

High vulnerability of eastern boundary upwelling systems to ocean acidification

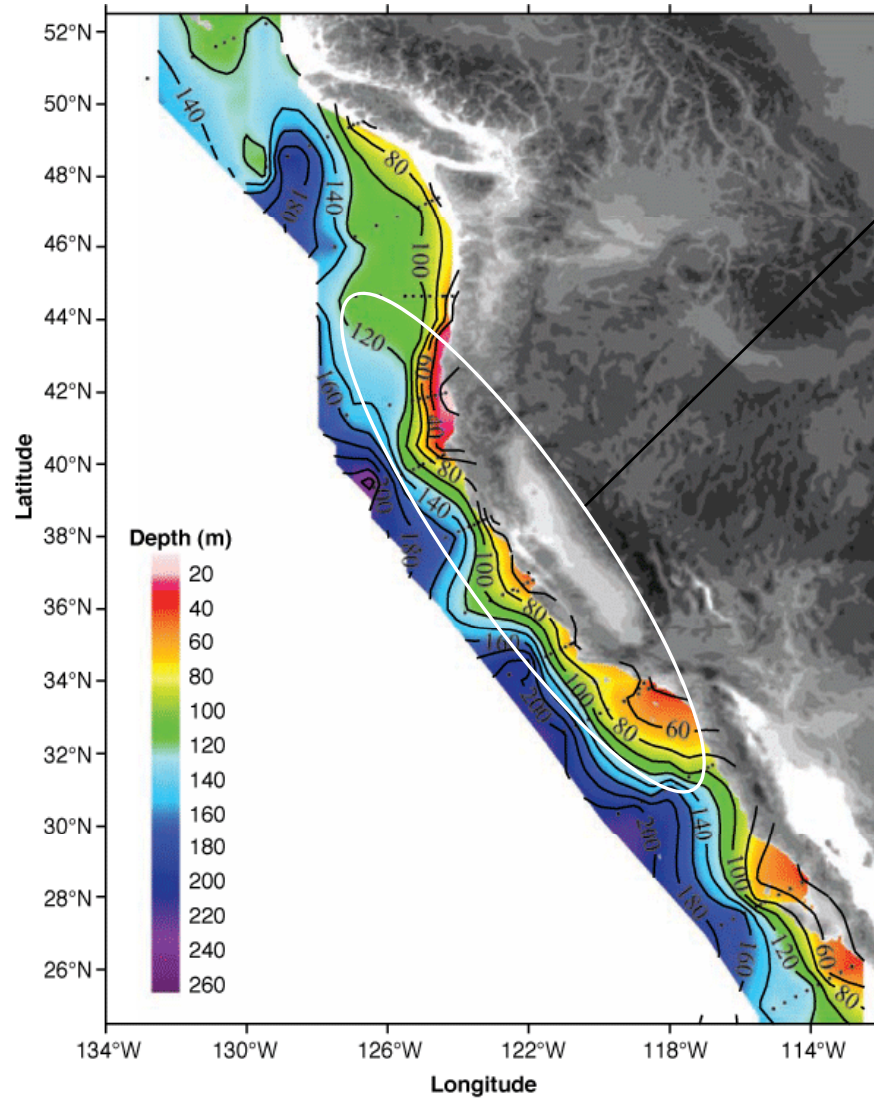
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California Current System: Aragonite saturation horizon



In the California Current System, the depth of saturation horizon for aragonite shoals into the euphotic zone already today!

Key Questions

- Low pH and shallow saturation horizon in the CalCS:
natural versus anthropogenic causes
- When will the system cross critical thresholds?
- How unique is the California Current System?

