

# mid-Proterozoic oxygen landscapes

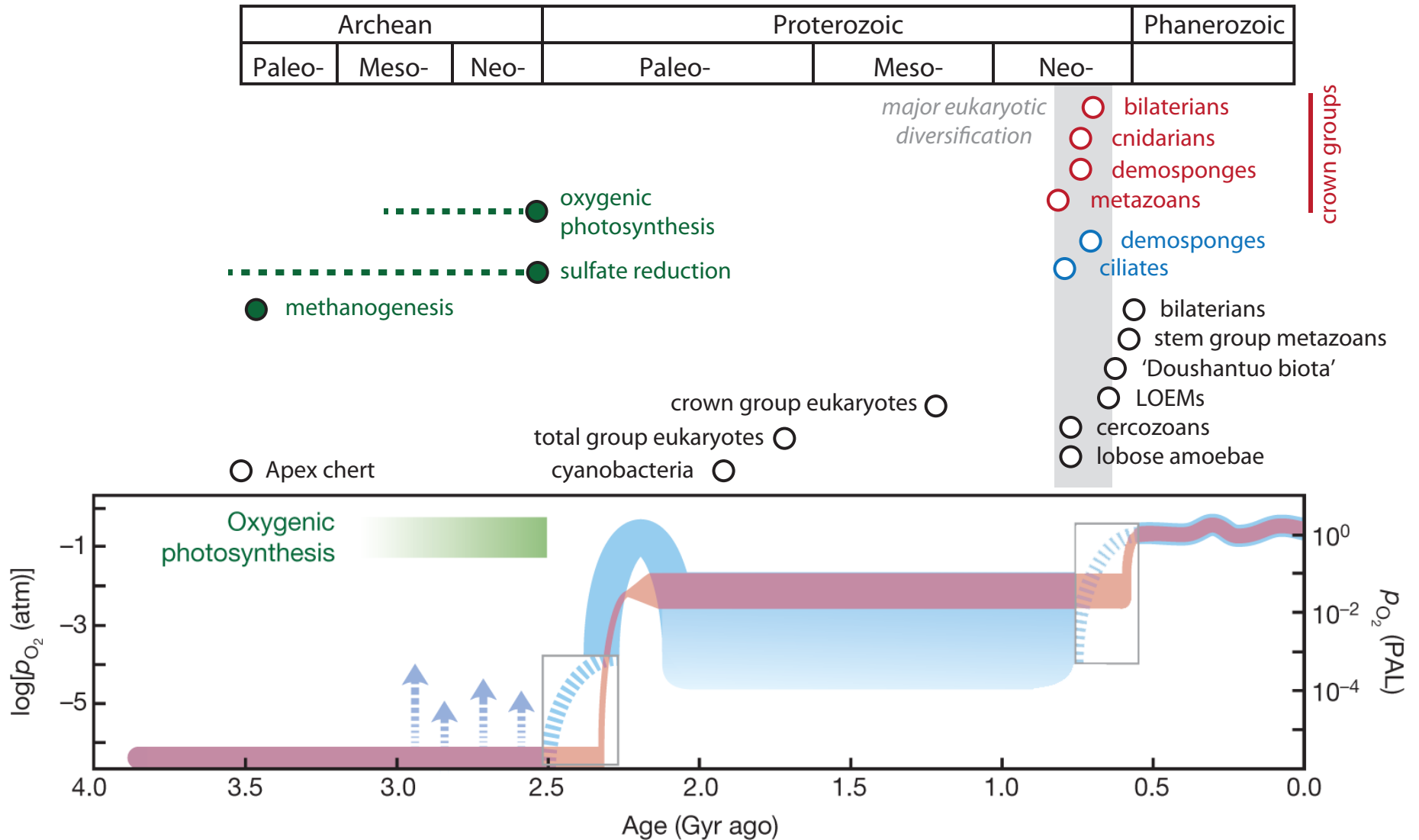
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Chris Reinhard

