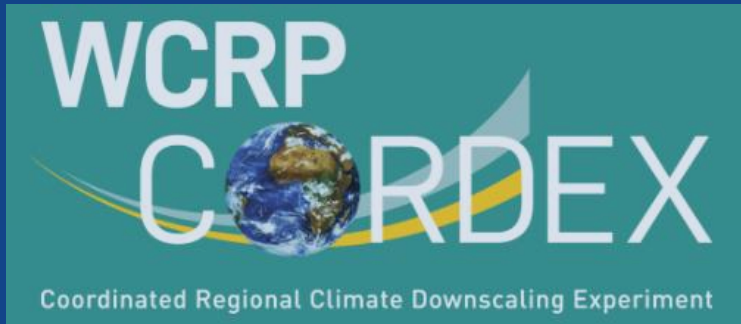
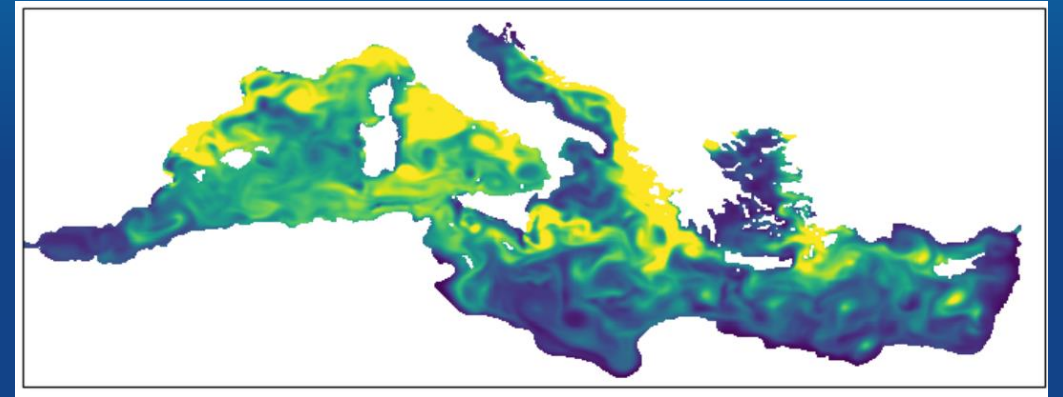


Mercury fate and transport in the Mediterranean Sea: current state and projected changes under RCP4.5 and RCP8.5 emission scenarios.

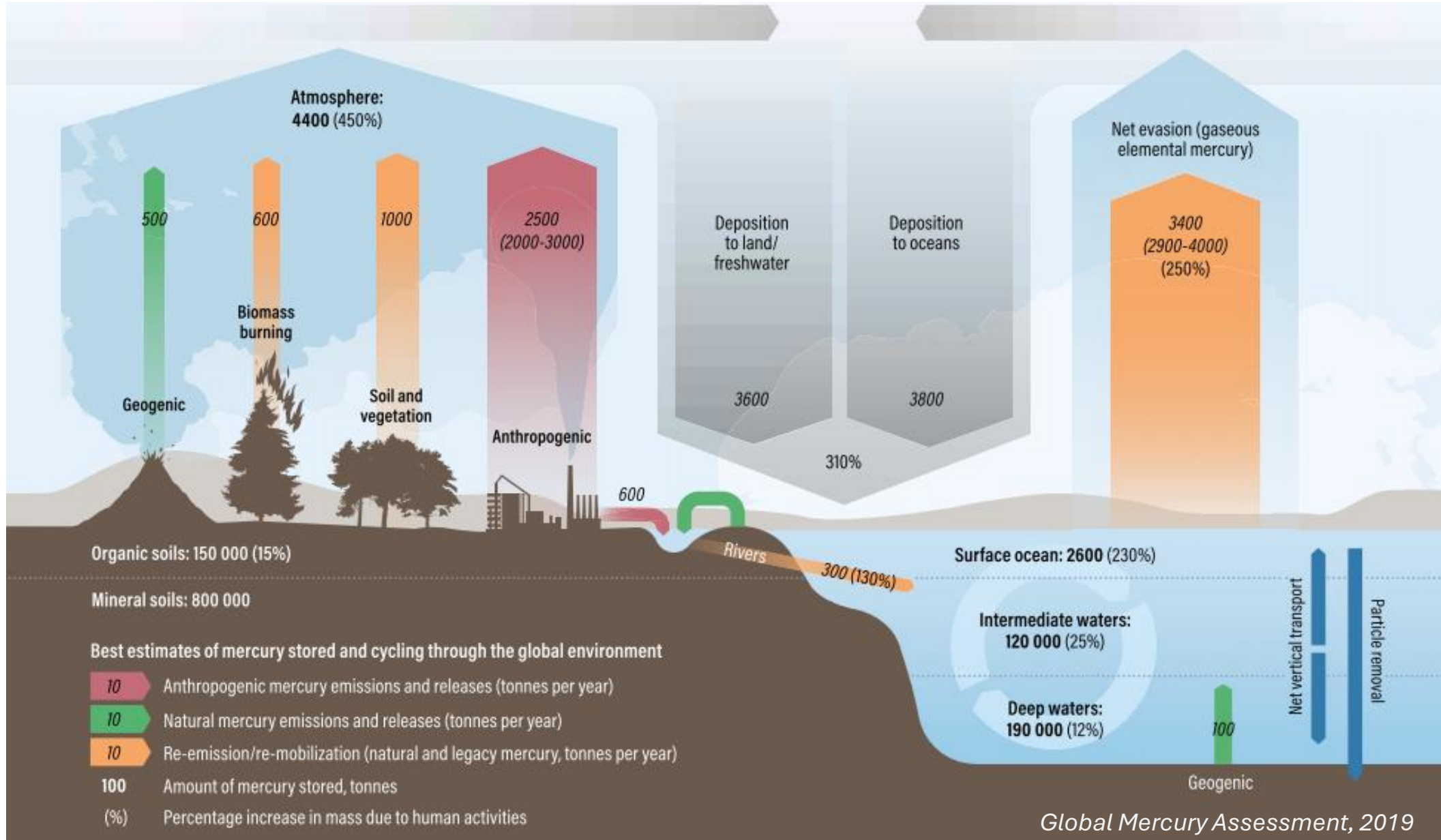
*Rosati G., Canu D., Lazzari P.,
Reale M., and Solidoro C.*



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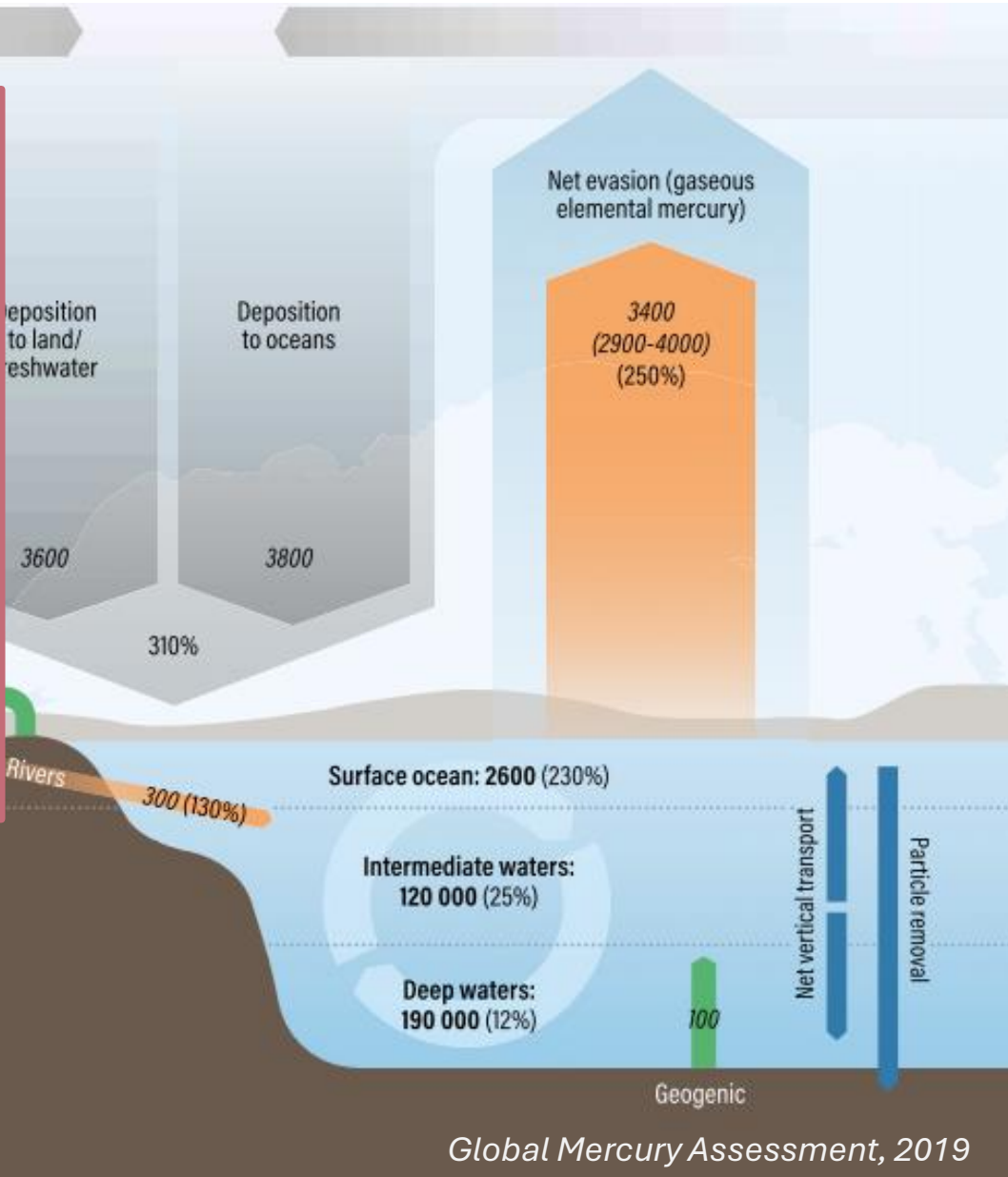
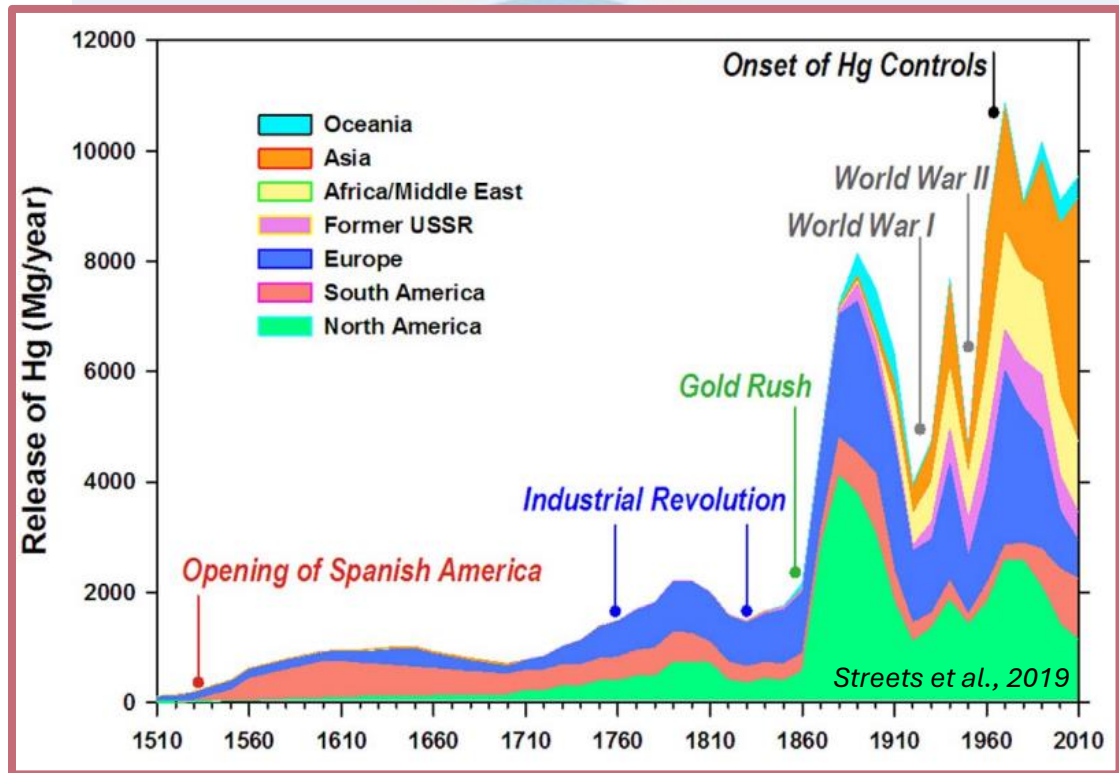
Mercury (Hg): a global pollutant