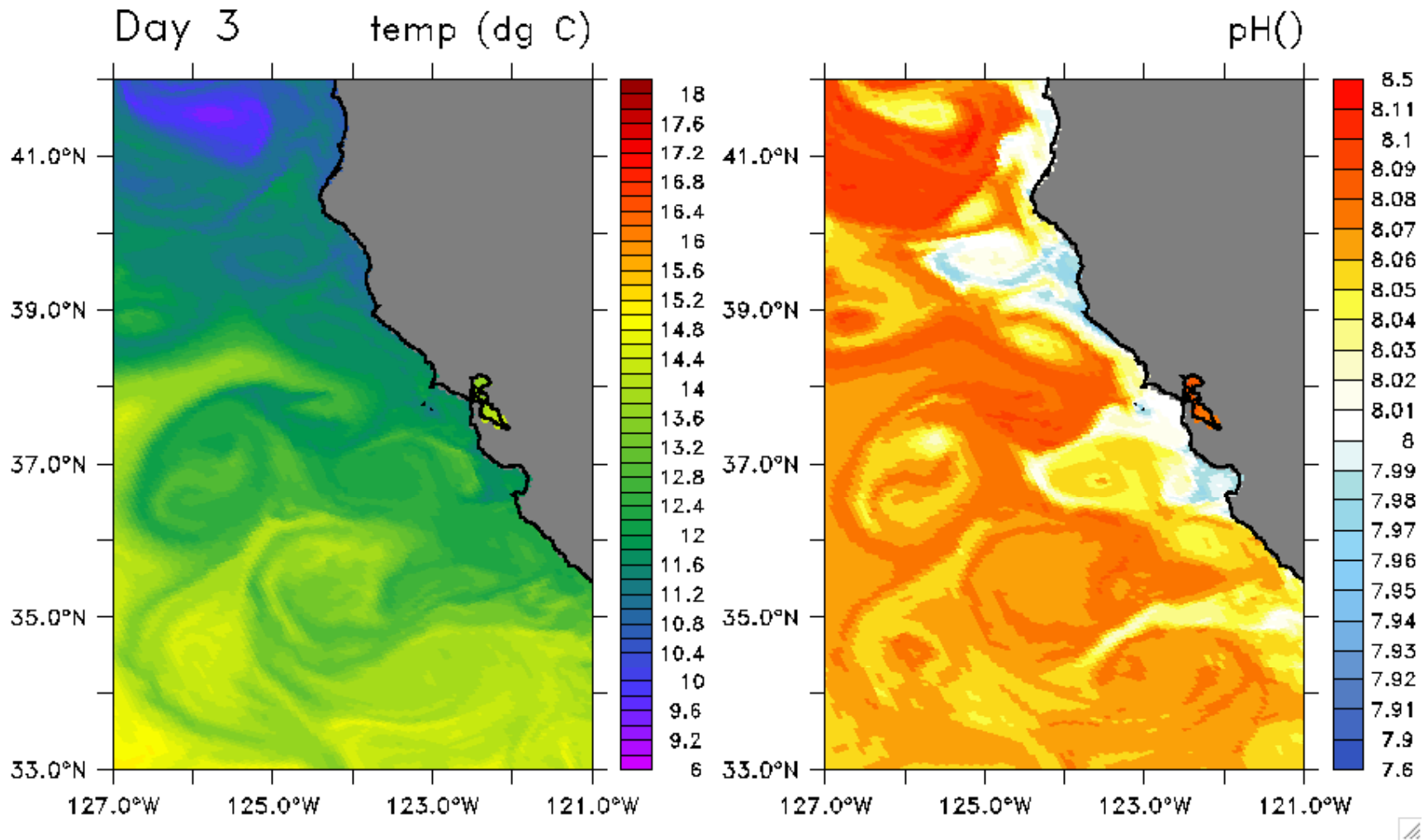
Modeling past, present, and future of EBUS

Use Regional Ocean Modeling System (ROMS) with NPZD model for the different EBUS (5km resolution)