NASA Astrobiology Institute

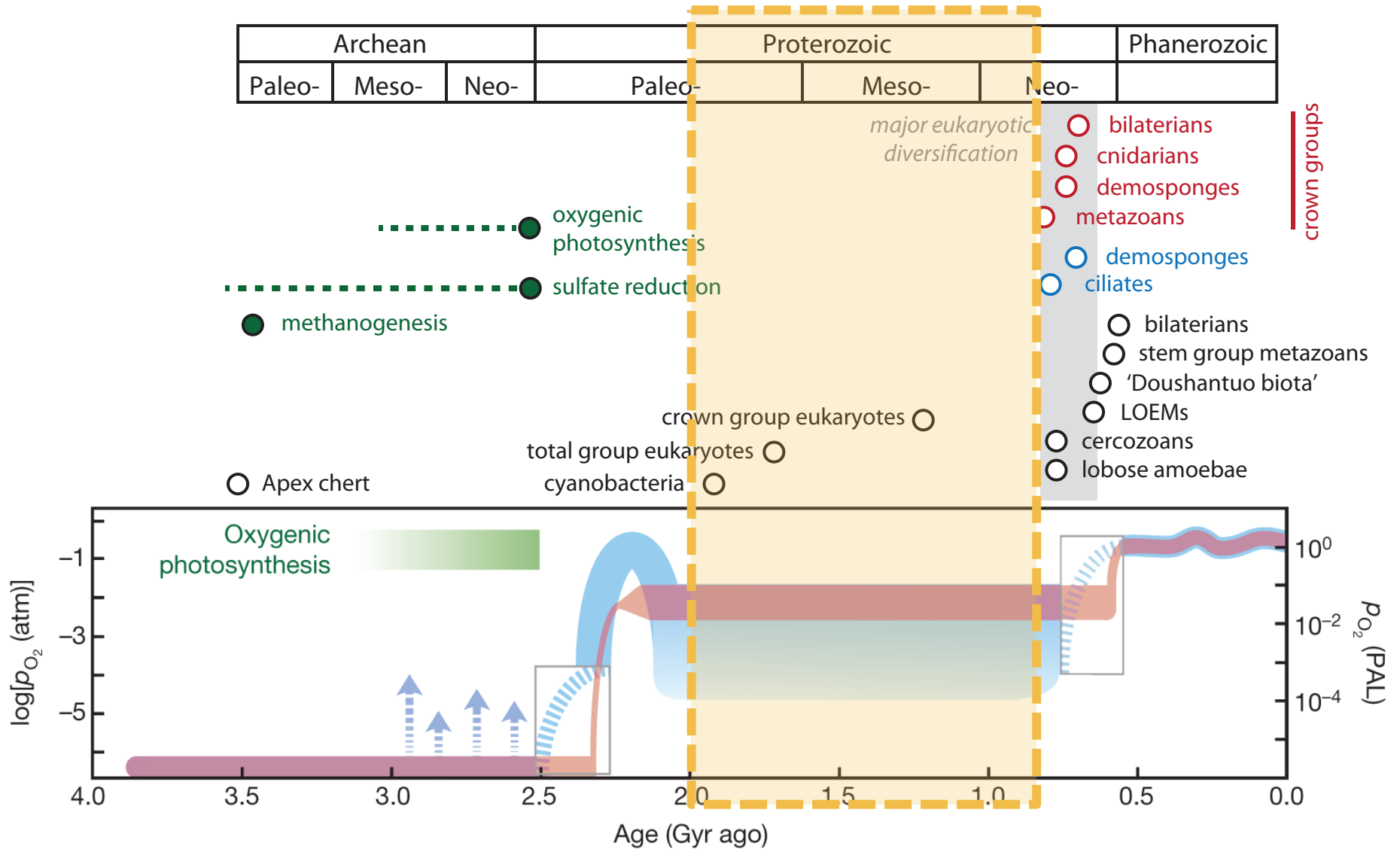
Earth & Atmospheric Sciences, Georgia Institute of Technology

# oxygen and the evolution of biological complexity



After Lyons et al. [2014]; Planavsky et al. [2014]