Ubiquitous Persistent Pollutant: once emitted it will cycle among earth's surface reservoirs

Mercury (Hg): a global pollutant

Extracted and used for centuries for several industrial and commercial scopes



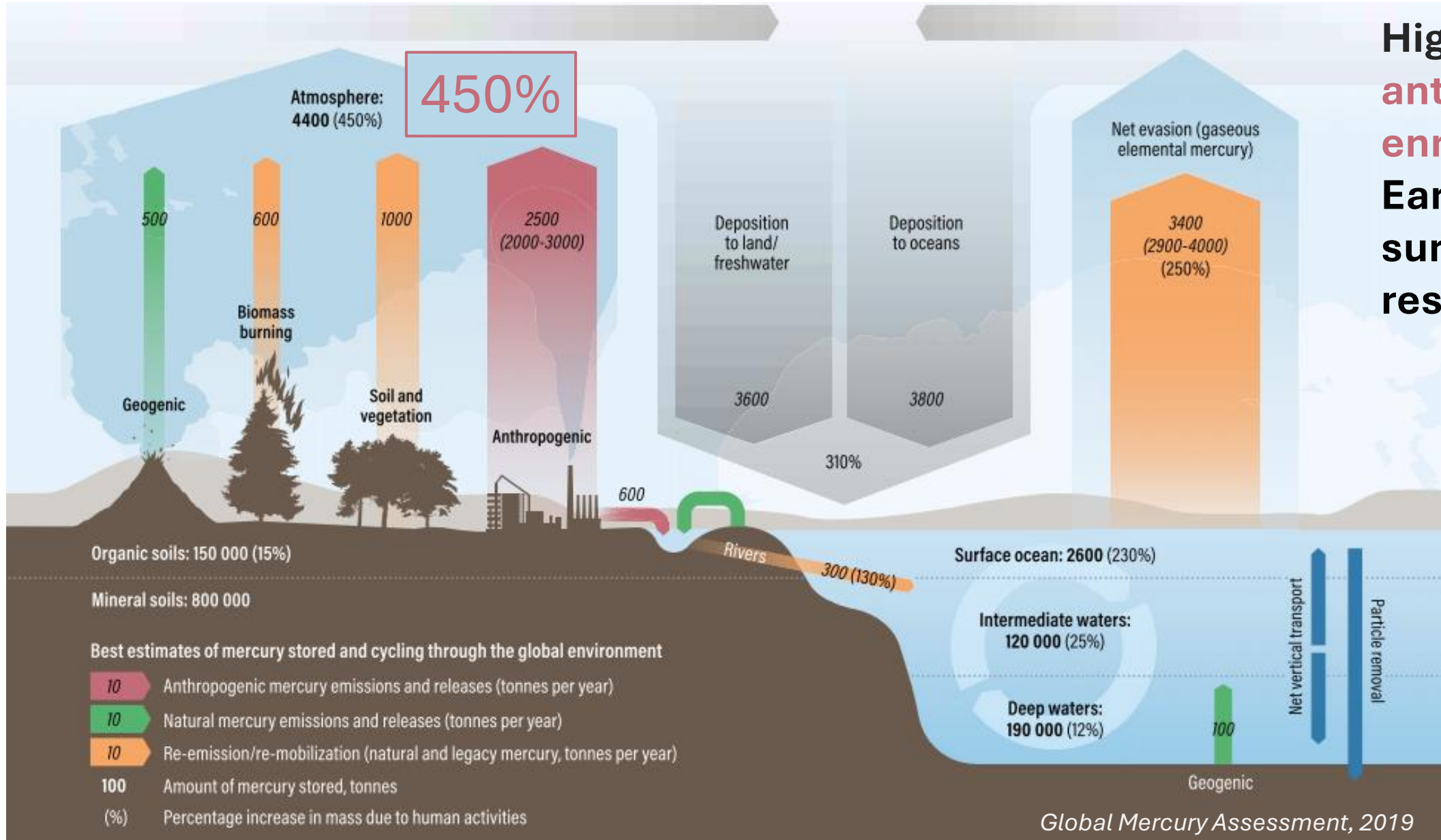
Mineral soils: 800 000

Best estimates of mercury stored and cycling through the global environment

- 10 Anthropogenic mercury emissions and releases (tonnes per year)
- 10 Natural mercury emissions and releases (tonnes per year)
- 10 Re-emission/re-mobilization (natural and legacy mercury, tonnes per year)
- 100 Amount of mercury stored, tonnes
- (%) Percentage increase in mass due to human activities

