Declining Methane Emissions from Tropical Wetlands Inferred from Four Years of CYGNSS Observations

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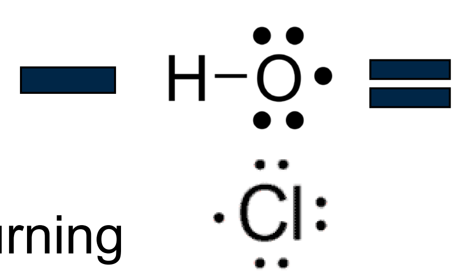
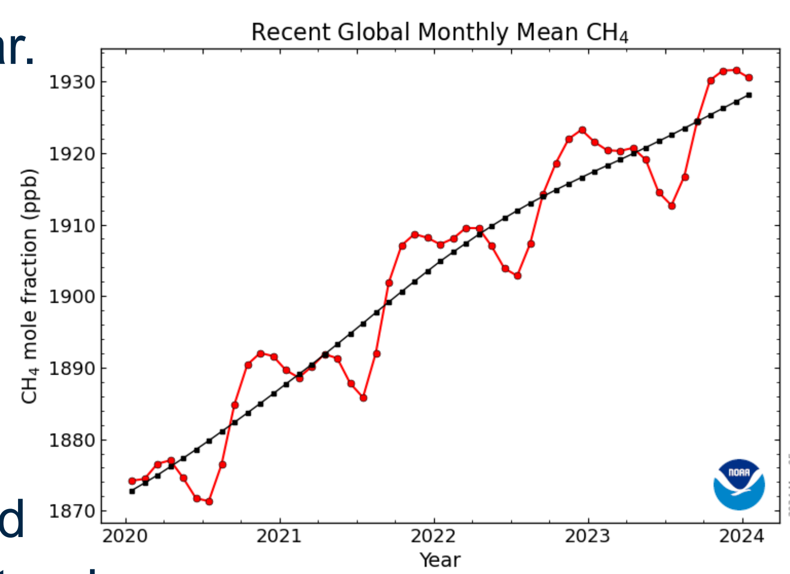
Context

1) The causes of this rapid increase in methane (CH_4) levels remain unclear.





2) Sparse ground, airborne data and limited satellite observations in the tropics.

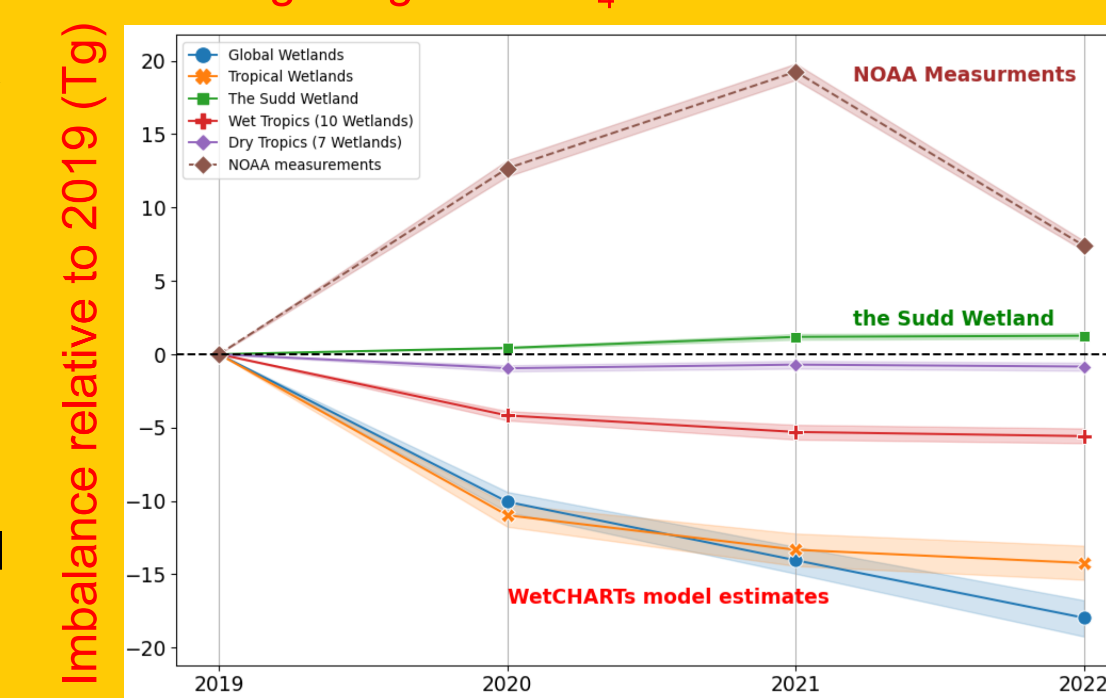
Quick Summary

This Study: Using the Berkely RWAWC inundation data for tropical wetland CH_4 modeling during 2018-2022.

