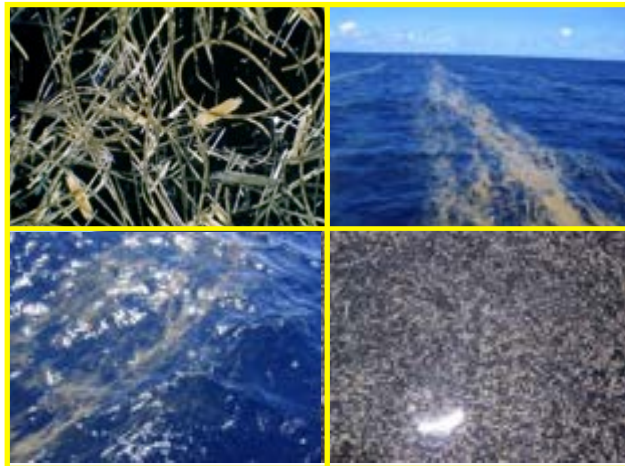


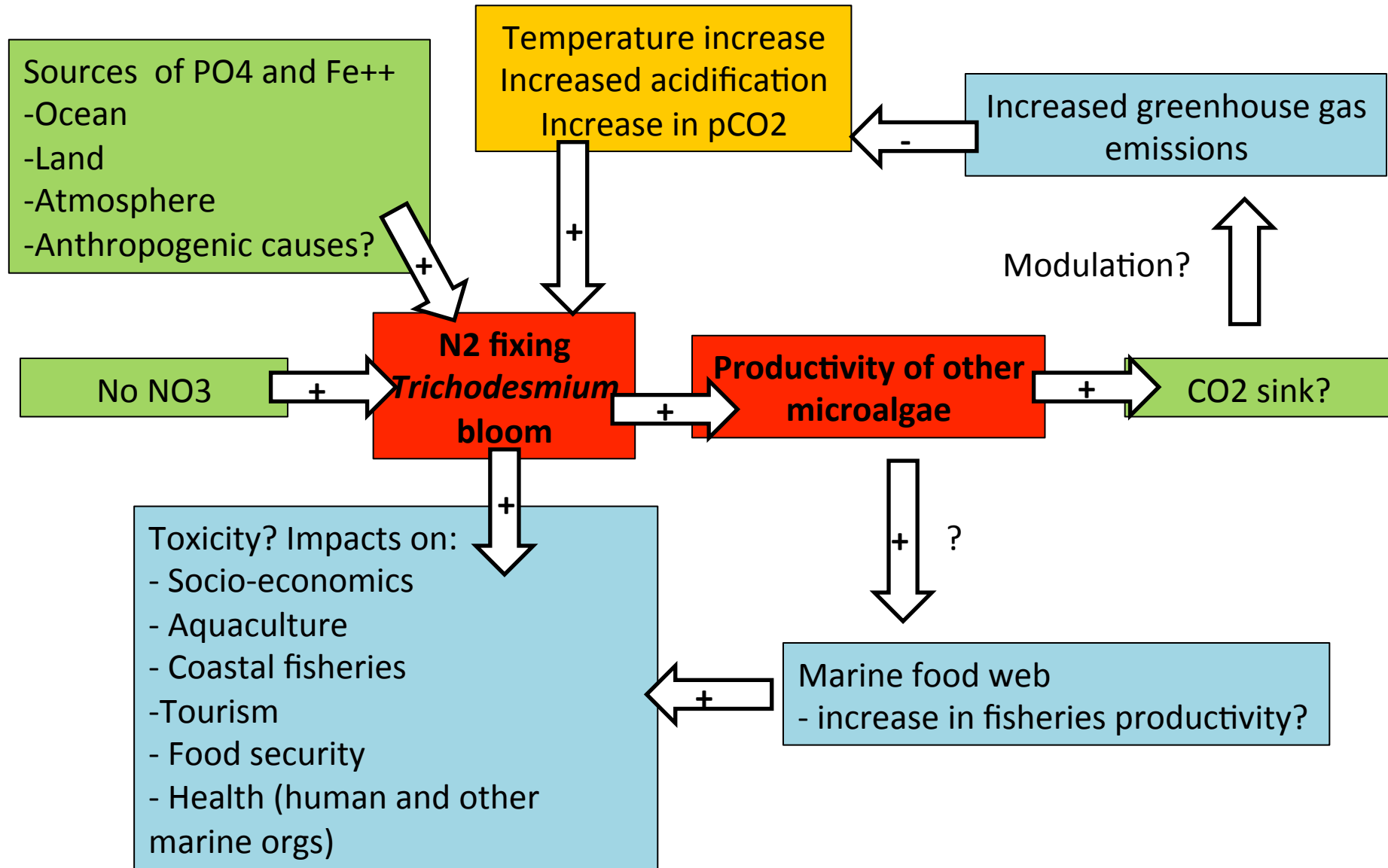
Group 3:

Effects of climate change and environmental disturbance on HABs

Day 1 summary results



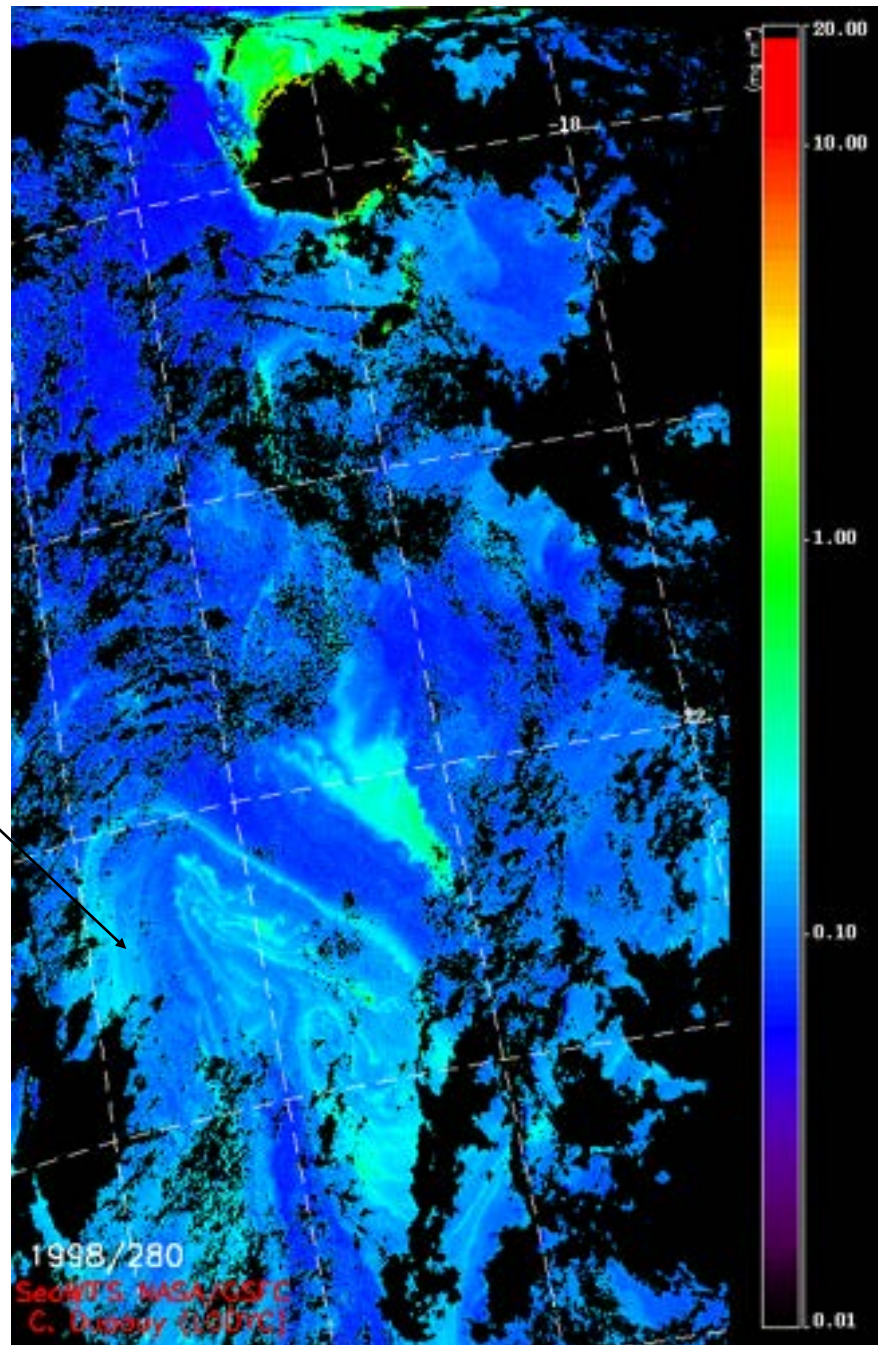
Case study 1: *Trichodesmium* in the South Pacific