Global Mercury Assessment, 2019

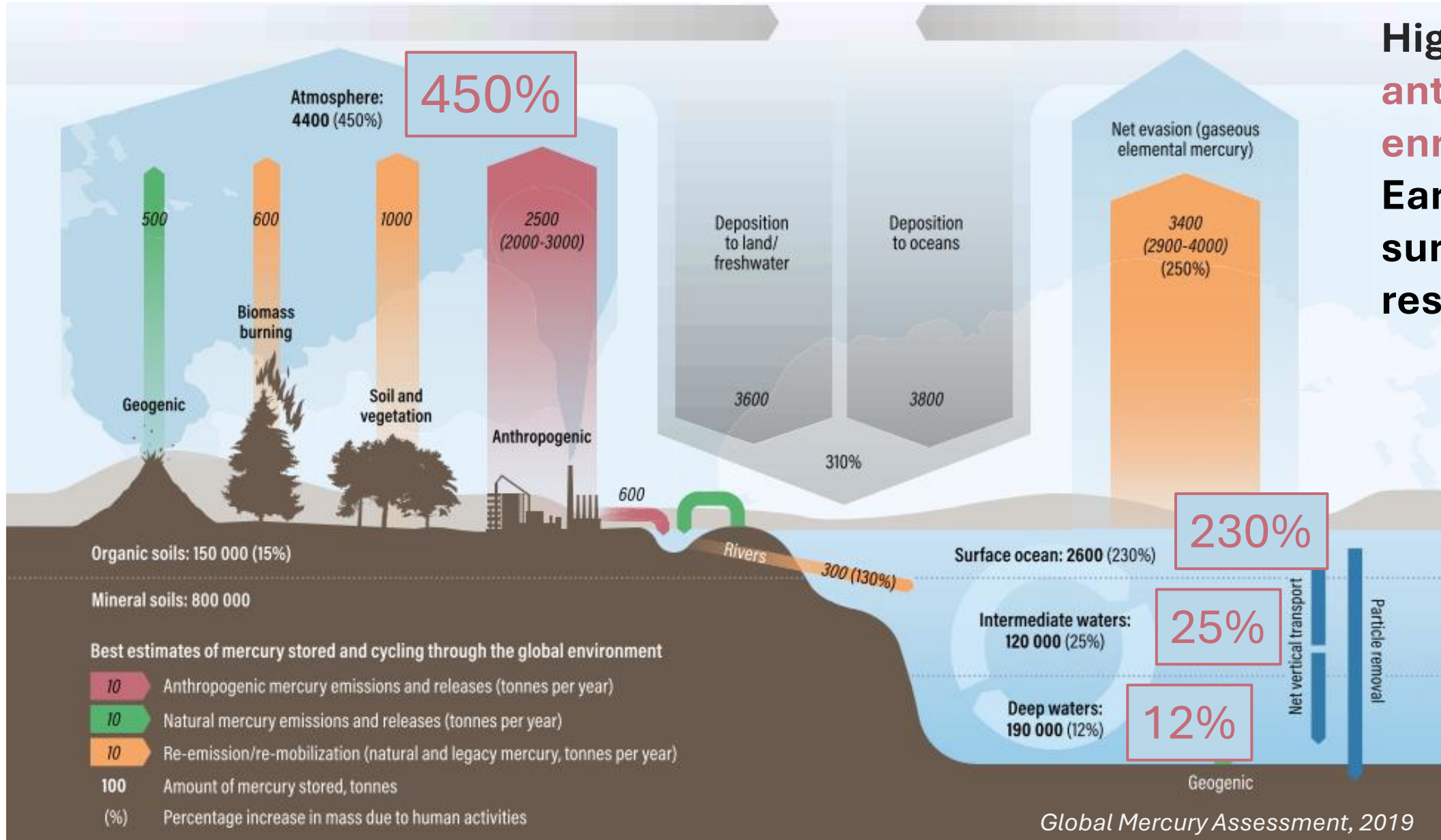
Mercury (Hg): a global pollutant



High anthropogenic enrichment in Earth's surface reservoirs

Global Mercury Assessment, 2019

Mercury (Hg): a global pollutant

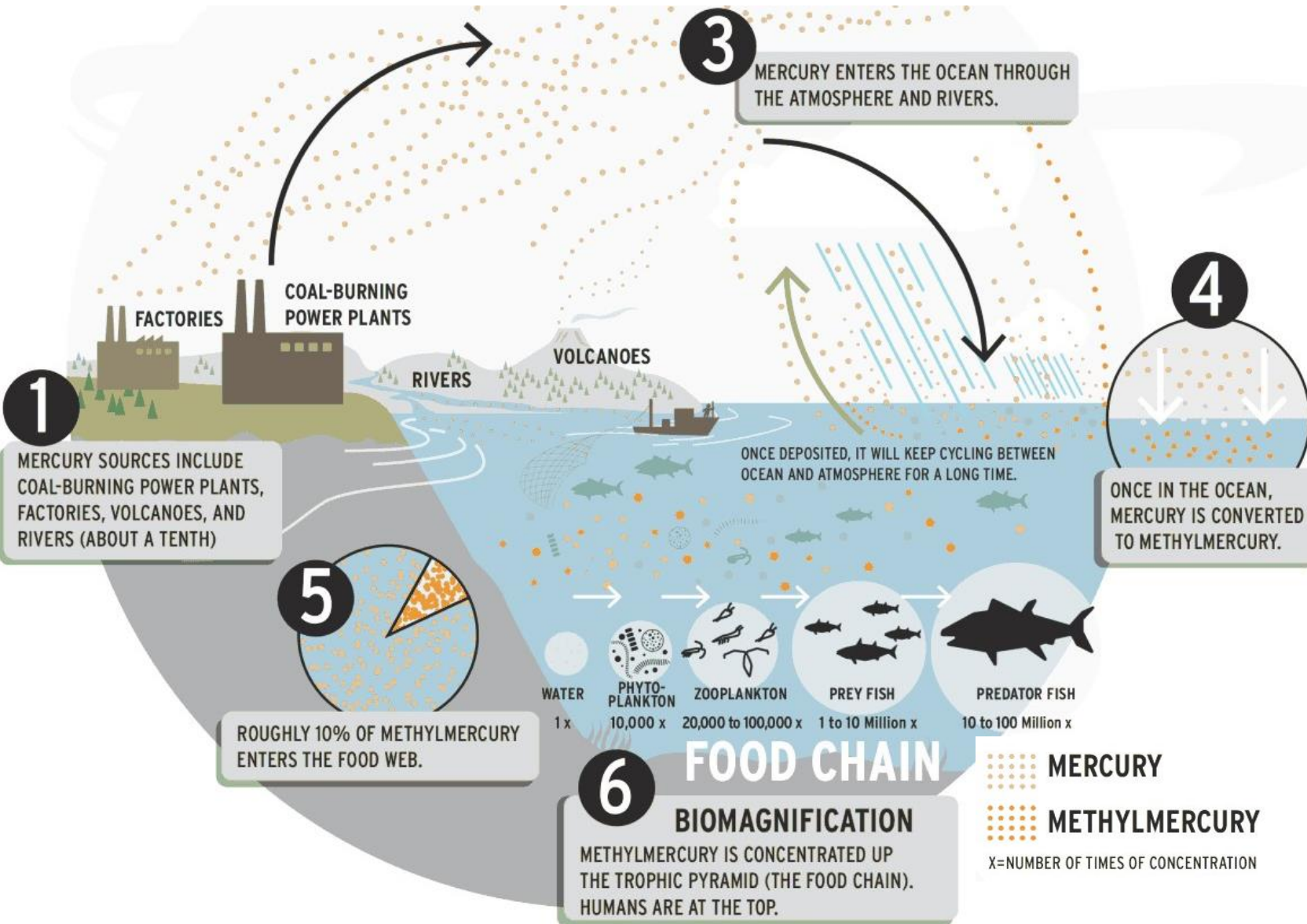


High anthropogenic enrichment in Earth's surface reservoirs

Global Mercury Assessment, 2019

Mercury (Hg): a global pollutant

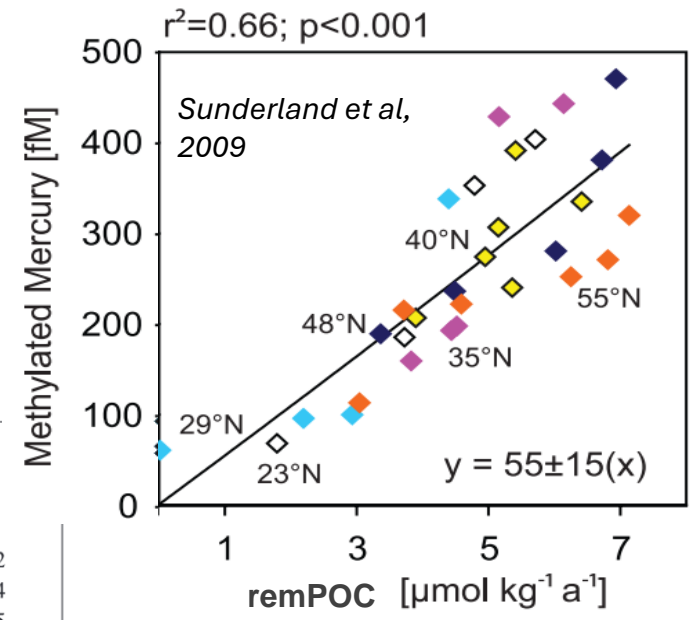
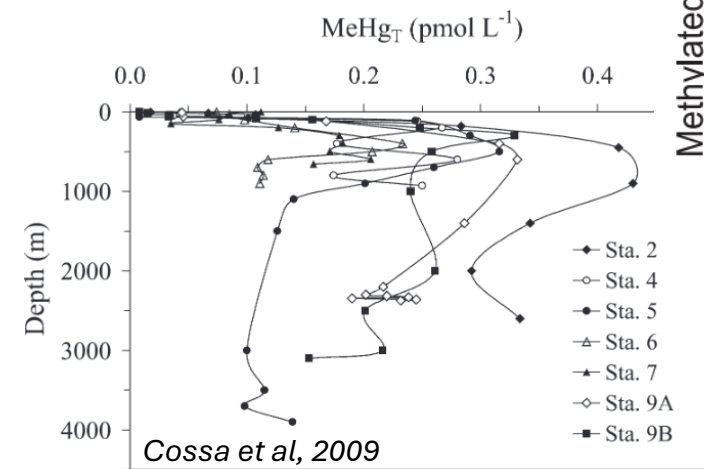
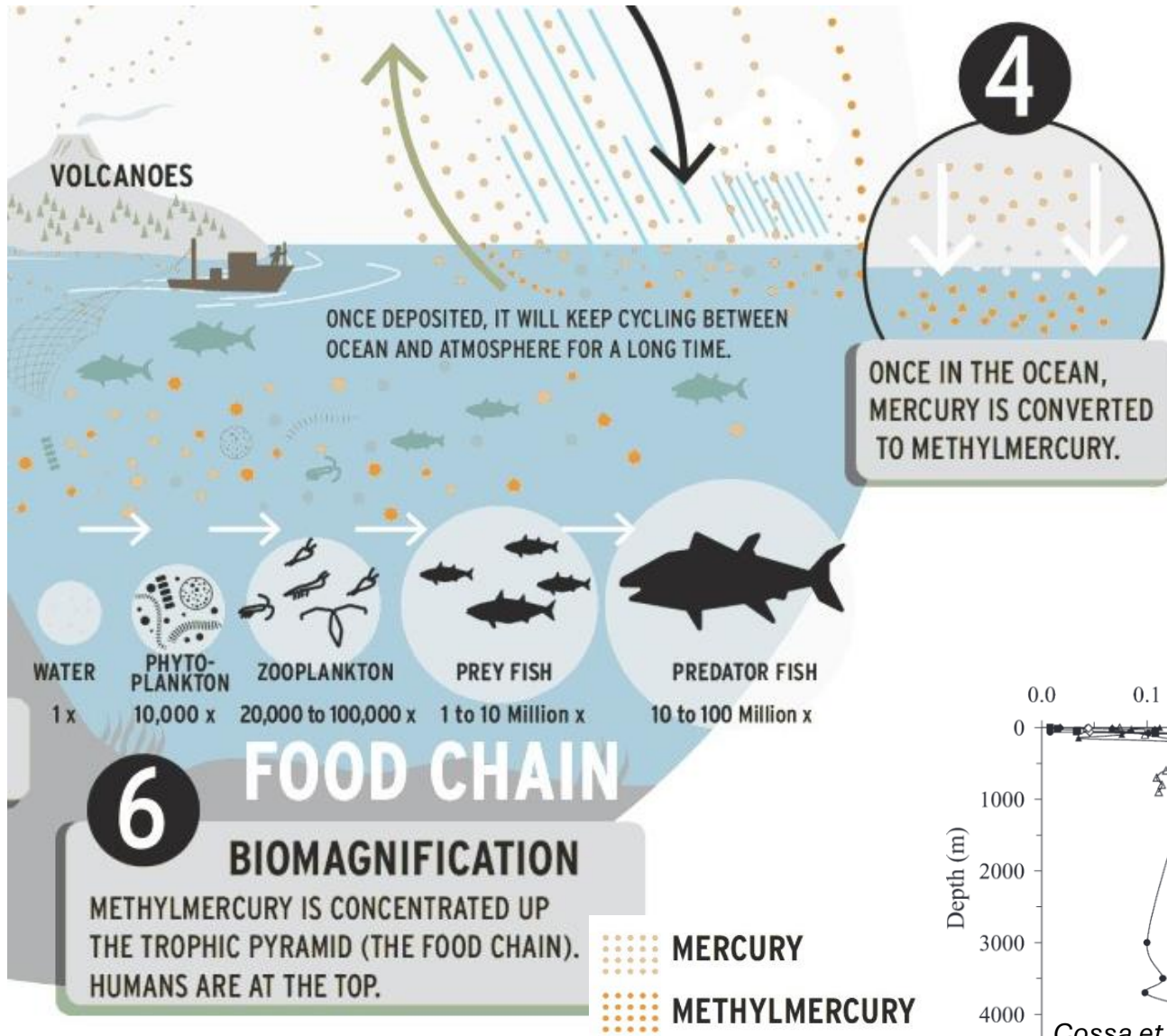
The **Ocean** has absorbed **50%** of Hg historical emissions



Mercury (Hg): a global pollutant

The Ocean has absorbed 50% of Hg historical emissions

Microbial transformation of Hg to **MeHg - methylmercury**, linked to **OM oxidation**



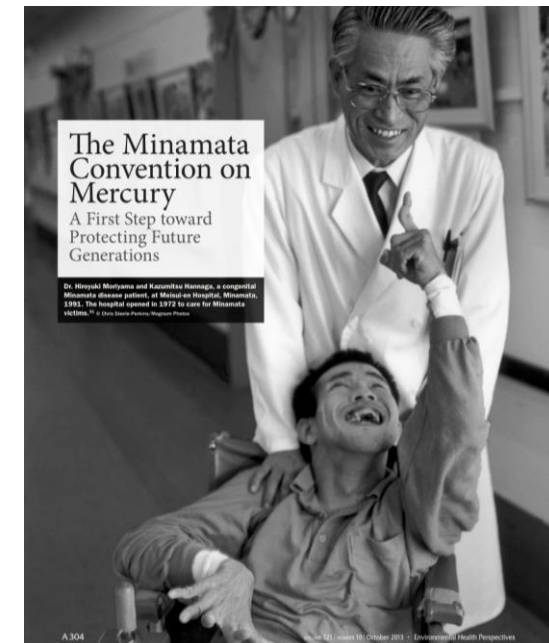
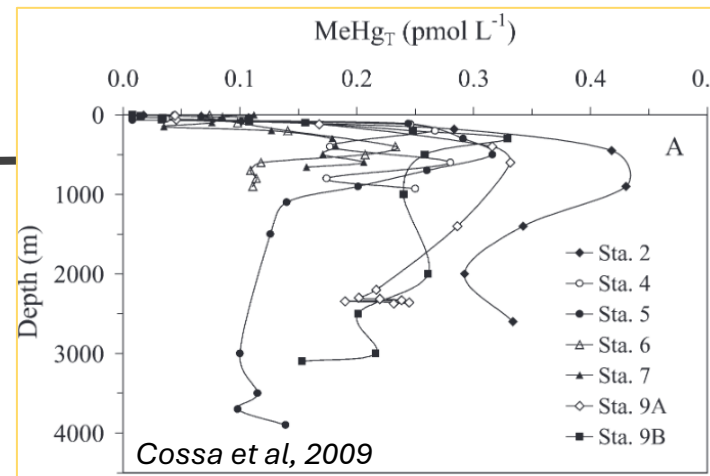
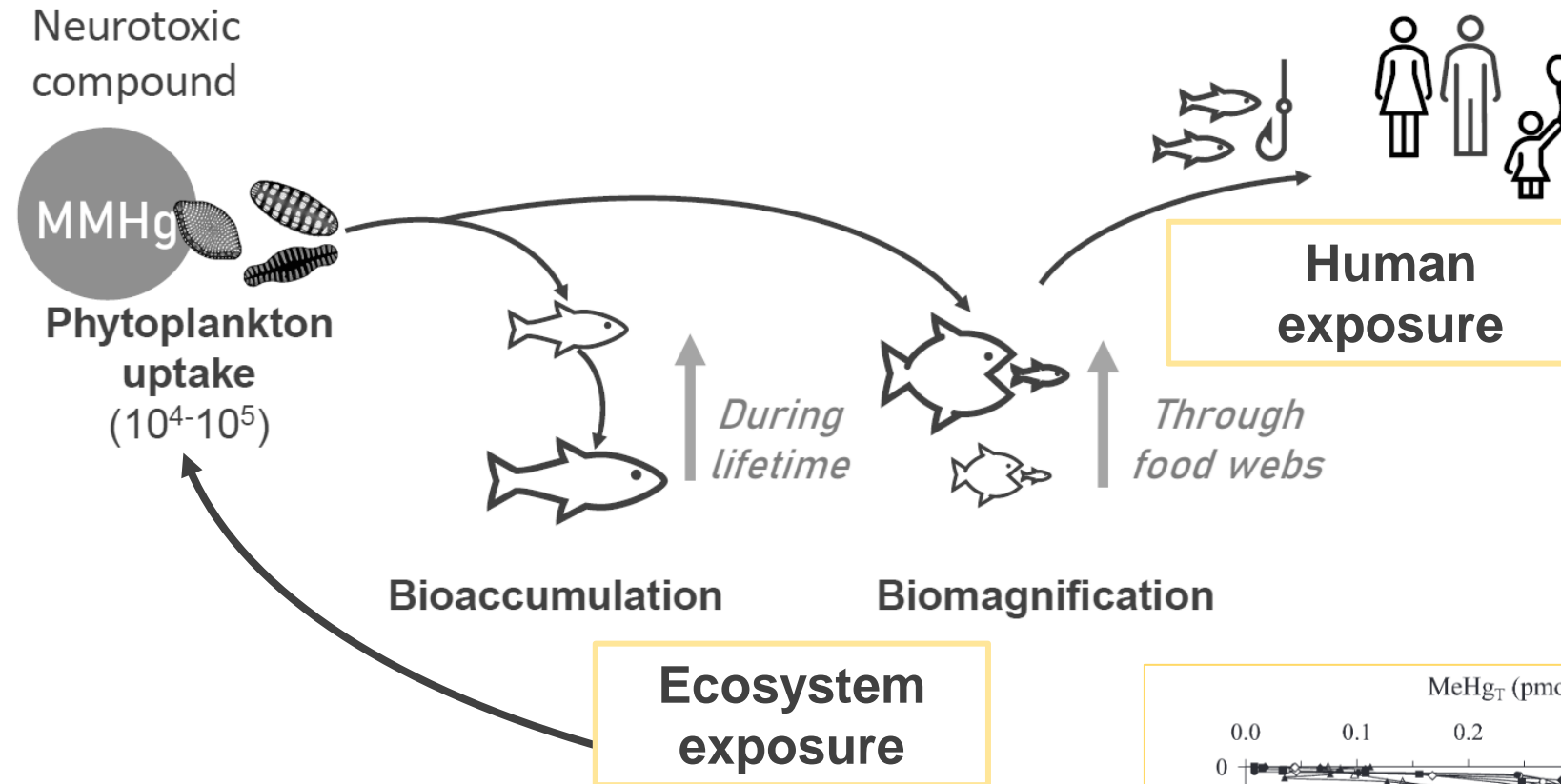
www.harvardmagazine.com