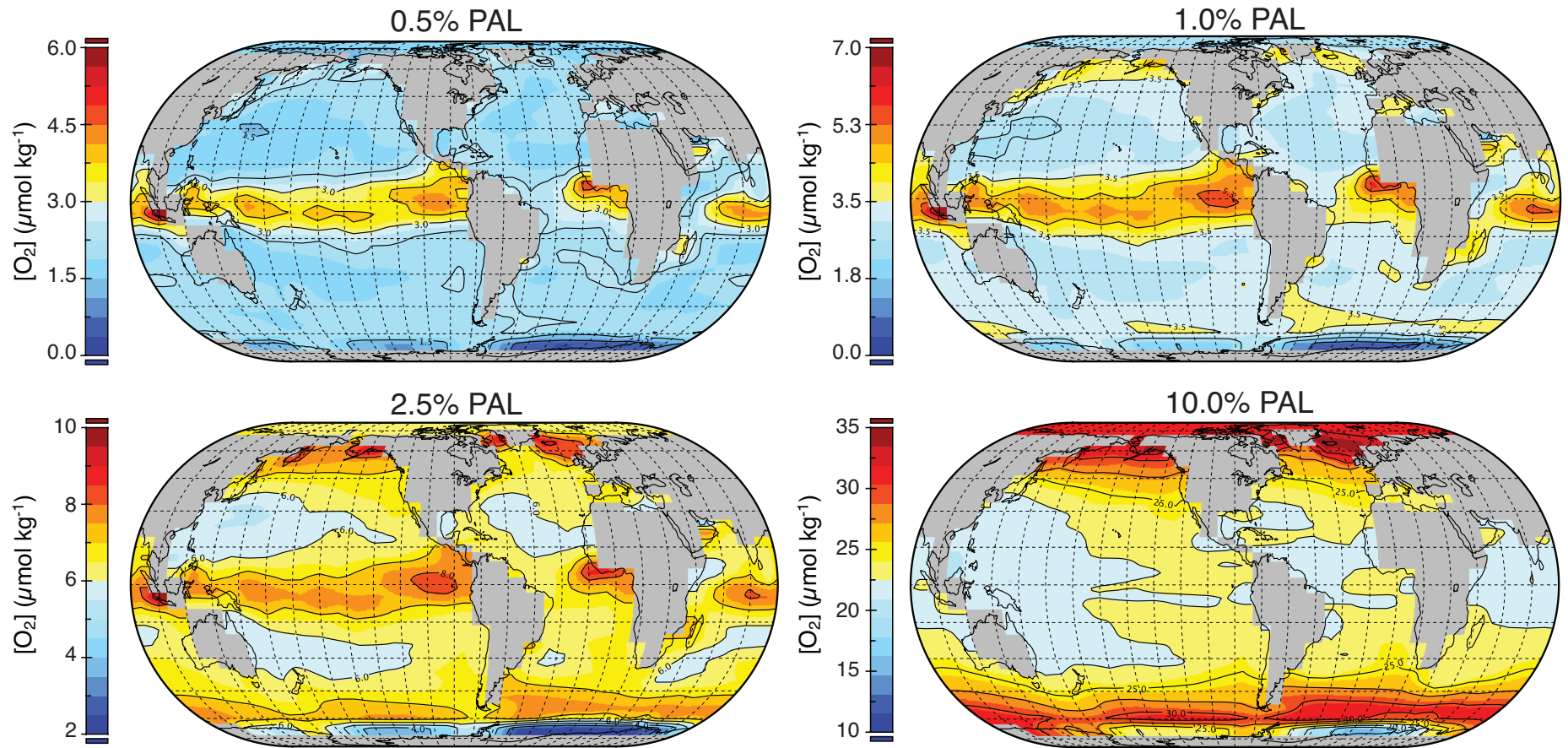
# oxygen and the evolution of biological complexity



After Lyons et al. [2014]; Planavsky et al. [2014]