Findings: (1) The observed variations in inundation within tropical wetlands are closely linked with **ENSO** phase transitions.(2) **A broad decline in CH_4 emissions** across tropical wetlands, even with an observed increase in the Sudd wetland.

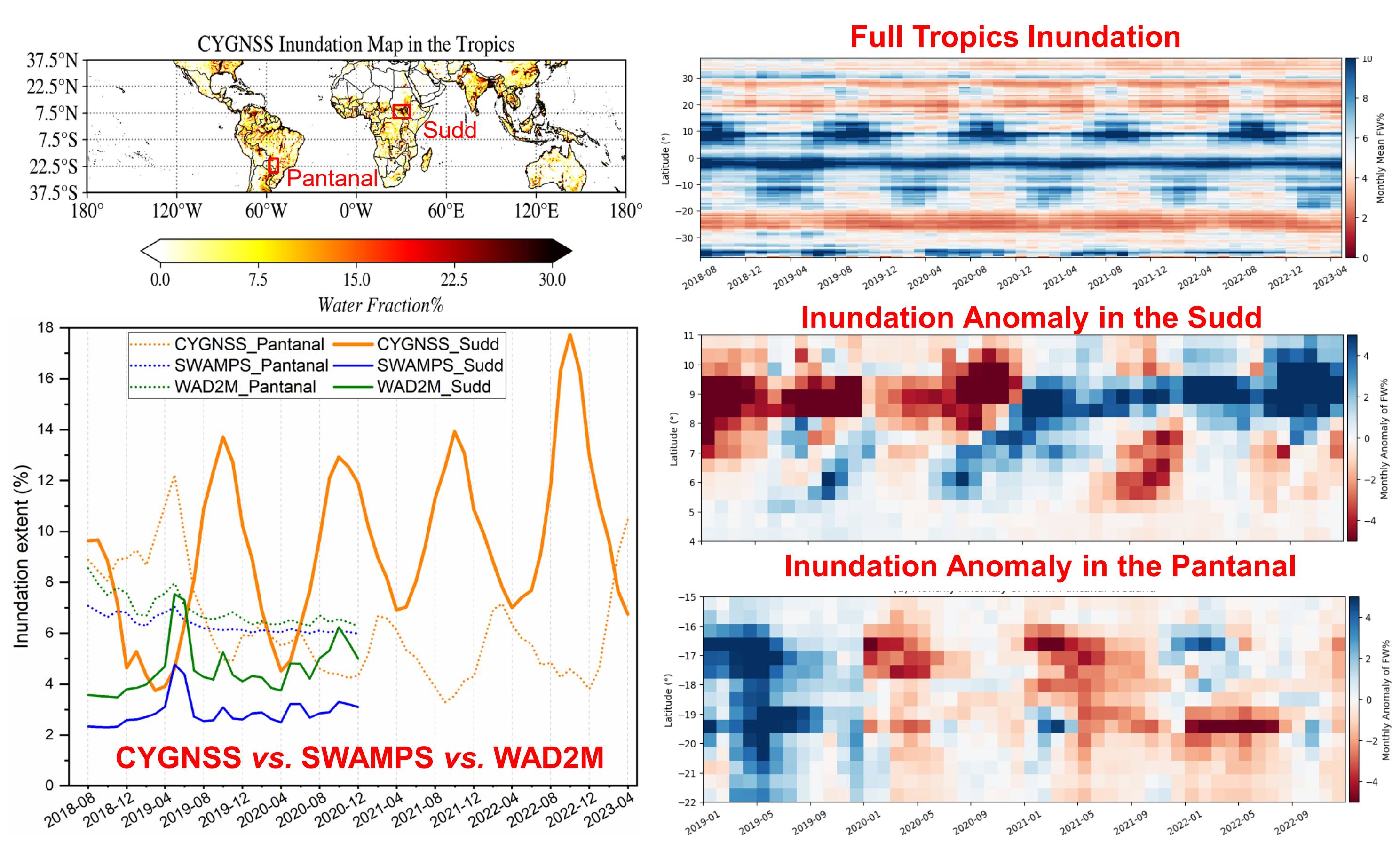
Implications: Tropical inundation in the WetCHARTs model **does not explain** the recent global CH_4 surge for 2018-2022. Other sources and sinks needed to be considered.