Mercury (Hg): a global pollutant

The Ocean has absorbed 50% of Hg historical emissions

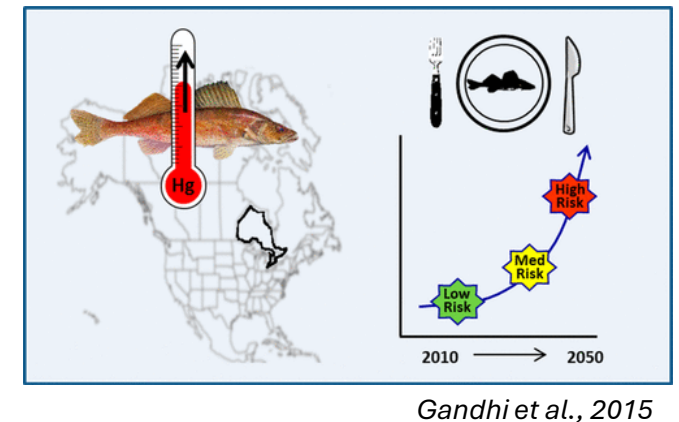
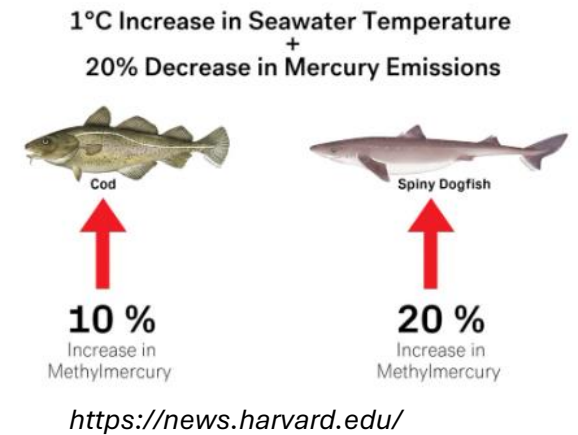
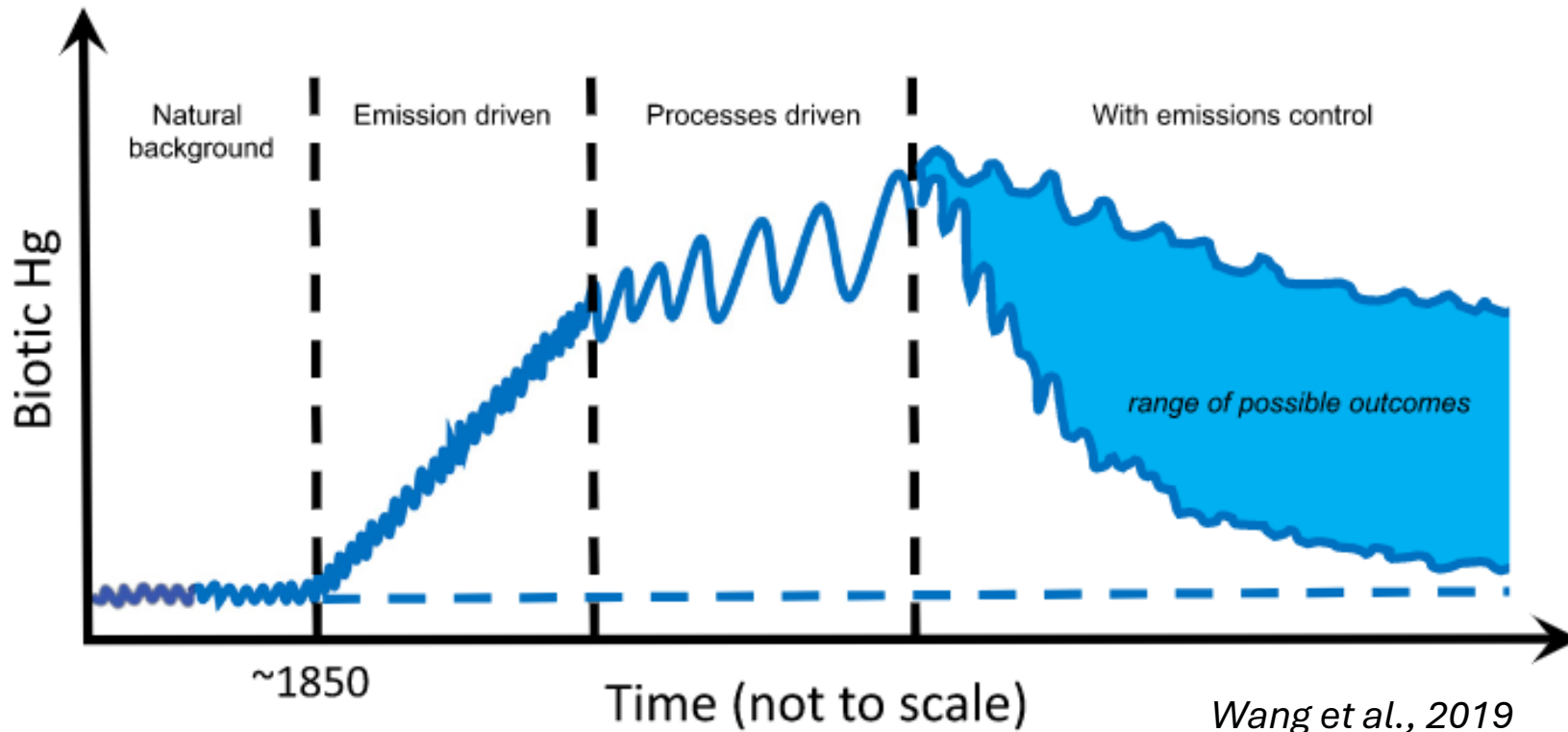
Microbial transformation of Hg to MeHg - methylmercury, linked to OM respiration

Bioaccumulation and biomagnification in food webs

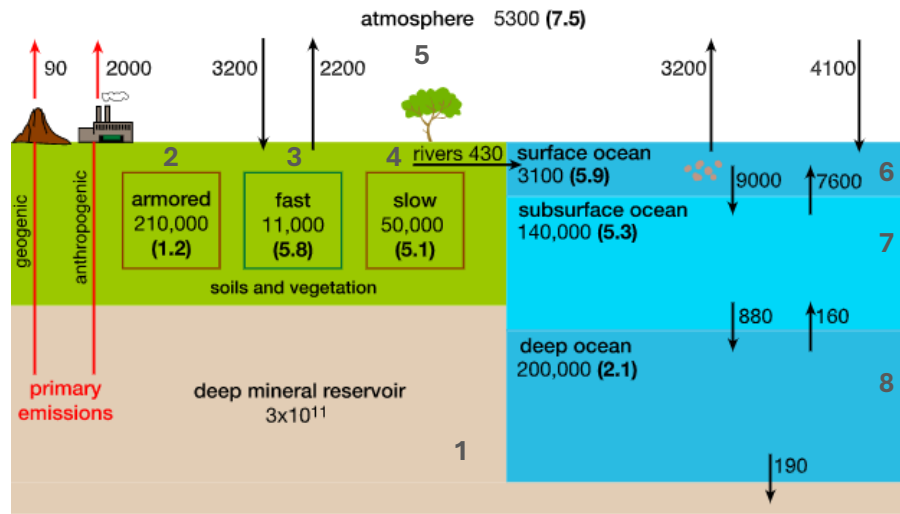


Mercury (Hg): a global pollutant

How will changes in Hg emissions and climate affect ocean ecosystems?

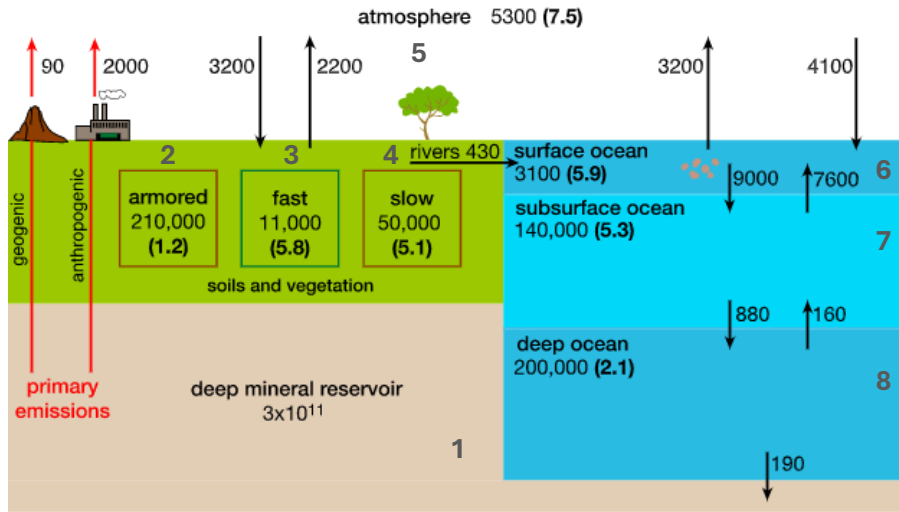


Mercury modelling: state of the art



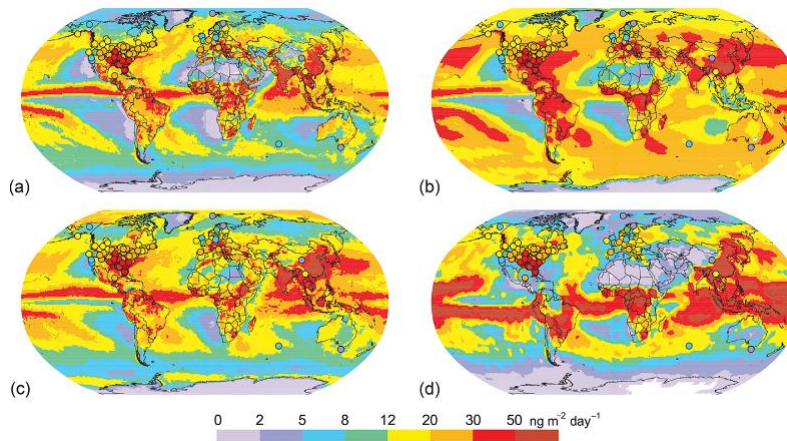
Global Earth System Model: 8 boxes
(Amos et al., 2013, 2014, 2015)

Mercury modelling: state of the art

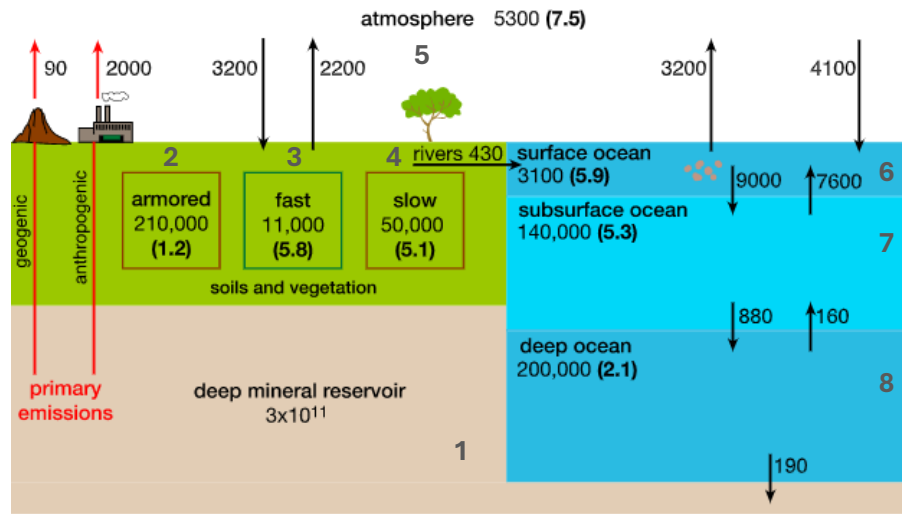


Global Earth System Model: 8 boxes
(Amos et al., 2013, 2014, 2015)

