Supplementary Material

Algal bloom exacerbates hydrogen sulfide and methylmercury contamination in the emblematic high-altitude Lake Titicaca

Running title: Algal bloom, methylmercury, and H_2S

Darío Achá [1,*], Stephane Guédron [2, 3], David Amouroux [1,4,5], David Point [1,4], Xavier Lazzaro [1, 6], Pablo Edgar Fernandez [7] and Géraldine Sarret [2]

[1] Instituto de Ecología, Unidad de Calidad Ambiental (UCA), Carrera de Biología, Universidad Mayor de San Andrés, Campus Universitario de Cota Cota, casilla 10077 La Paz, Bolivia; david.amouroux@univ-pau.fr(D.A.); david.point@ird.fr (D.P.); xavier.lazzaro@ird.fr (X.L.)

[2] Institut des Sciences de la Terre (ISTerre), Université Grenoble Alpes (UGA), Université Savoie Mont Blanc, Institut de Recherche pour le Développement (IRD), CNRS, IFSTTAR - 38000 Grenoble, France; stephane.guedron@ird.fr (S.G.); geraldine.sarret@univ-grenoble-alpes.fr (G.S.)

[3] Laboratorio de Hidroquímica, Instituto de Investigaciones Químicas, Universidad Mayor de San Andrés, Campus Universitario de Cota-Cota, casilla 3161, La Paz, Bolivia.

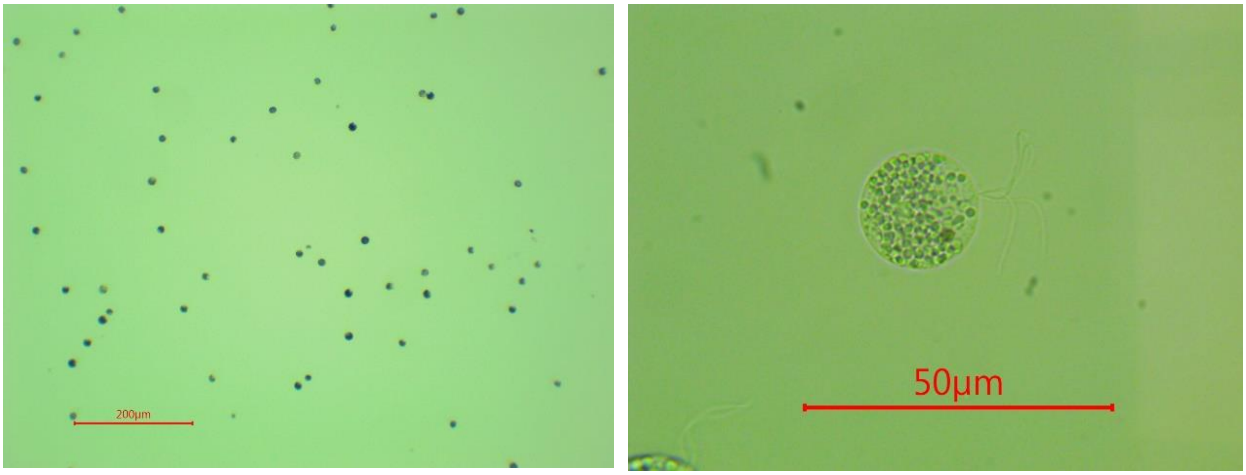
[4] Institut des Sciences Analytiques et de Physico-chimie pour l'Environnement et les Matériaux (IPREM), UMR5254, CNRS / University Pau Pays Adour – E2S UPPA, 64000 PAU, France

[5] Géosciences Environnement Toulouse, UMR5563 - IRD UR 234, Université Paul Sabatier, 14 Avenue Edouard Belin 31400 Toulouse, France

[6] Unité Biologie des Organismes, Biologie des Organismes et Ecosystèmes Aquatiques (BOREA), Muséum National d'Histoire Naturelle, Sorbonne Université, Université Caen-Normandie, Université des Antilles, CNRS, IRD. 61 rue Buffon, 75231 Paris cedex 5, France

[7] Carrera de Biología, Universidad Mayor de San Andrés, Campus Universitario de Cota Cota, casilla 10077 La Paz, Bolivia; pablo86fernandez@hotmail.com

* Corresponding author: darioacha@yahoo.ca; dacha@fcpn.edu.bo; +591-737-46065



(**A**) (**B**)

Figure S1. Algae responsible for the bloom at different scales showing the dominance of *Carteria sp.* at the water surface. (**A**), and one of the images used for classification (**B**).