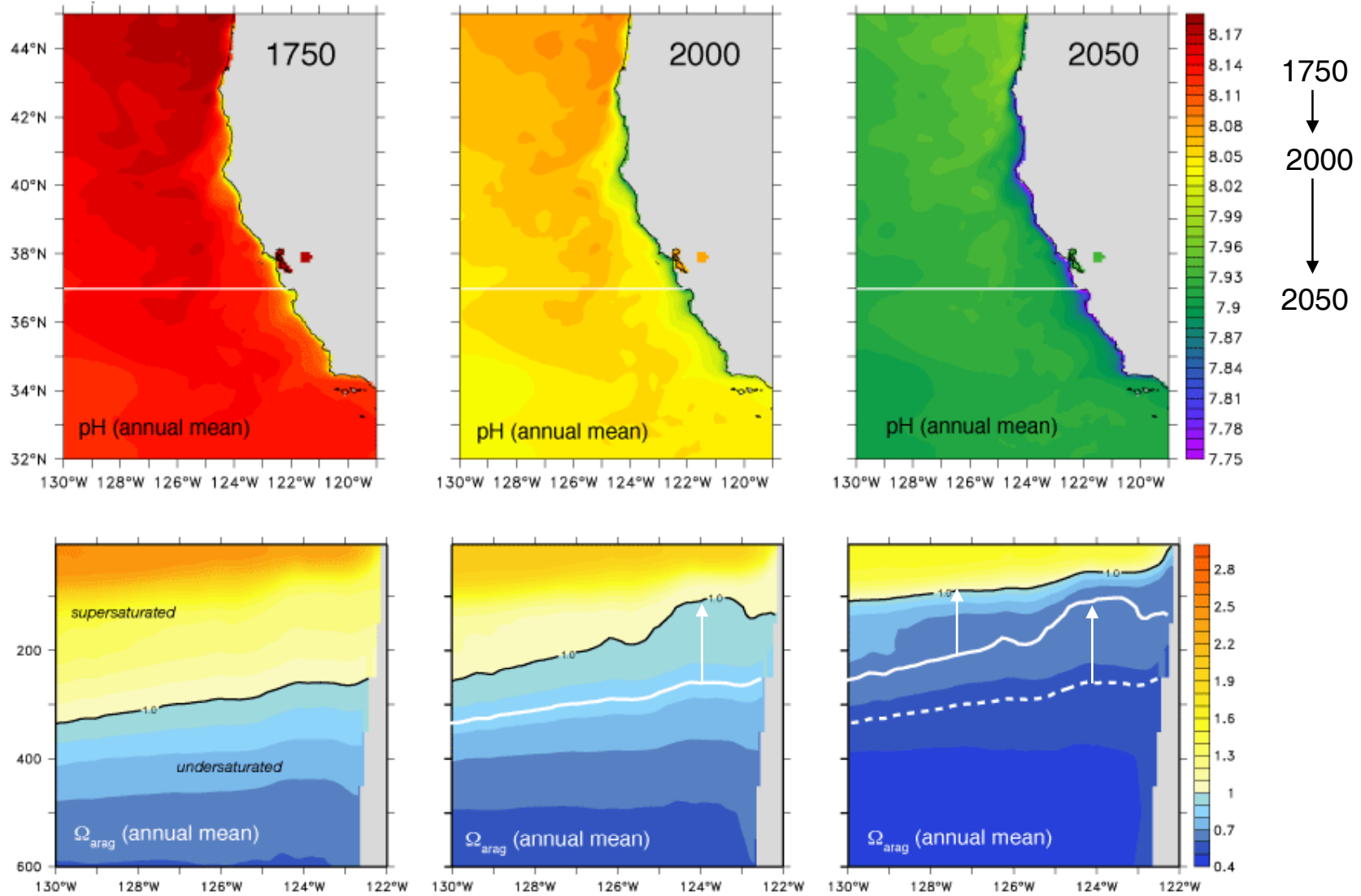
Prescribe lateral and atmospheric boundary conditions for time-slice integrations (*GLODAP & NCAR CSM global model*)

	1750 (370 ppm)	2000 (370 ppm)	2050 (A2) (550 ppm)
California Current System	YES	YES	YES
Canary Current System	YES	YES	IN PROGRESS
Humboldt Current System	<i>PLANNED</i>	<i>PLANNED</i>	<i>PLANNED</i>