Ensamble of Global Atmospheric Models: 2.5° - 1°
(Travnikov et al., 2009, Jung et al., 2009, Holmes et al., 2010, Durnford et al., 2012)

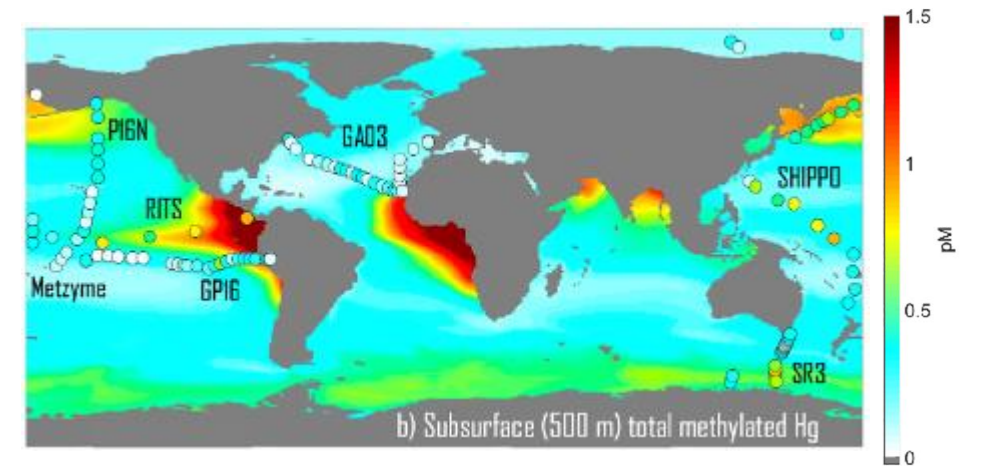
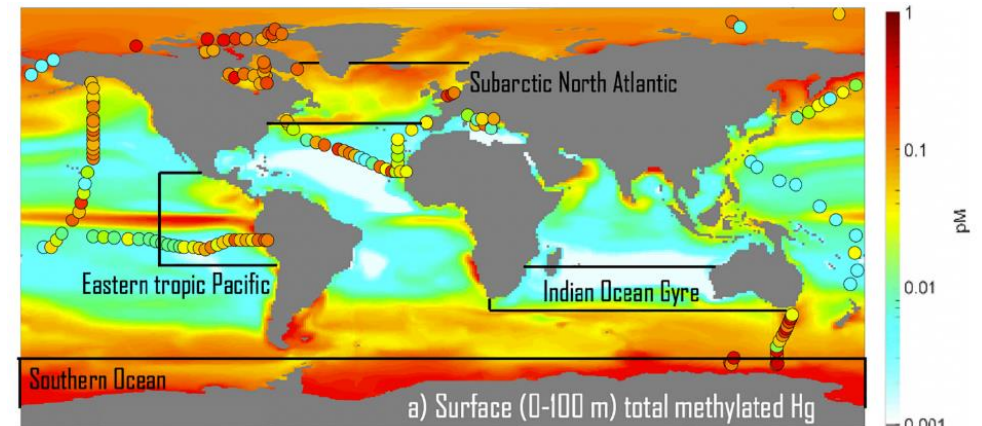
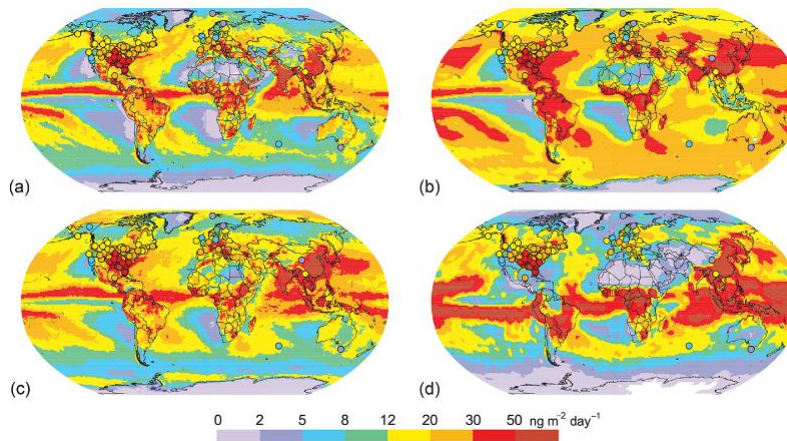


Mercury modelling: state of the art



Global Earth System Model: 8 boxes
(Amos et al., 2013, 2014, 2015)

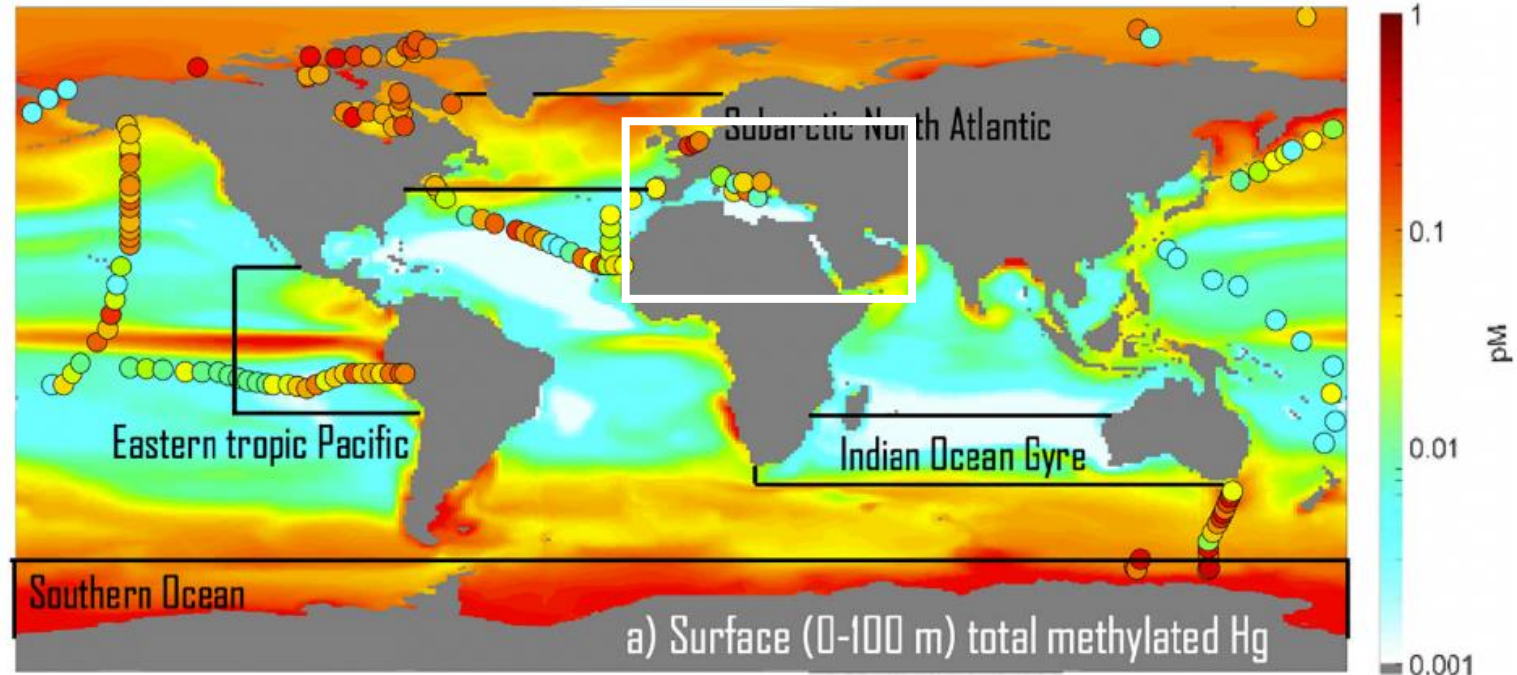
Ensamble of Global Atmospheric Models: 2.5° - 1°
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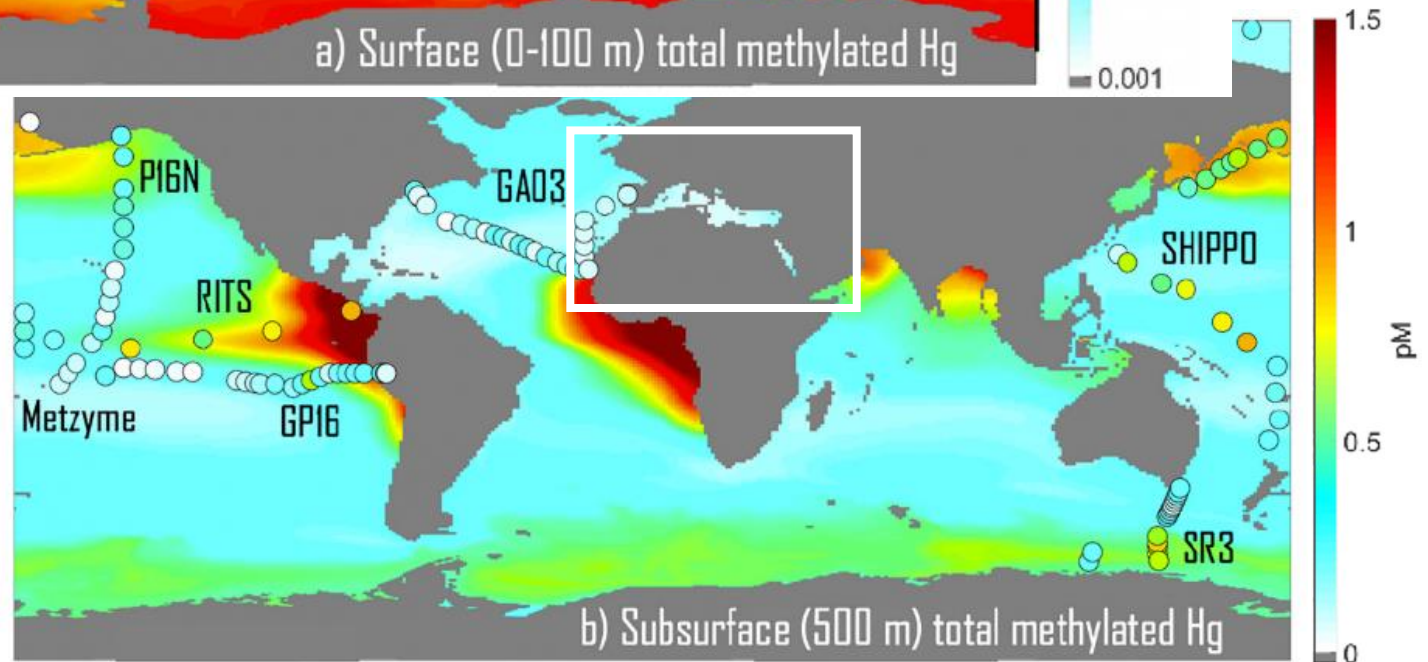
Global Ocean Model: 1° - 1/5°
(Zhang et al., 2014, 2020, 2023)

