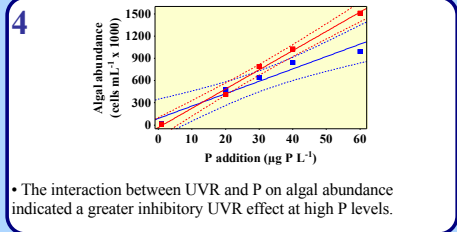
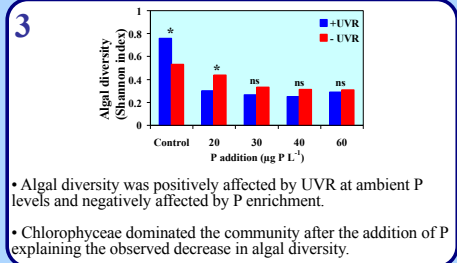
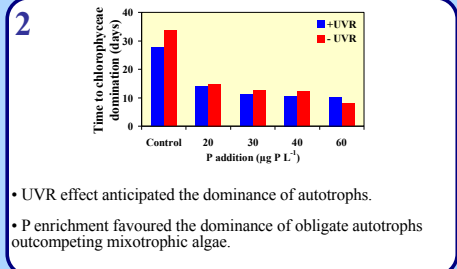
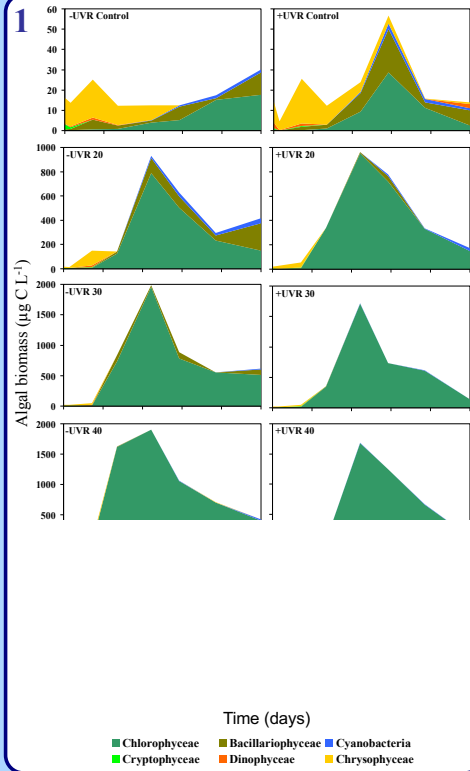
Variables

Algal structure → specific composition, abundance and diversity.
Algal replacement → Time (days) to chlorophyceae dominance.

Statistical analysis

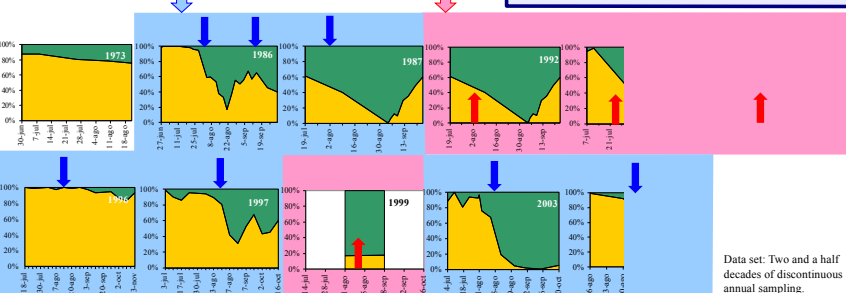
ANCOVA analysis → Light quality (+UVR, -UVR) as factor and nutrient level as covariate.
Paired t-test → To detect UVR effects when no lineal relationship between P-addition and the studied variable was found.

RESULTS



5 A consistent seasonal pattern emerges characterized by a shift in algal structure from mixotrophs to obligate autotrophs after natural P enrichments via:

- a** P-inputs via aerosols from Sahara desert (blue arrows)
- b** Resuspension of P-rich sediments (red arrows) in dry years with low thickness of water column (< 2 m)



Data set: Two and a half decades of discontinuous annual sampling.

CONCLUSIONS

- ✓ Low nutrient availability rather than UVR promotes the dominance of mixotrophs in "extreme" aquatic ecosystems. Nevertheless, UVR favoured algal diversity.
- ✓ In a global change scenario more frequent atmospheric P-inputs and more intensive UVR fluxes could lead to:
 - higher algal abundance and biomass.
 - the dominance of obligate autotrophs.