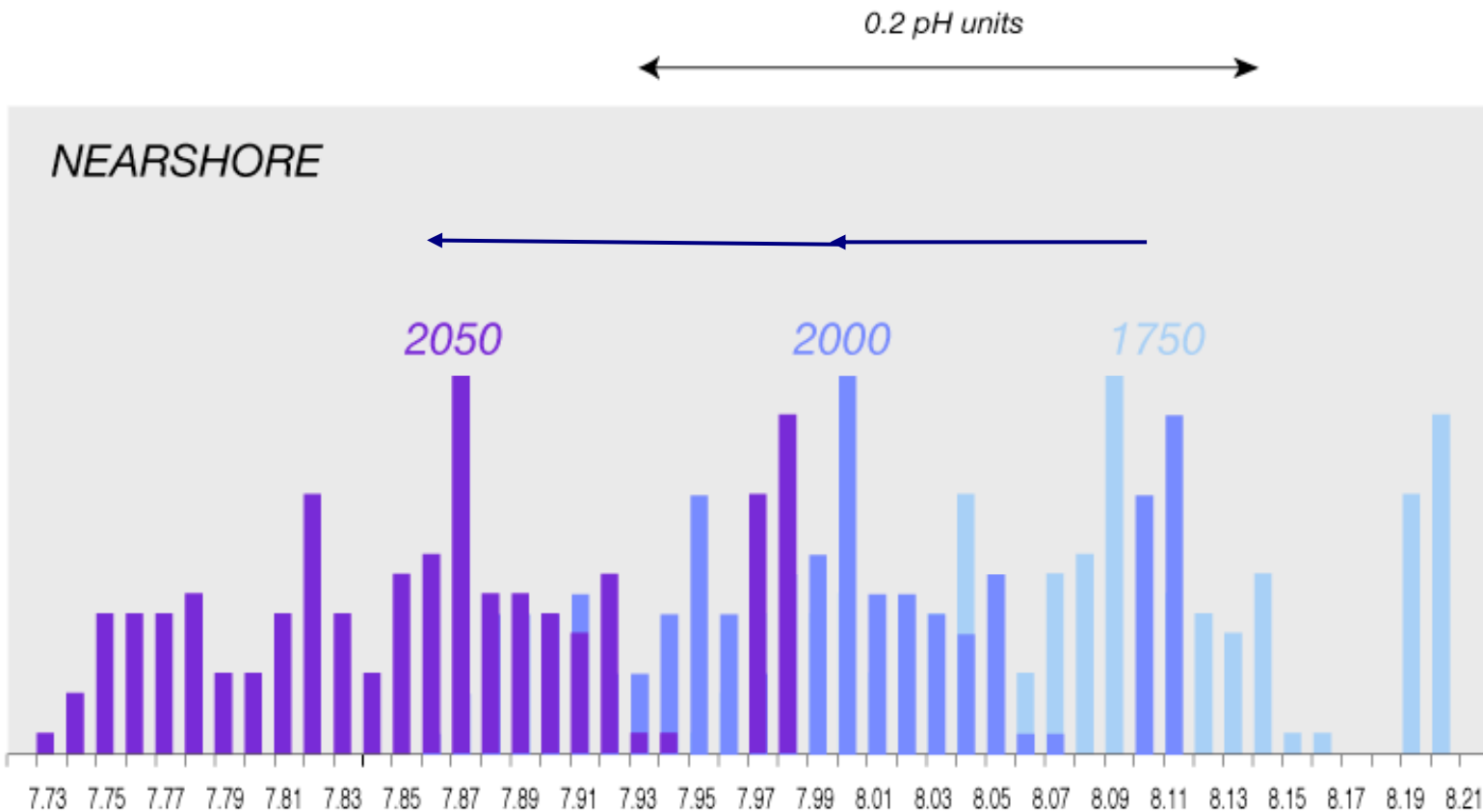
Temperature and pH in the CalCS: Year 2000