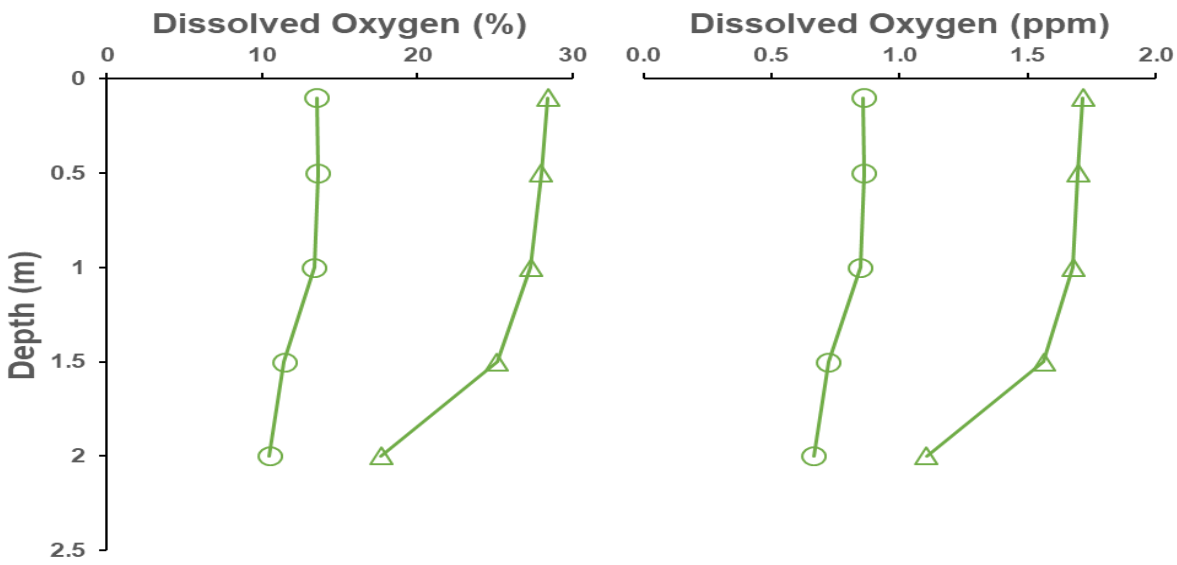


Figure S2. Oxygen profiles of the water column in the Cohana Bay during the bloom 8:30 in the morning (circles) and 17:30 (tringles).

Figure S3. Location of meteorological stations from where data was collected by Senamhi Peru (green circles) and IRD France (Blue circle) (modified from the map provided by Senamhi Peru, http://www.senamhi.gob.pe/).