Change in global CH_4 source-sink imbalance



Methods

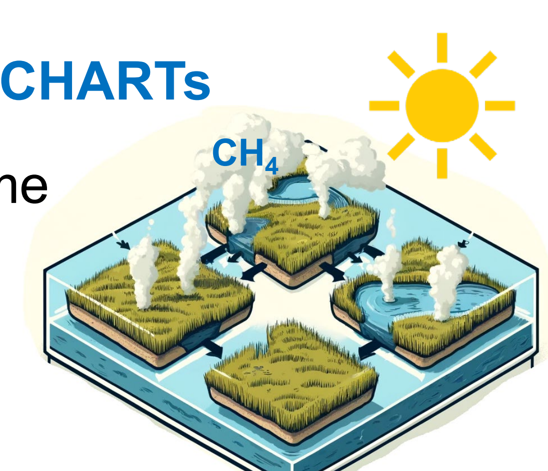
1) Develop the Berkeley RWAWC Inundation Product



The Berkeley RWAWC (Random Walk Algorithm WaterMask from CYGNSS) generates monthly inundation maps (**0.01º × 0.01º**) within the CYGNSS domain (**37.5ºS to 37.5ºN**) from August 2018 to the present.

2) Run Wetland CH_4 Emission Model: WetCHARTs

WetCHARTs derives CH_4 emissions (F) at time (t) and location (x):