Natural versus anthropogenic causes

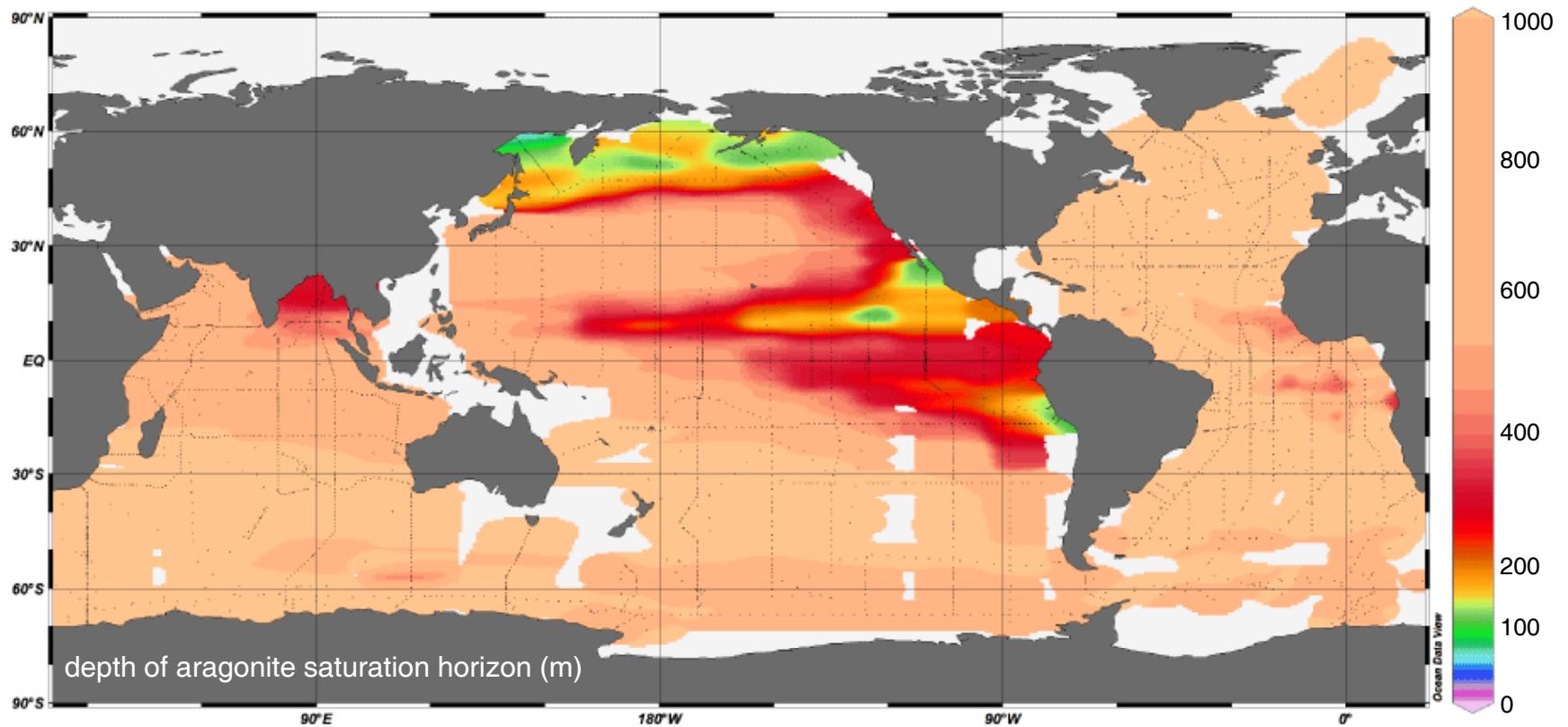


Crossing thresholds



In the presence of high temporal variability, the determination of when a given threshold is passed is not obvious

The vulnerability of coastal upwelling systems



The Bering Sea and the eastern boundary upwelling systems of the Pacific are particularly vulnerable

Summary and Outlook

- Eastern boundary upwelling regions (particularly those of the Pacific) are among those with the *lowest pH* and will be among the first regions to *experience undersaturation* with regard to aragonite.
- High spatial and temporal variability exposes organisms to a *large range* of pH and saturation conditions. This makes it more difficult to define when thresholds are crossed.
- These upwelling systems could represent ideal testbeds for studying the impact of ocean acidification on organisms and their possible adaptive strategies.



The End.