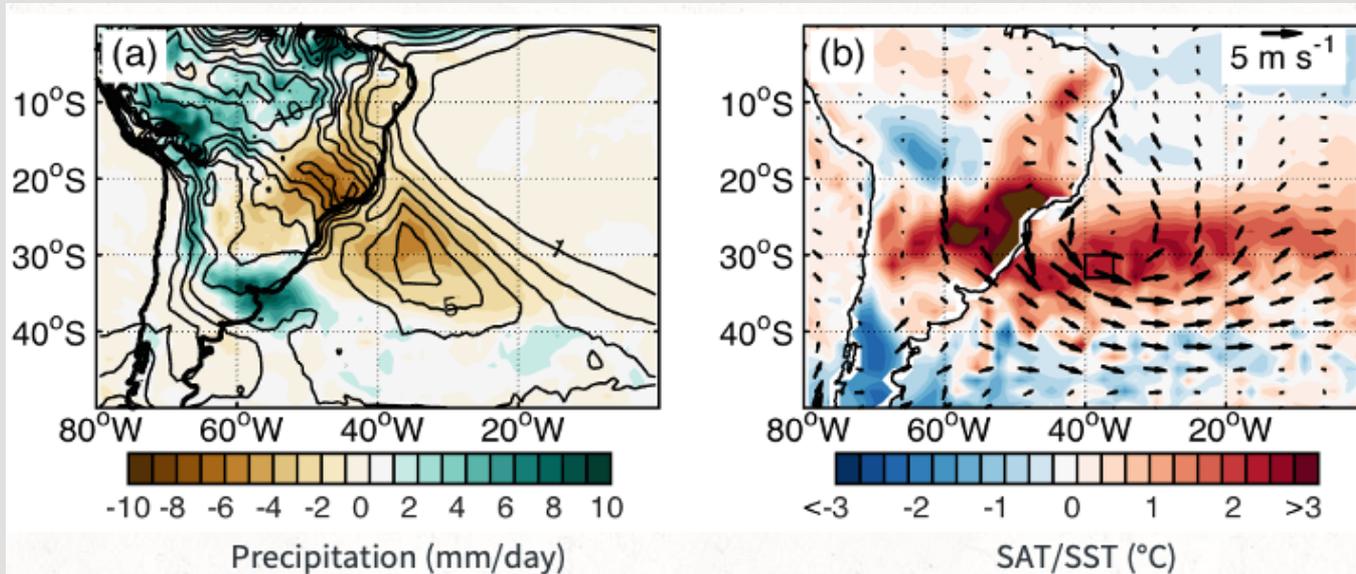


From severe droughts in South America to marine heatwaves in the South Atlantic

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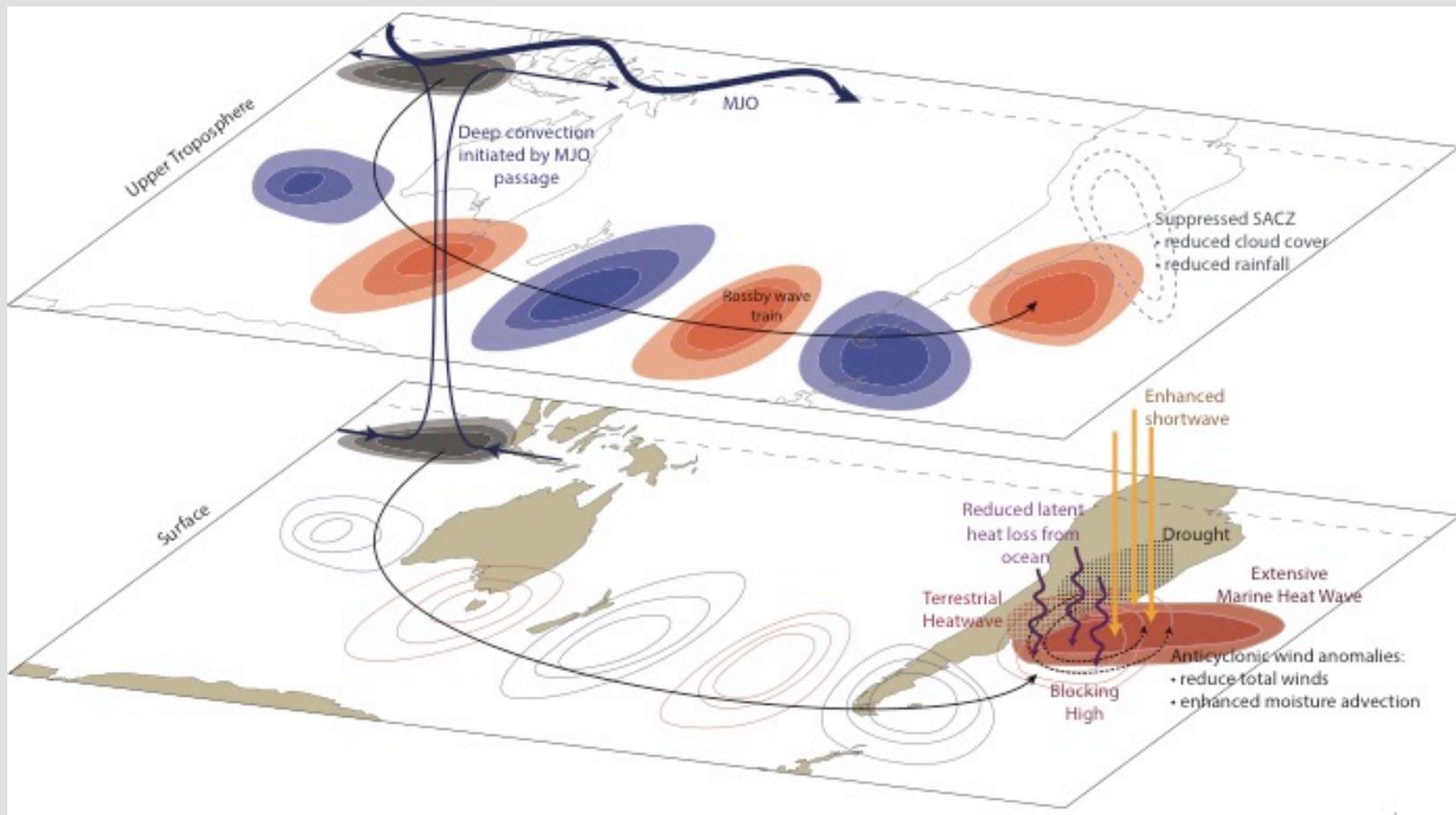
- ✓ In austral summer of 2013/14 eastern South America experienced one of its worst droughts associated with extremes of air temperatures
- ✓ At the same time an unprecedented marine heatwave developed in the western South Atlantic