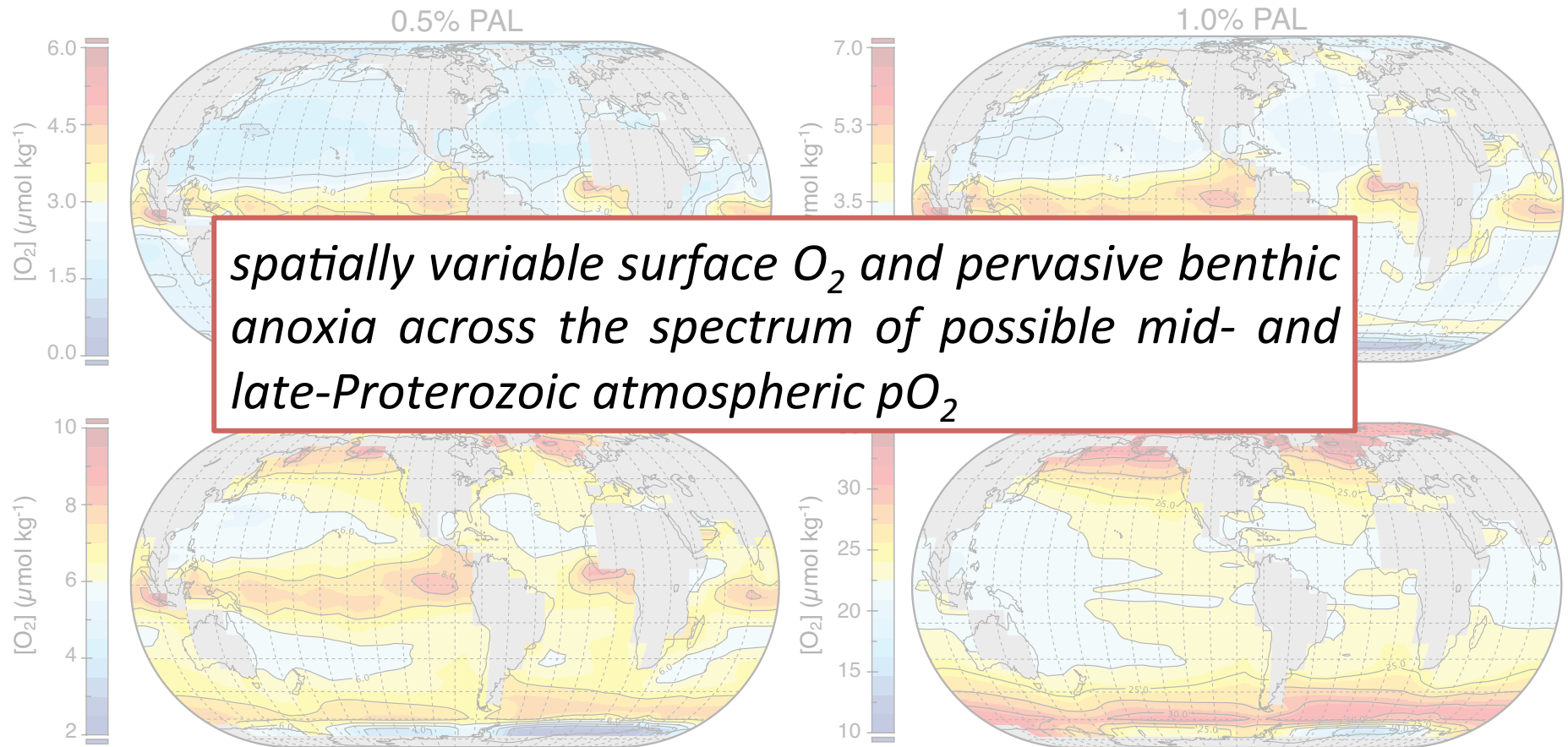
# ocean oxygen landscapes

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