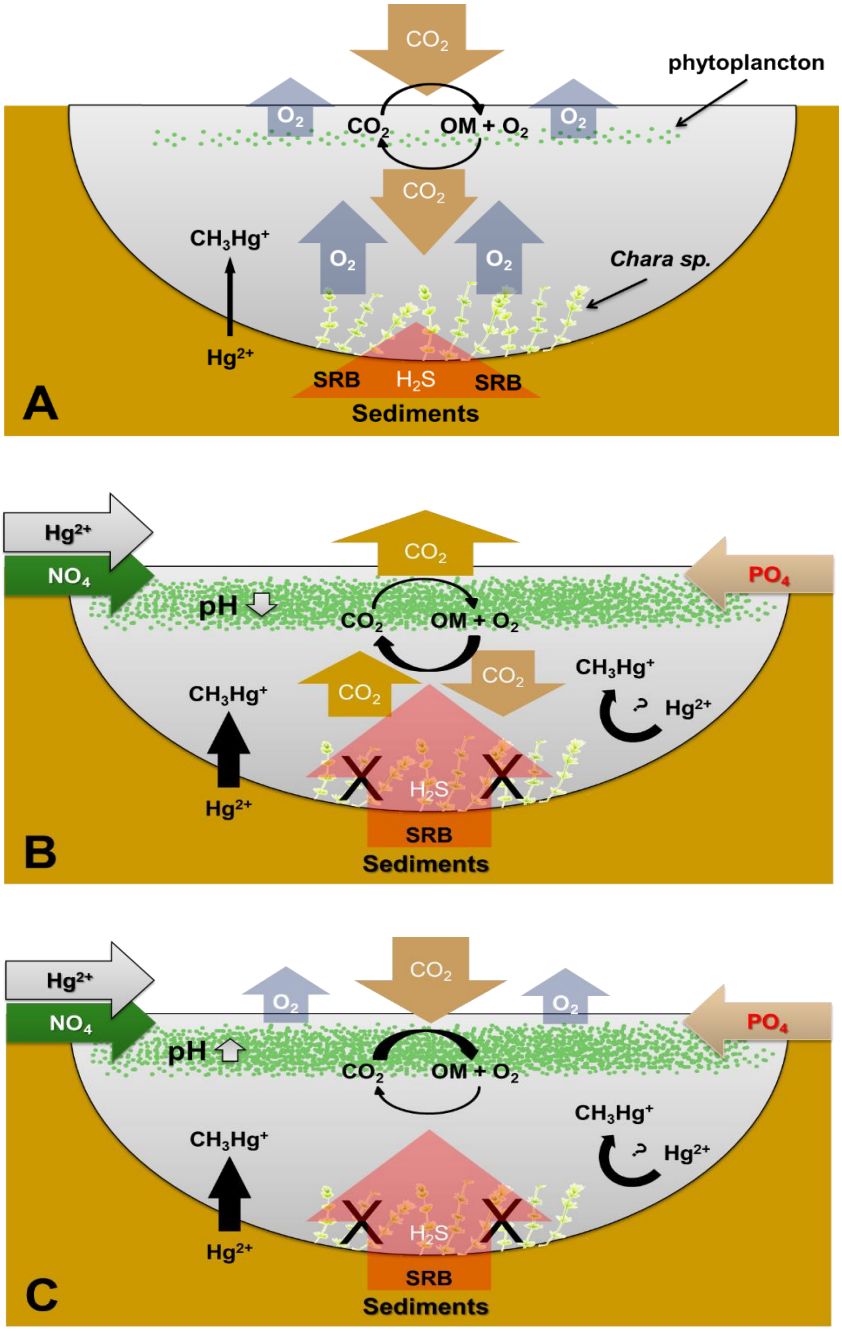


Figure S4. Diagram of the Titicaca Lake ecosystem under (**A**) undisturbed conditions, (**B**) bloom close to Cohana Bay and (**C**) bloom at open waters. Shows how the bloom may have allowed higher hydrogen sulfide concentrations, higher Sulfate-reducing bacteria (SRB) activity, higher methylmercury (CH_3Hg^{2+}) concentrations and how organic matter (OM) consumption and decomposition lowers or increases pH respectively.