Causes

- ✓ The concurrent extremes had a common cause: the suppression of the South Atlantic Convergence Zone and its associated rainfall
- ✓ Atmospheric blocking triggered by tropical convection in the Indian and Pacific oceans can cause persistent anticyclonic circulation over southeast Brazil preventing synoptic systems reaching the region while inhibiting the development of the South Atlantic Convergence Zone and its associated rainfall
- ✓ We show that increased shortwave radiation due to reduced cloud cover and reduced ocean heat loss from weaker winds are the main contributors to the establishment of marine heatwaves in the region.

- ✓ The proposed mechanism involving atmospheric blocking and droughts, explains approximately 60% of the heatwaves over land and the marine heatwave events in the western South Atlantic



Impacts

- ✓ This compound event led to water & power shortages in southeast Brazil, a region that is heavily populated, home to more than 80 million people, and responsible for 60% of the Brazilian gross domestic product
- ✓ It also reduced Brazilian soy, coffee and sugarcane production, impacting food supplies globally and increasing worldwide prices
- ✓ It decreased the production of oysters and the catch of some commercially important fish species, while decimating clams along the southern coast of Brazil
- ✓ This event was also responsible for a dengue fever outbreak that tripled the usual number of fatalities
- ✓ In addition, compound events like this have a disastrous impact on ecosystem degradation and loss of land & marine biodiversity

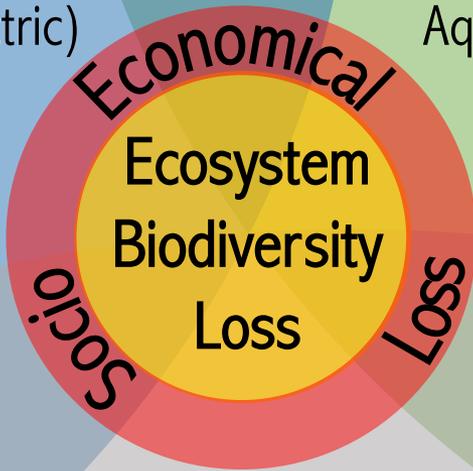
Water & Energy Security

Water shortages
Water contamination
Energy shortages (65% hydroelectric)

Food Security

Agriculture (soy, coffee, sugar cane)
Fisheries (clams, fishes)
Aquaculture (oysters)

Drought



Heatwave

Human Health

Infectious diseases
Heat stress (strokes)
Vector-borne diseases (dengue)

Marine Heatwave

Conclusions

- ✓ We have identified an increase in frequency, duration, intensity and extension of these compound extremes over the satellite period 1982-2016
- ✓ Their socioeconomical consequences for a country like Brazil are immense and recovery will be made more difficult once they become more frequent and intense
- ✓ For more information please contact: regina.rodriques@ufsc.br or  [@rrrocean](https://twitter.com/rrrocean)
- ✓ Rodrigues, R.R., A.S. Taschetto, A. Sen Gupta, G. Foltz (2019). Common cause of severe droughts in South America and marine heatwaves in the South Atlantic. *Nature Geoscience*, 12, 620-626.