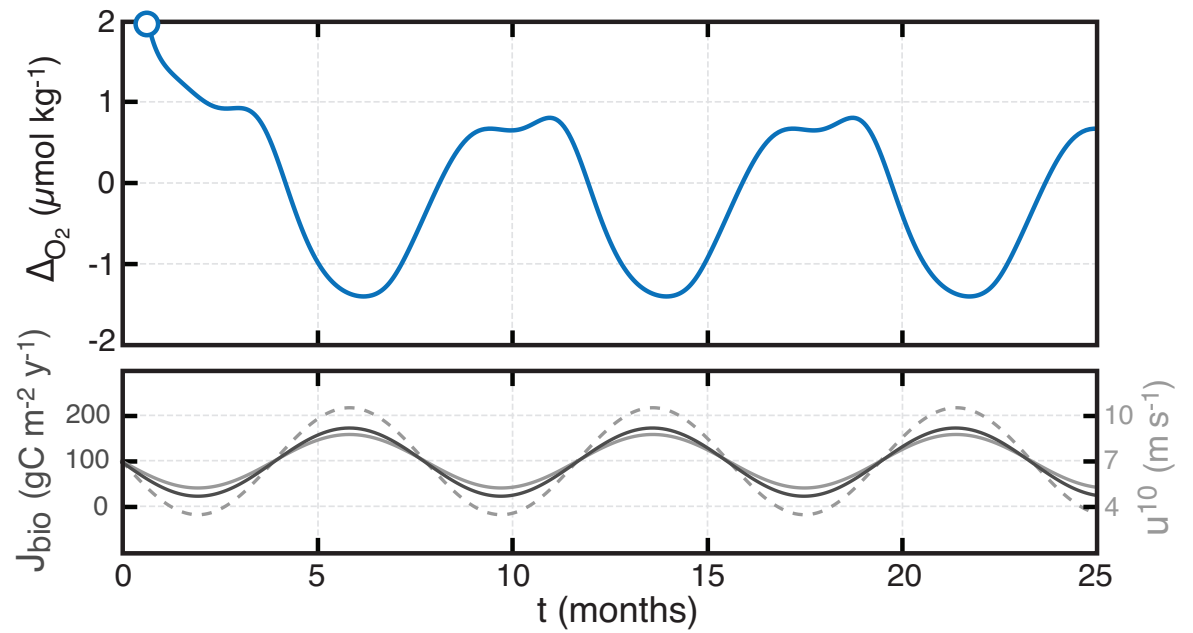
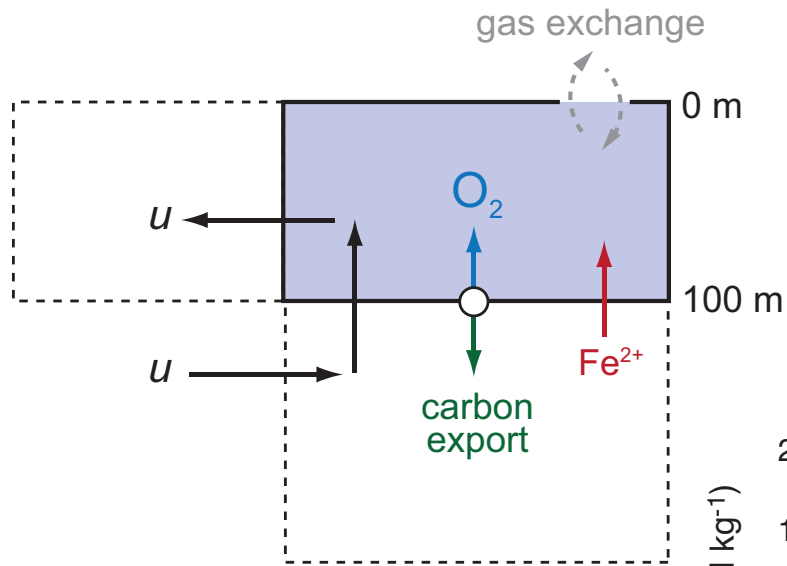
Reinhard et al. [In press]