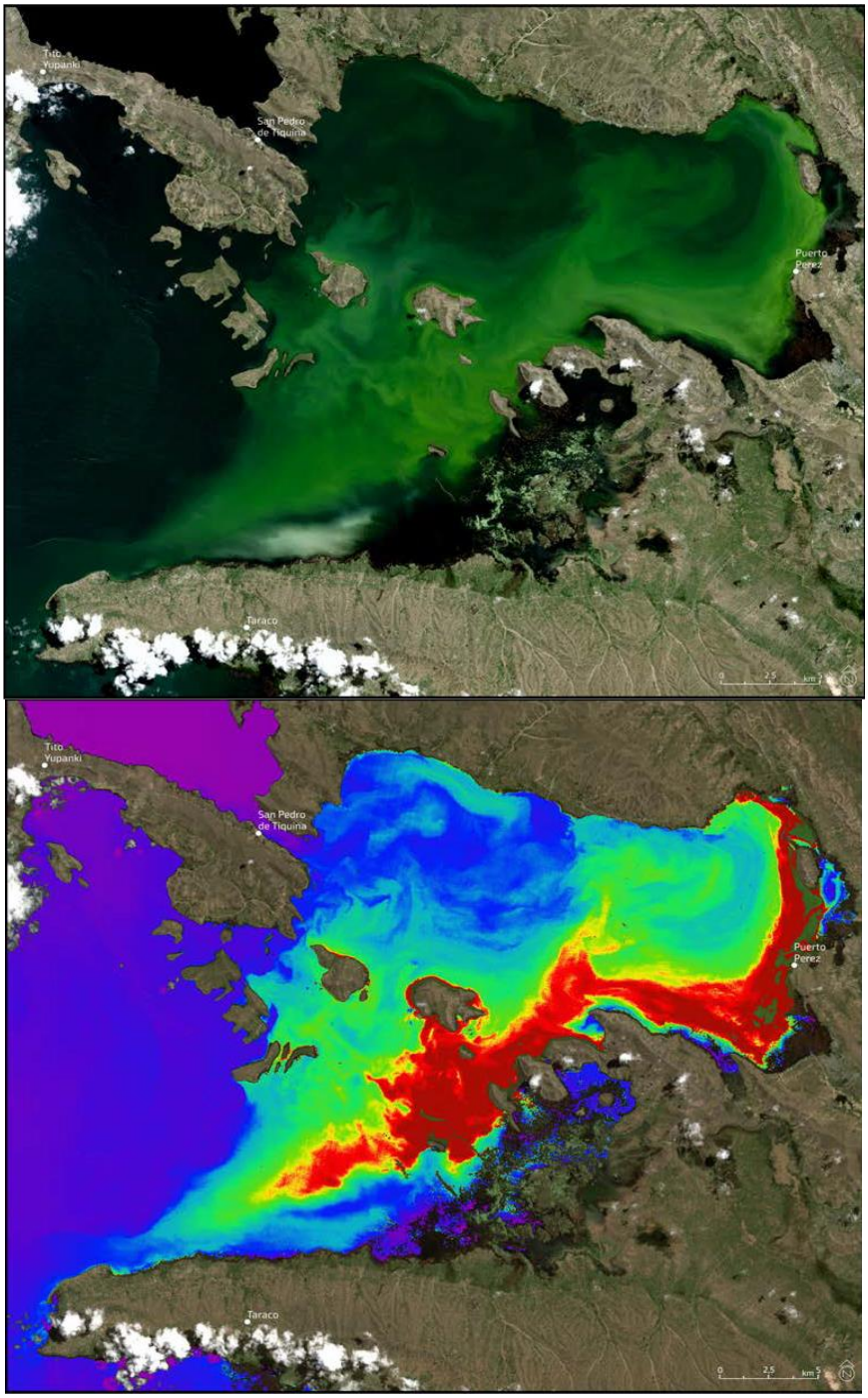


Figure S5. Satellite images showing the lake Menor of Titicaca during the bloom event. Upper panel with a. Landsat 8 image 23-04-2015 and in the bottom panel from blue to red gradient showing Chlorophyll content of the same image (modified from Earth Observation Services Supporting International Development Banks Projects (EOSID), project developed and funded by the European Space Agency (ESA) under ESA Earth Observation Envelope Programme). Note that the view expressed in this publication can in no way be taken. to reflect the official opinion of the European Space Agency.

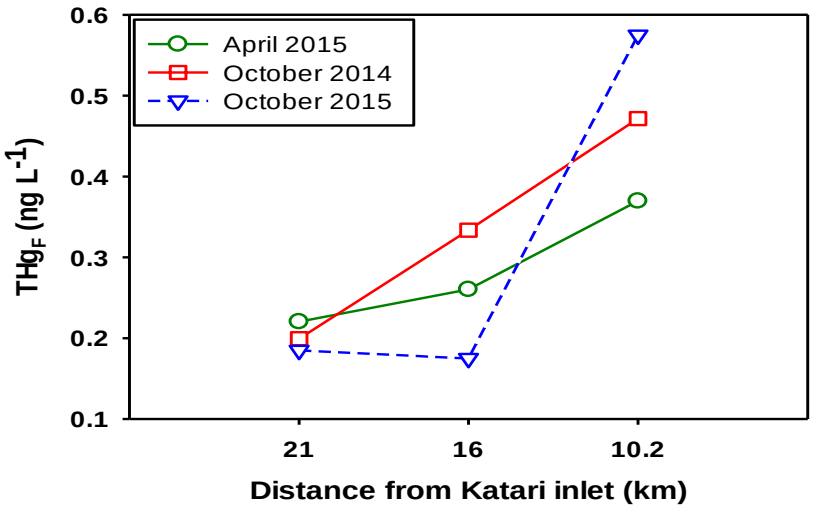


Figure S6. Total mercury concentrations in filtered water (THg_F) in the, 21, 16 and 10.2 km sampling locations during (green circles), before (red squares) and after the algae bloom (blue triangles).

Table S1. Main sampling locations at Lago Menor.

Location	Distance to Katari Inlet Km*	Latitude °South	Longitude °West
Cohanna Bay	7.5	16.35538	68.71900
Cohanna Bay	9.6	16.34296	68.73288
Out Cohanna Bay	10.2	16.33831	68.73597
Out Cohanna Bay	16	16.28733	68.71746
Out Cohanna Bay	21	16.24590	68.70105
Huatajata	24	16.21626	68.69157
Chua	29	16.21151	68.76602

* Distance was measured not in straightlines but following potential currecnts that may disperse the contaminants.

Table S2. Oxygen concentrations during the bloom.

Depth **m**	**10.2 km** **mg·L^{-1}**	**16 km** **mg·L^{-1}**	**21 km** **mg·L^{-1}**
0.1	2.94	5.10	3.81
1	2.62	5.14	4.06
2	2.54	5.17	4.04
3	2.43	5.08	3.43
4	2.42	5.04	2.57
5		5.13	1.93
6		5.06	1.64
7		5.00	1.55
8		5.03	1.51
9		5.04	1.47
10		5.04	1.46
11		4.98	1.41
12		4.67	1.22
13		4.72	
14		4.30	
15		4.13	