Mercury modelling: state of the art

Mediterranean Sea
SURFACE:
<0.01 pM



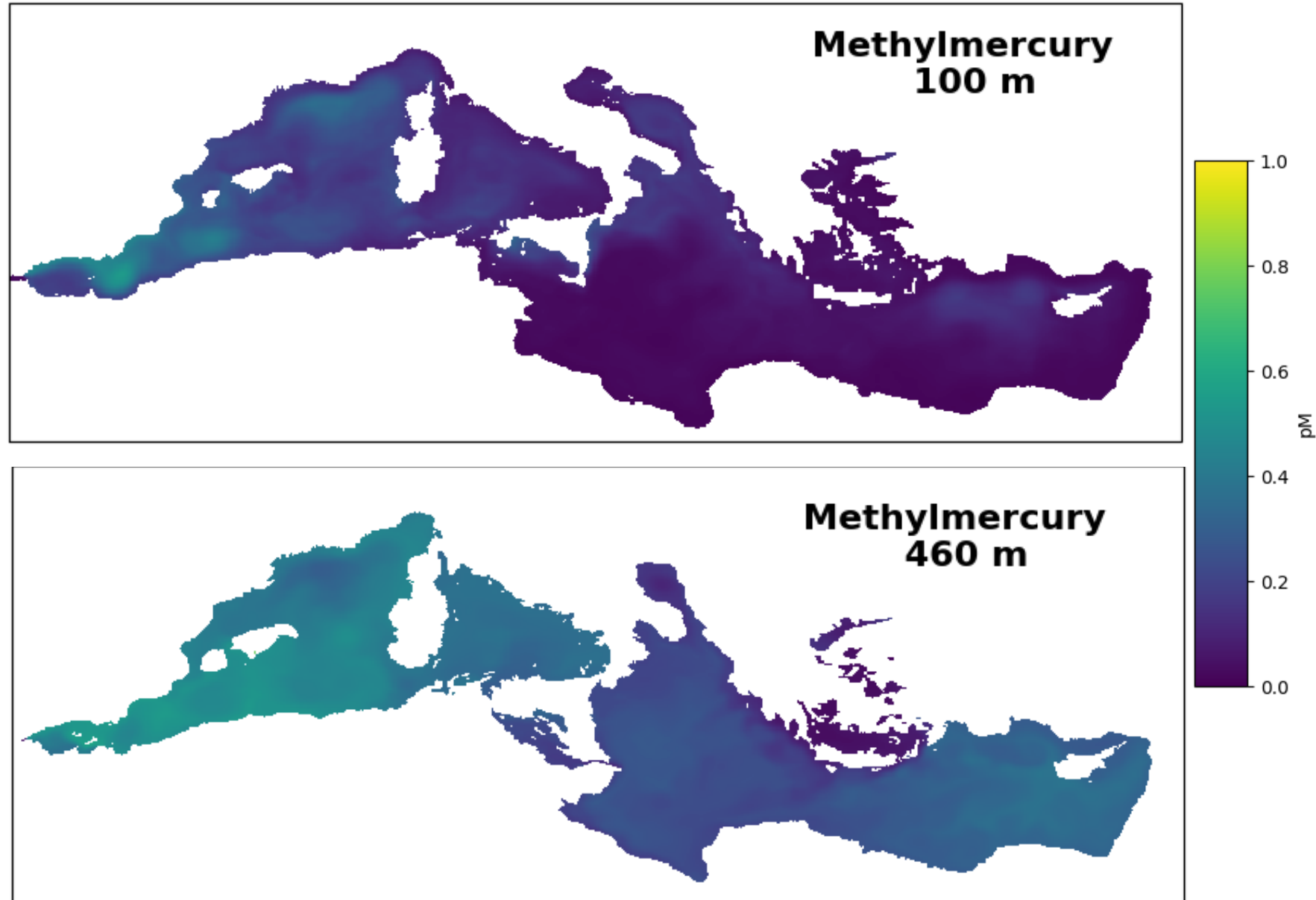
Mediterranean Sea
SUBSURFACE:
<0.5 pM



Global Ocean Model: 1°
(Zhang et al., 2020)

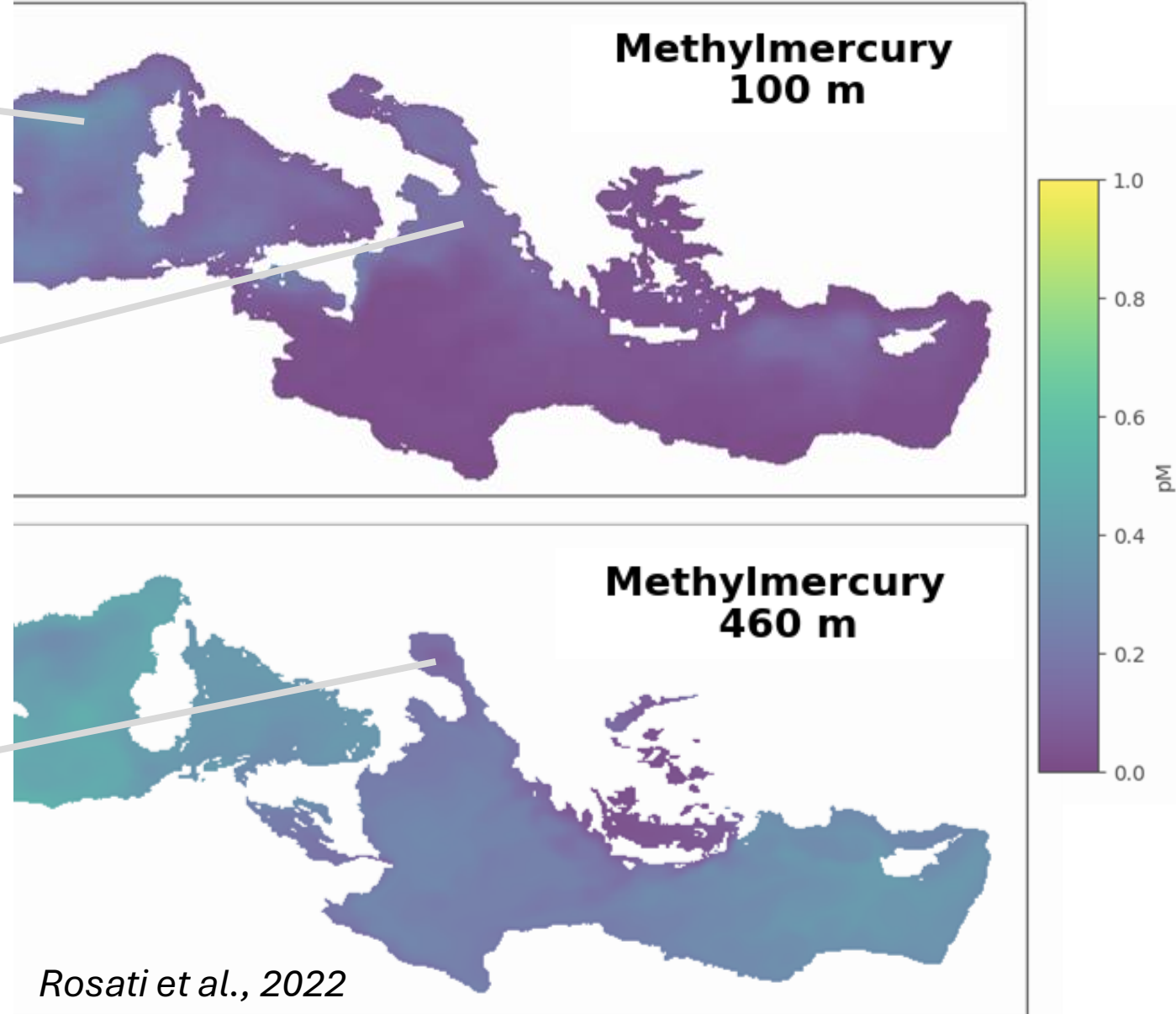
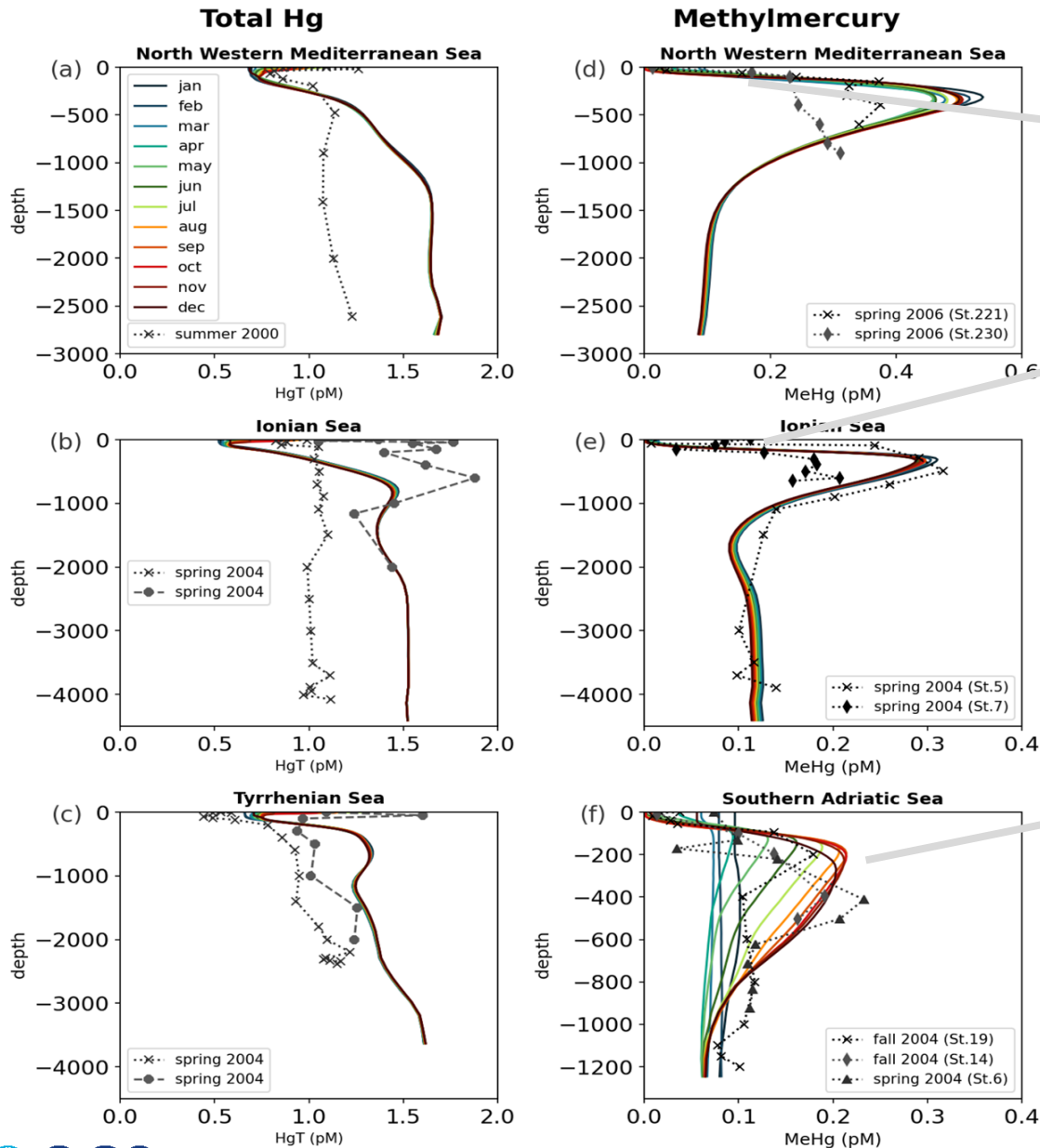
Mercury modelling: state of the art

Let's go
REGIONAL!