# ocean oxygen landscapes



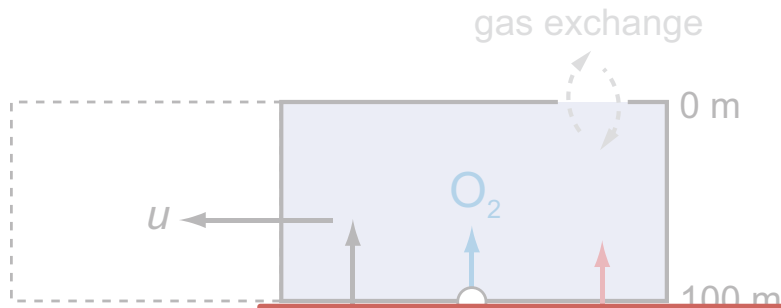
Reinhard et al. [In press]

# ocean oxygen landscapes

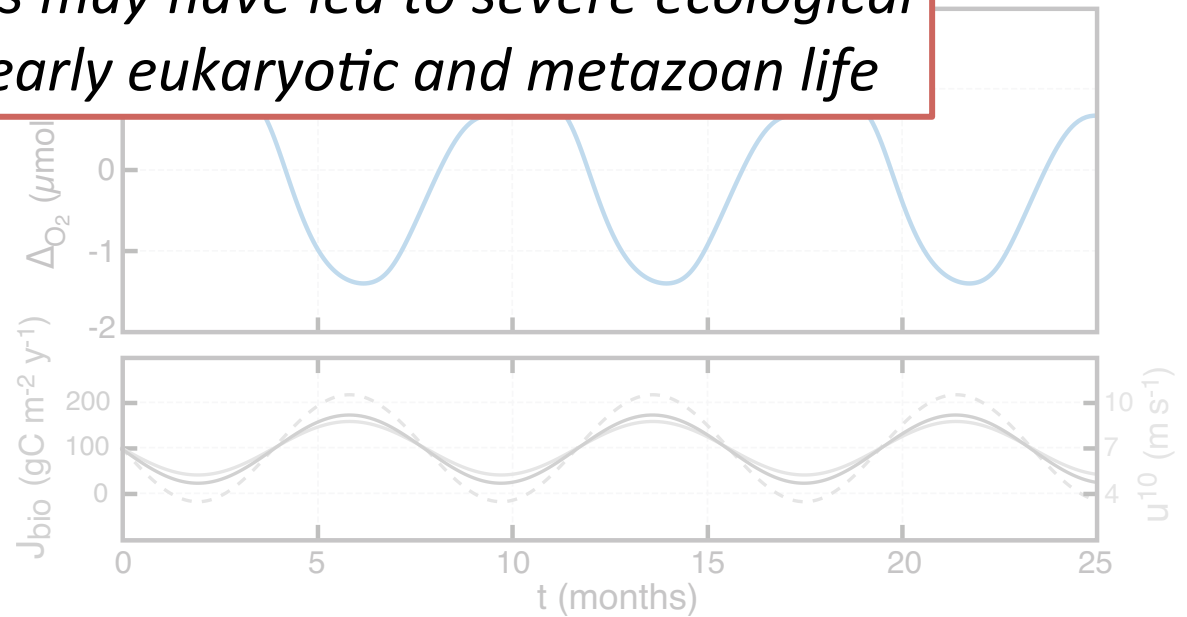


Reinhard et al. [In press]

# ocean oxygen landscapes



*temporally unstable (and spatially 'patchy') marine  $O_2$  levels may have led to severe ecological constraints on early eukaryotic and metazoan life*

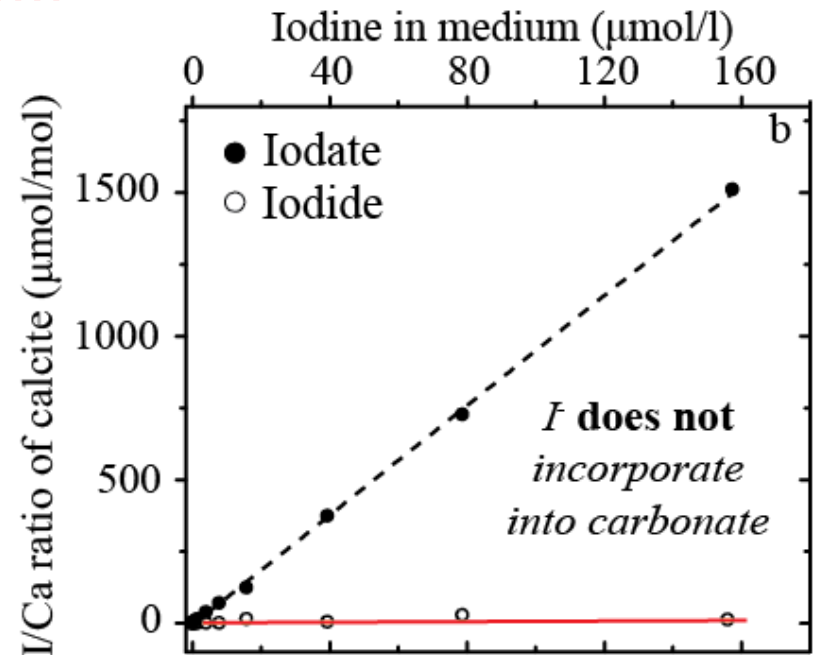
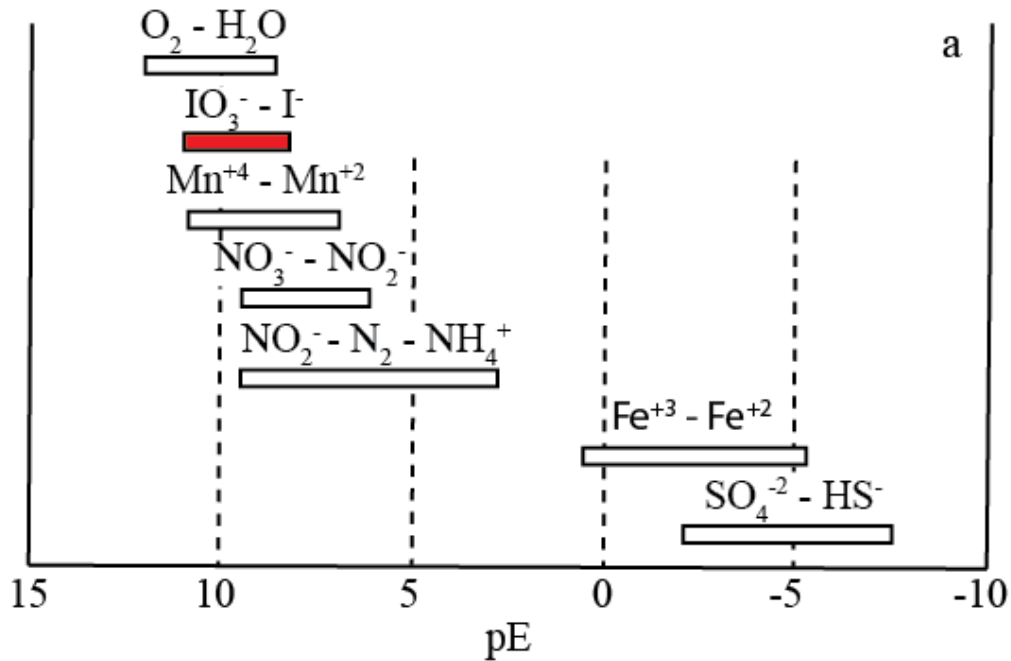