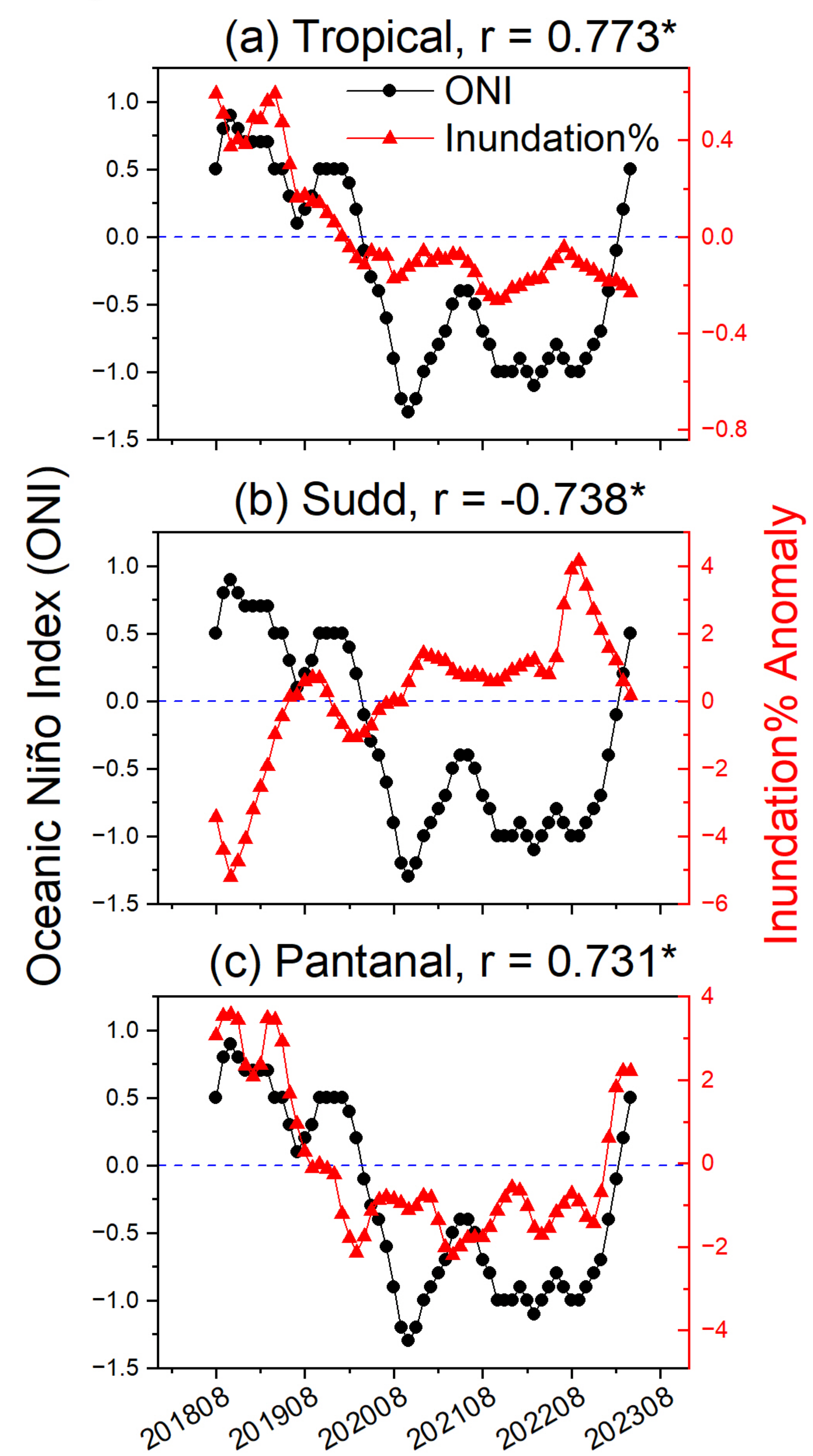


$$F(t,x) = sA(t,x)R(t,x)q_{10}^{\frac{T(t,x)}{10}}$$

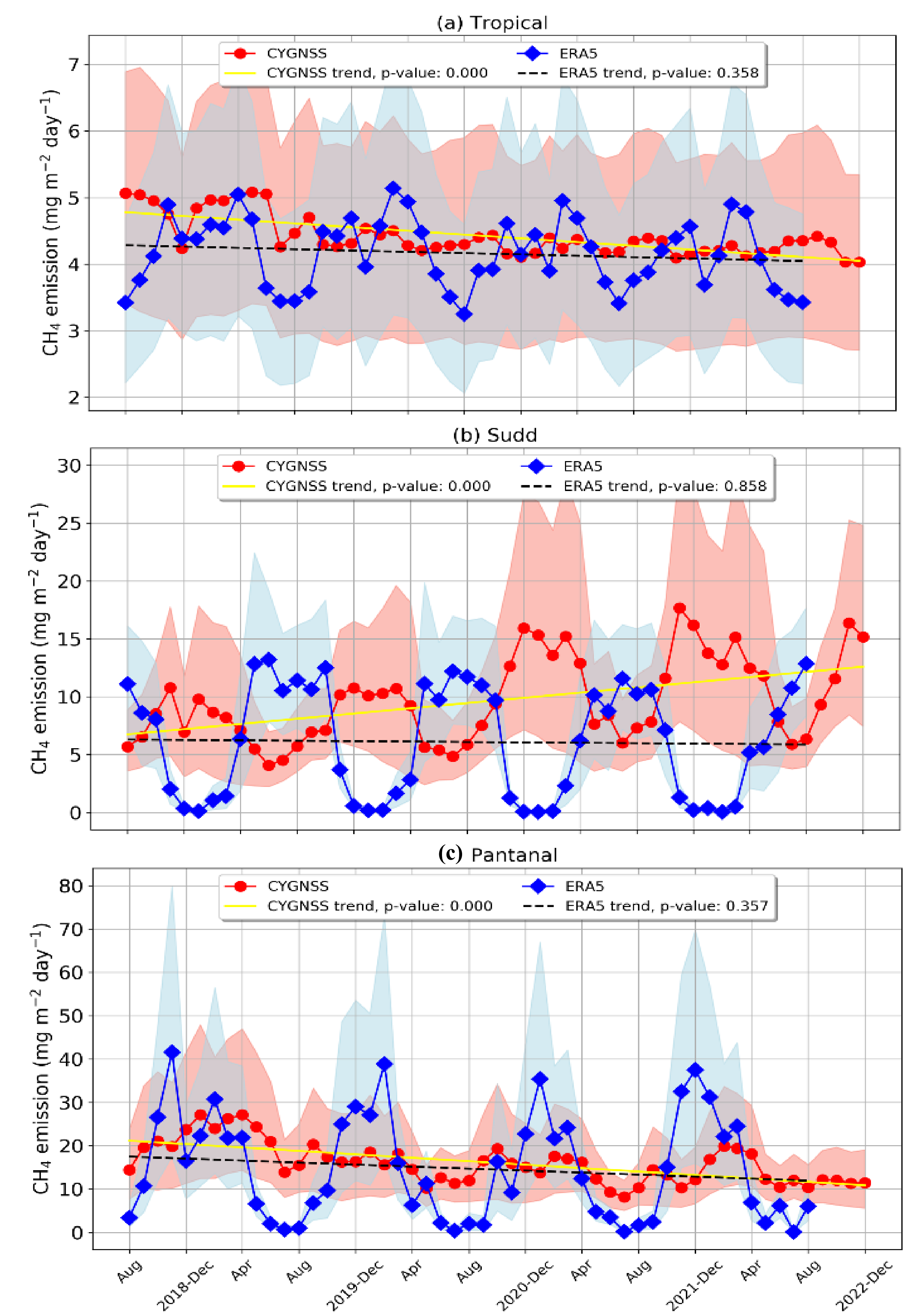
A: wetland extent, R: carbon availability, T: temperature

Findings

ENSO Impact



Tropical Wetlands CH_4 Emissions for 2018-2022



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