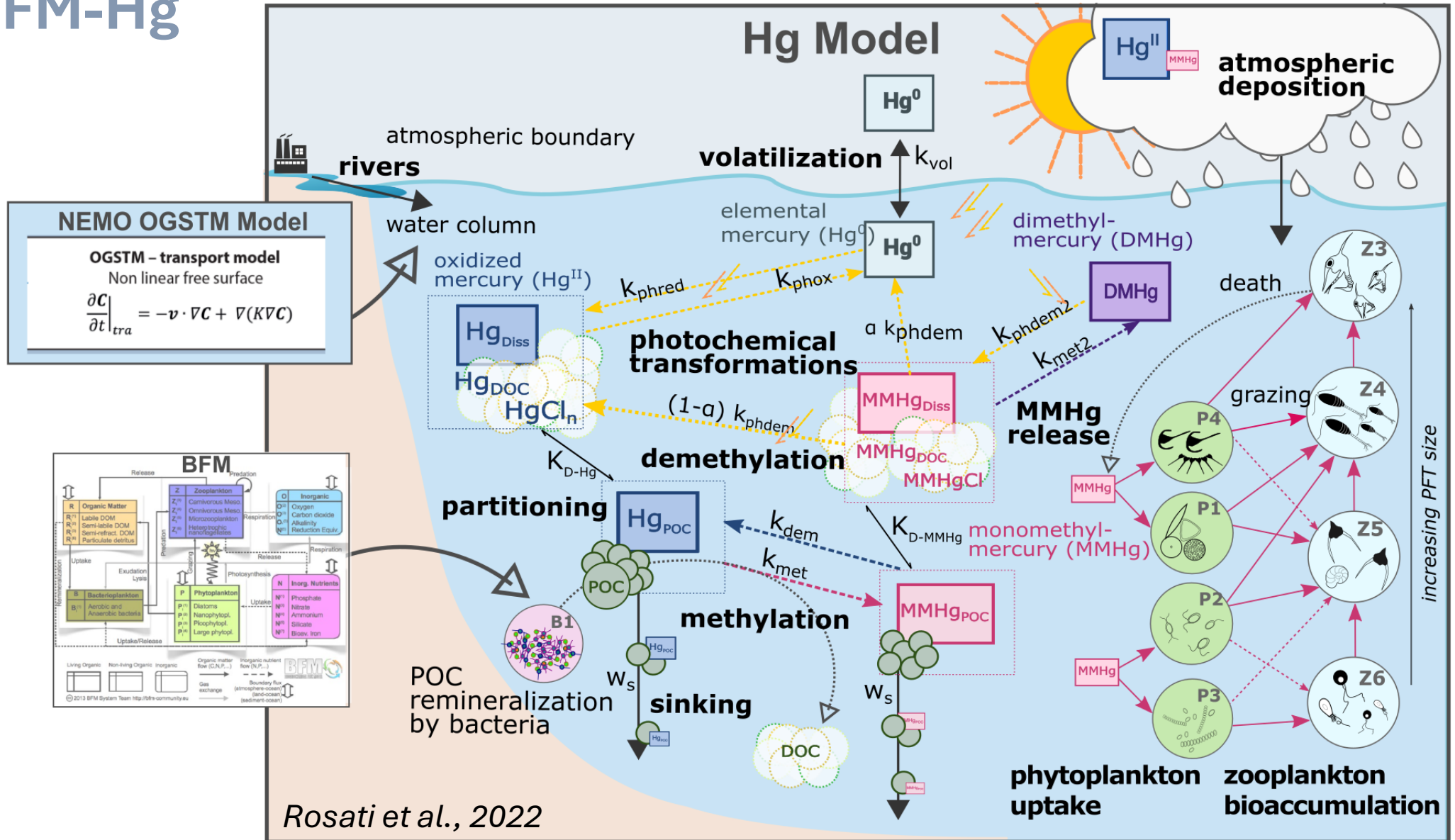
Regional Model: 1/16°
(Rosati et al., 2022)

Mercury modelling: state of the art

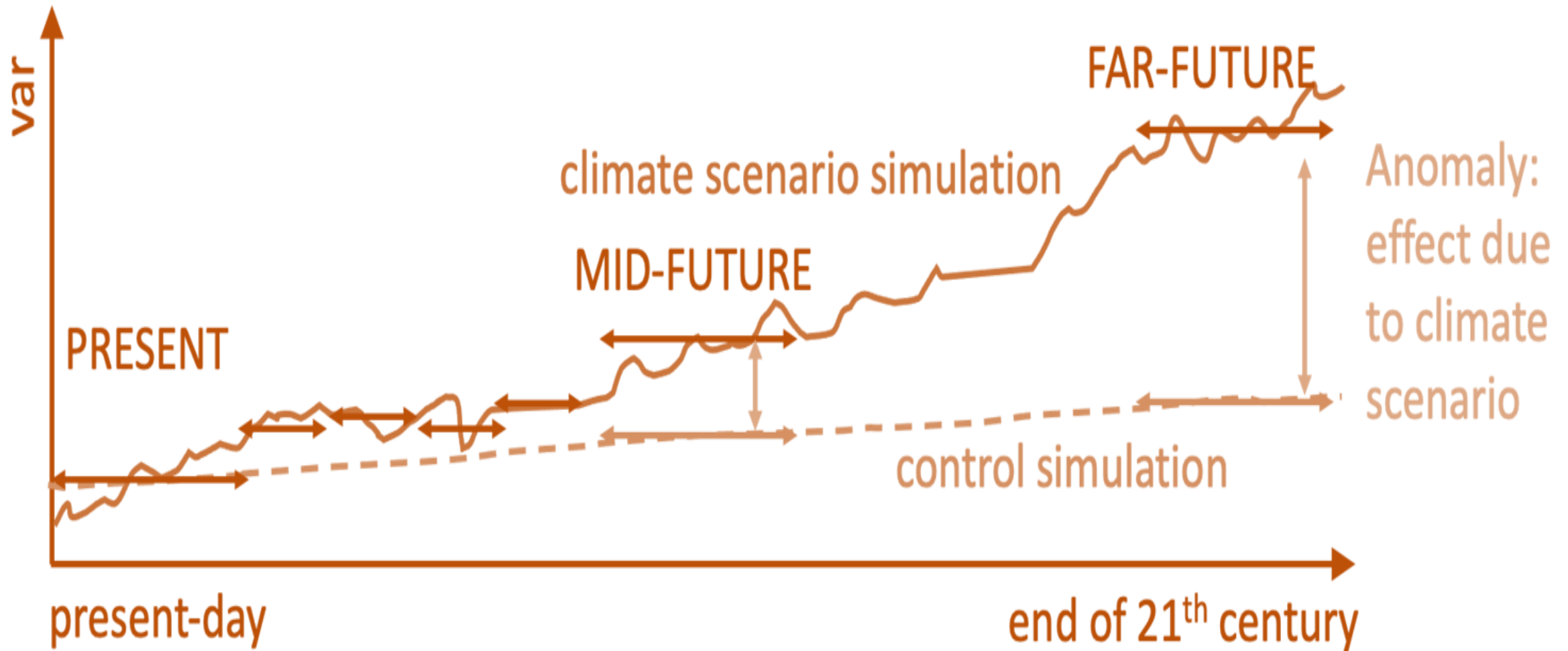


Rosati et al., 2022

Coupled transport biogeochemical model OGSTM-BFM-Hg

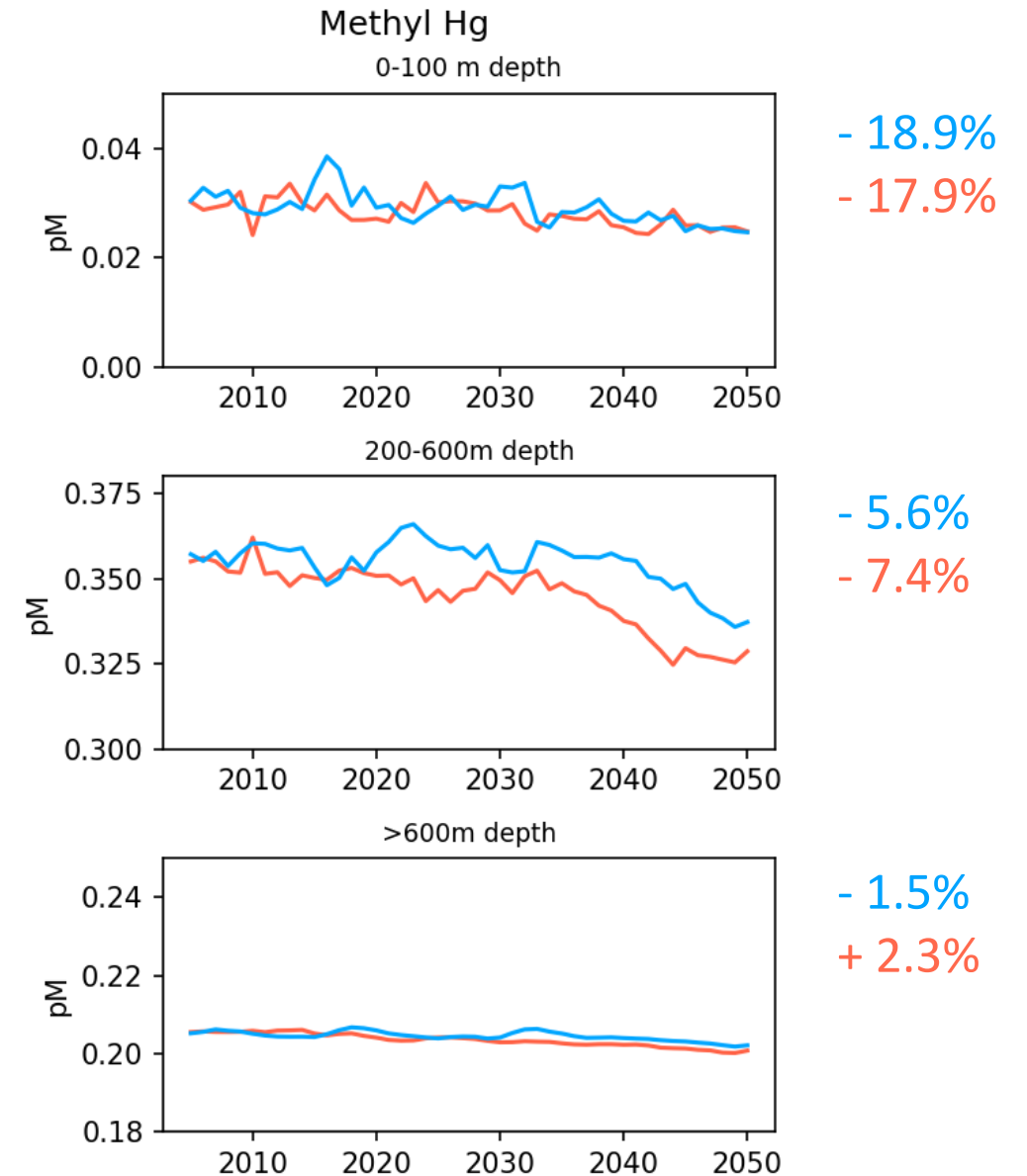
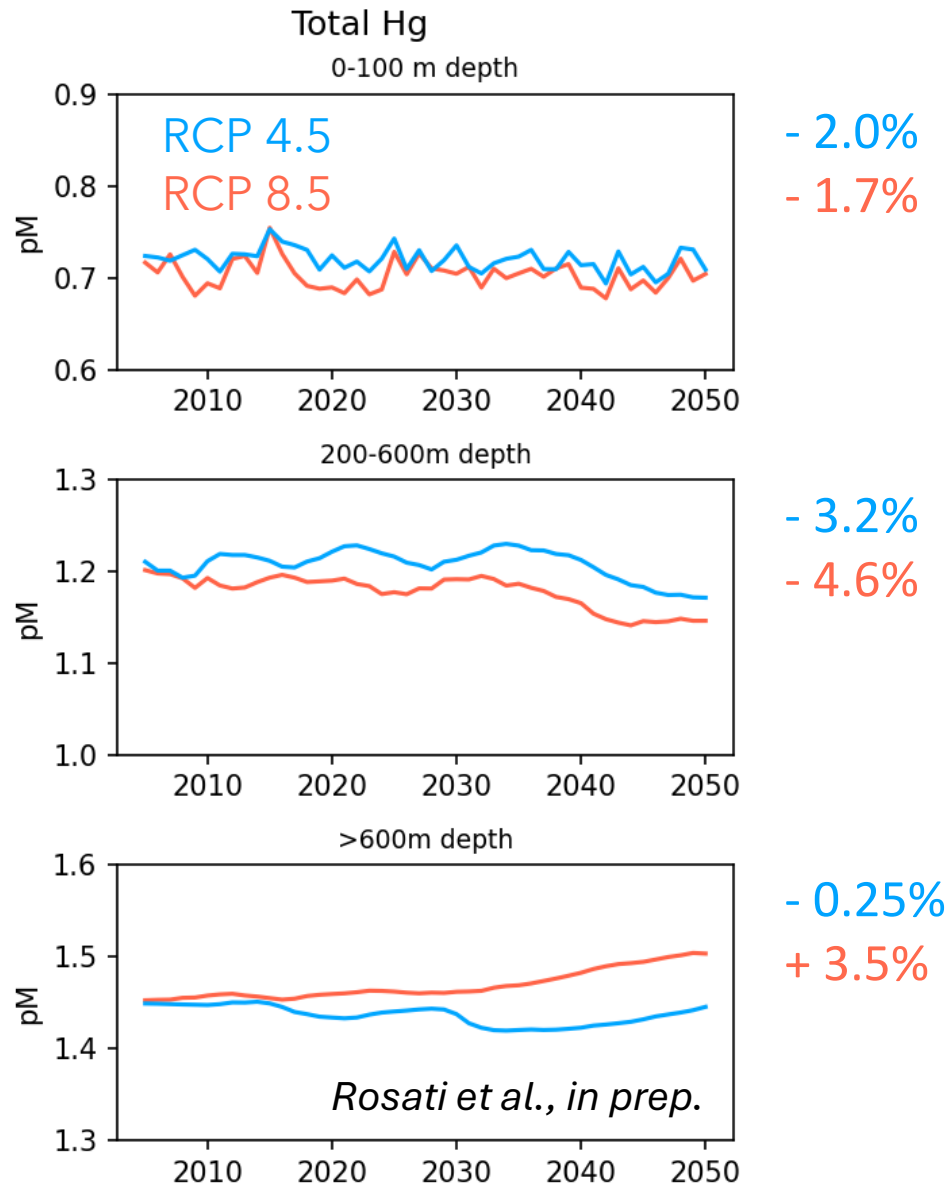