Reinhard et al. [In press]

# proxies for $O_2$ in the shallow ocean: iodine

iodide ( $I^-$ )  $\rightarrow$  iodate ( $IO_3^-$ )

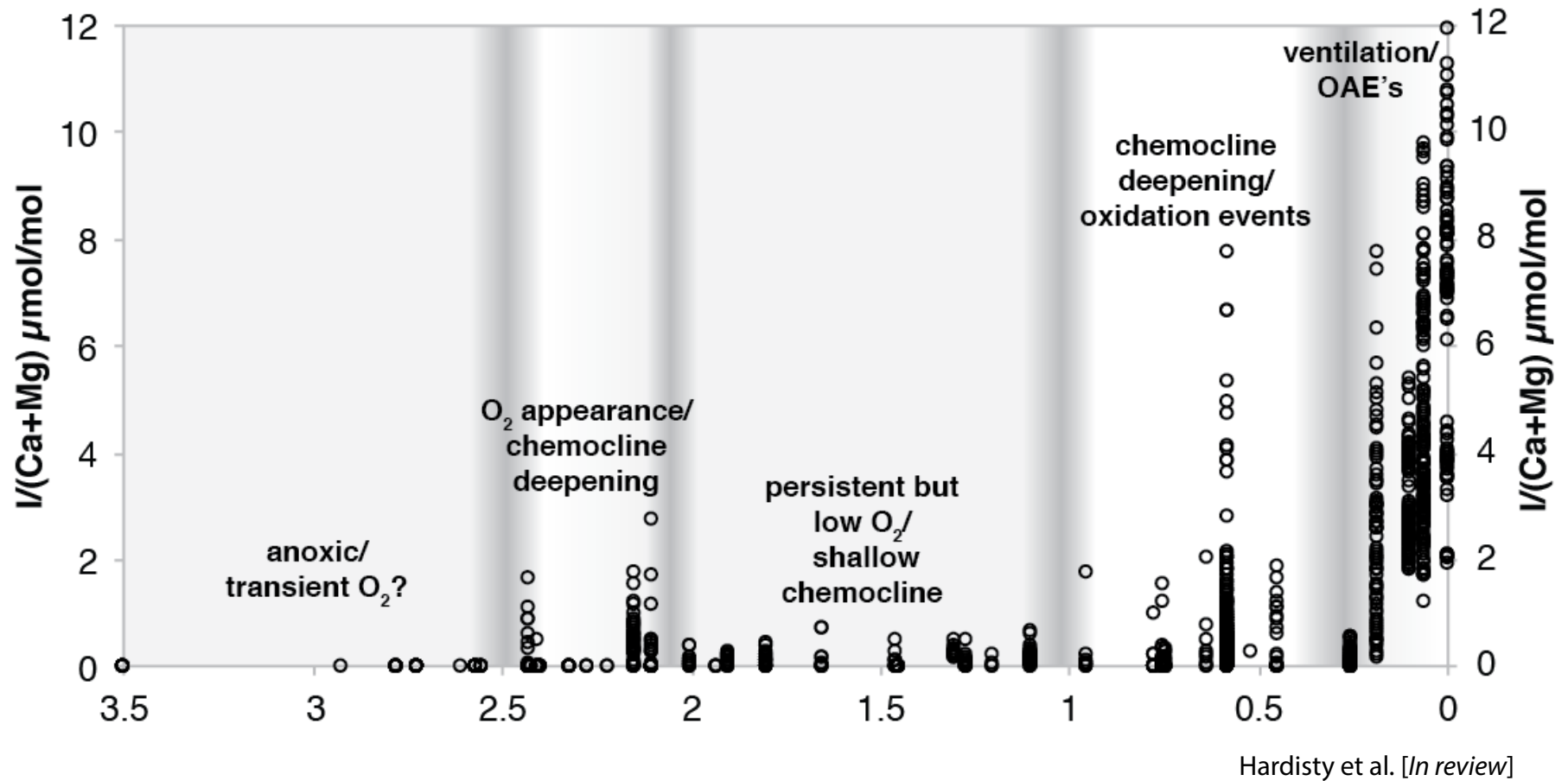
$O_2 \geq 1-3 \mu M$



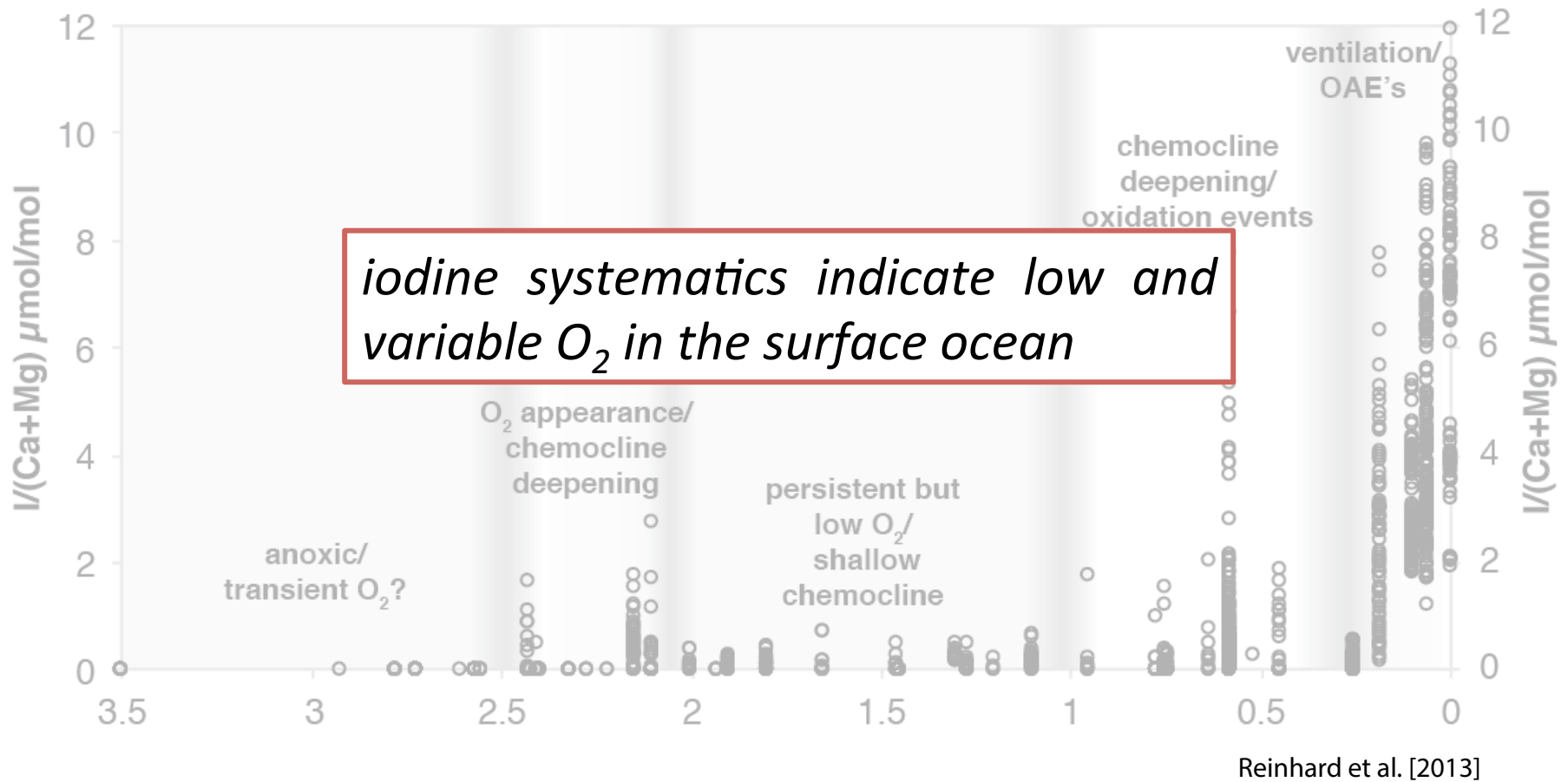
Rue et al. [1997]; Lu et al. [2010]



# proxies for O<sub>2</sub> in the shallow ocean: iodine



# proxies for O<sub>2</sub> in the shallow ocean: iodine



# ocean oxygen landscapes