Climate scenarios: simulations protocol



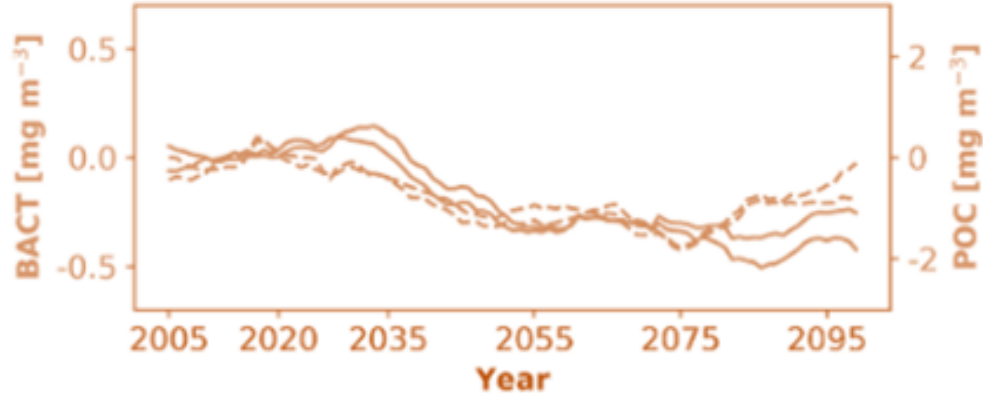
Reale et al., 2022
Solidoro et al., 2022

Projected evolution of Hg state variables

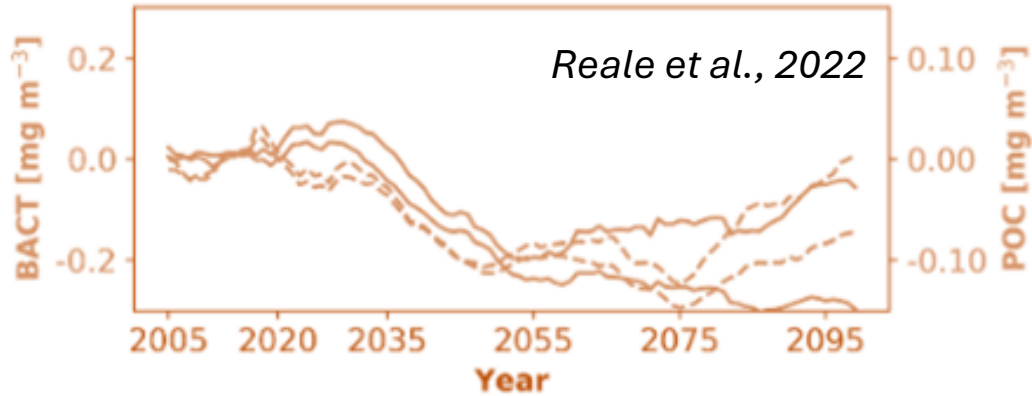


Projected evolution of Hg state variables

(a) MED 0-100 m

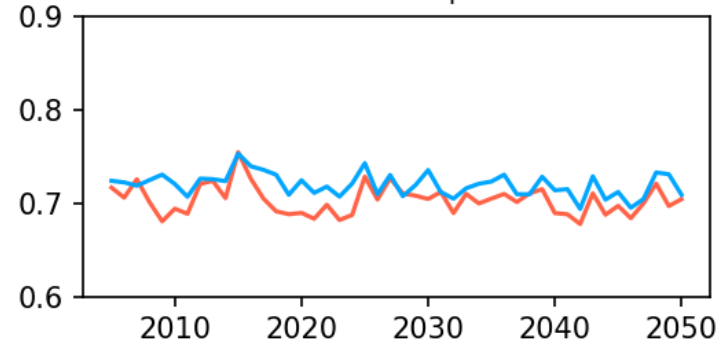


(b) MED 200-600 m

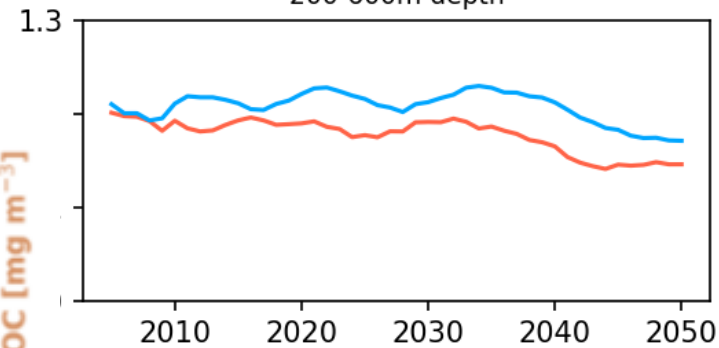


Total Hg

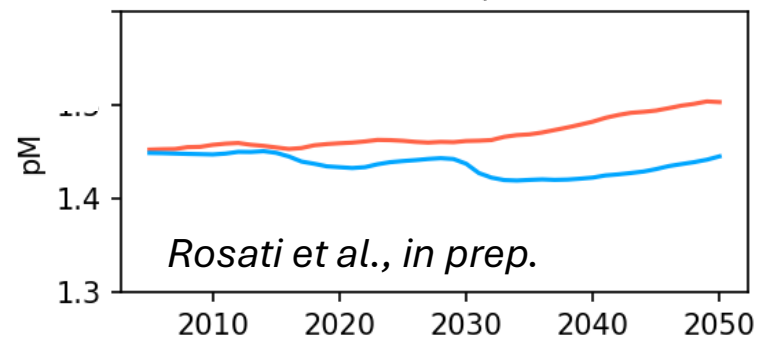
0-100 m depth



200-600m depth

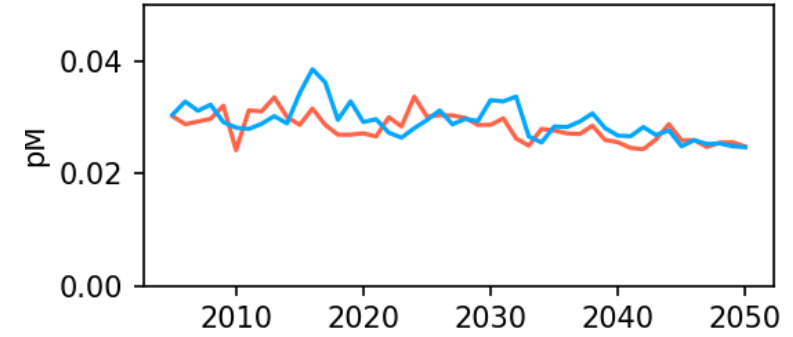


>600m depth

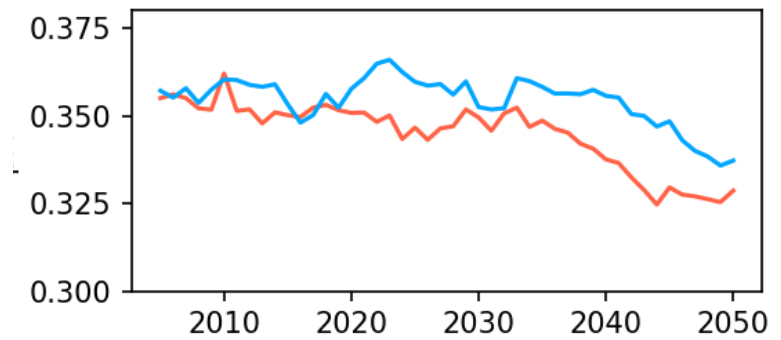


Methyl Hg

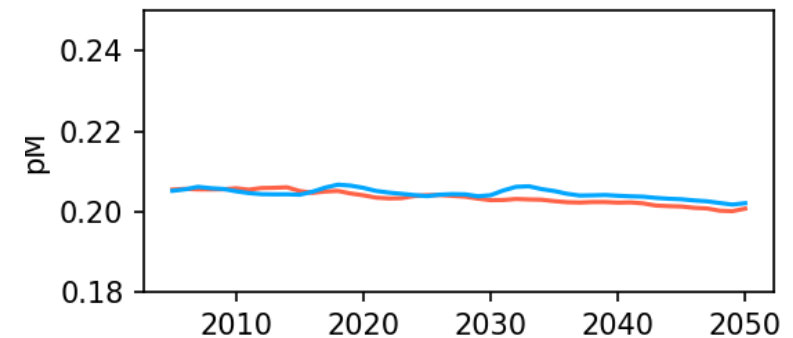
0-100 m depth



200-600m depth



>600m depth





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Contacts:



grosati@ogs.it



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***Thank you for
listening!***

WCRP

CORDEX

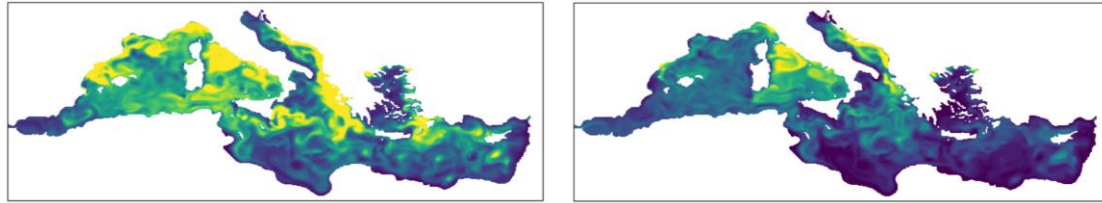
Coordinated Regional Climate Downscaling Experiment

Results – Present dynamics

MMHg in phytoplankton

MMHg in zooplankton

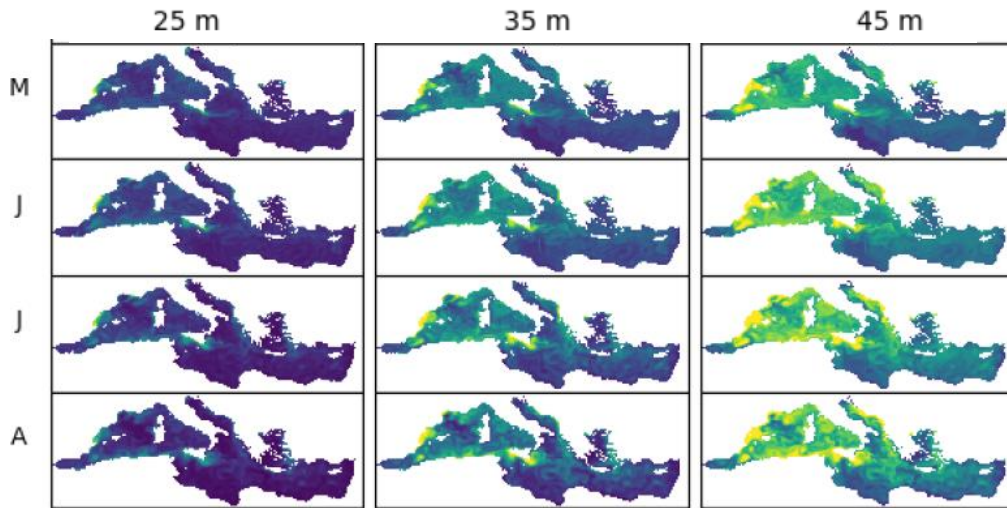
July, 35 m depth



July, 45 m depth



MMHg in water



MMHg in plankton is decoupled from the distribution of water MMHg