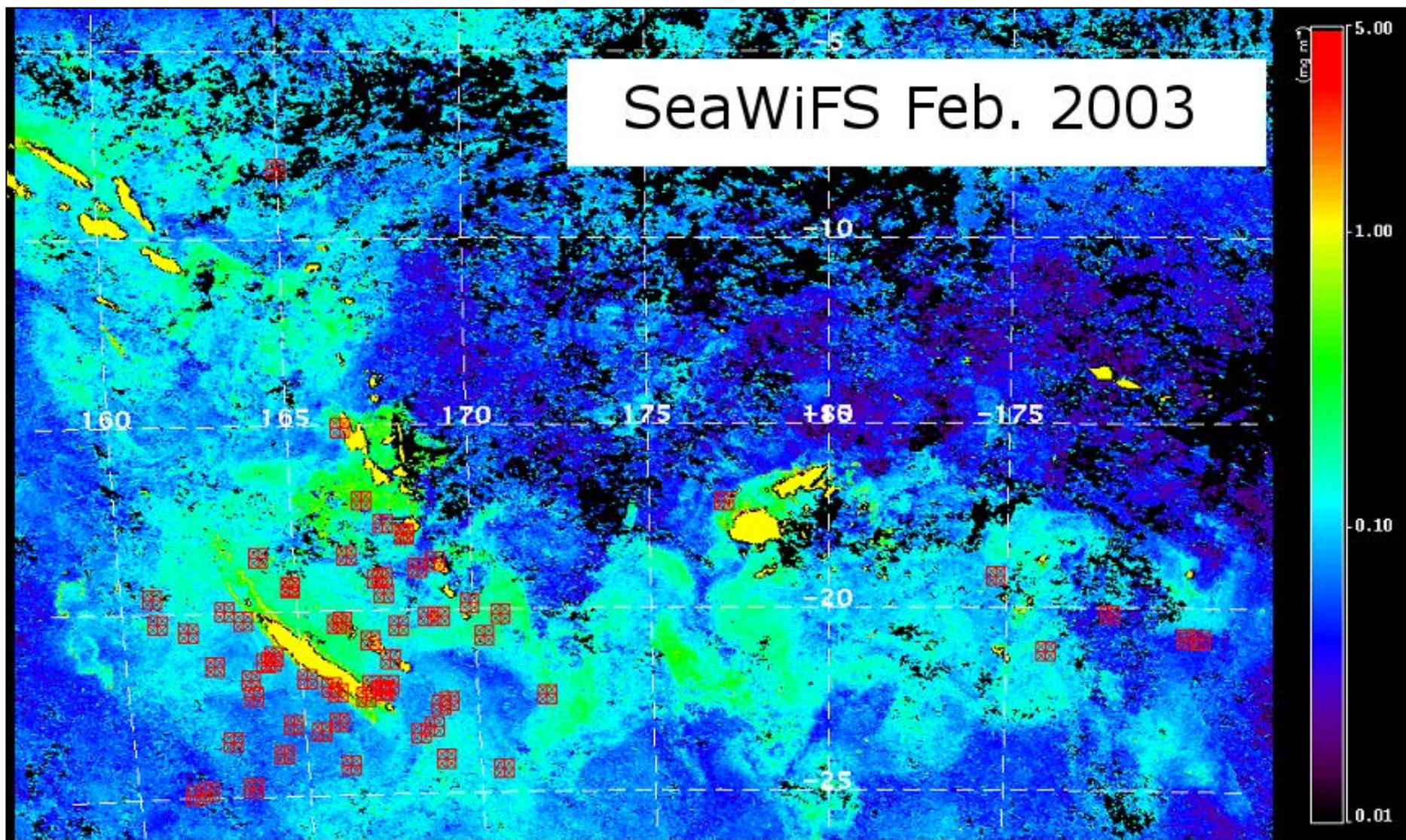
Trichodesmium bloom In November 1998



Marine Nationale, 1998



SeaWiFS Feb. 2003



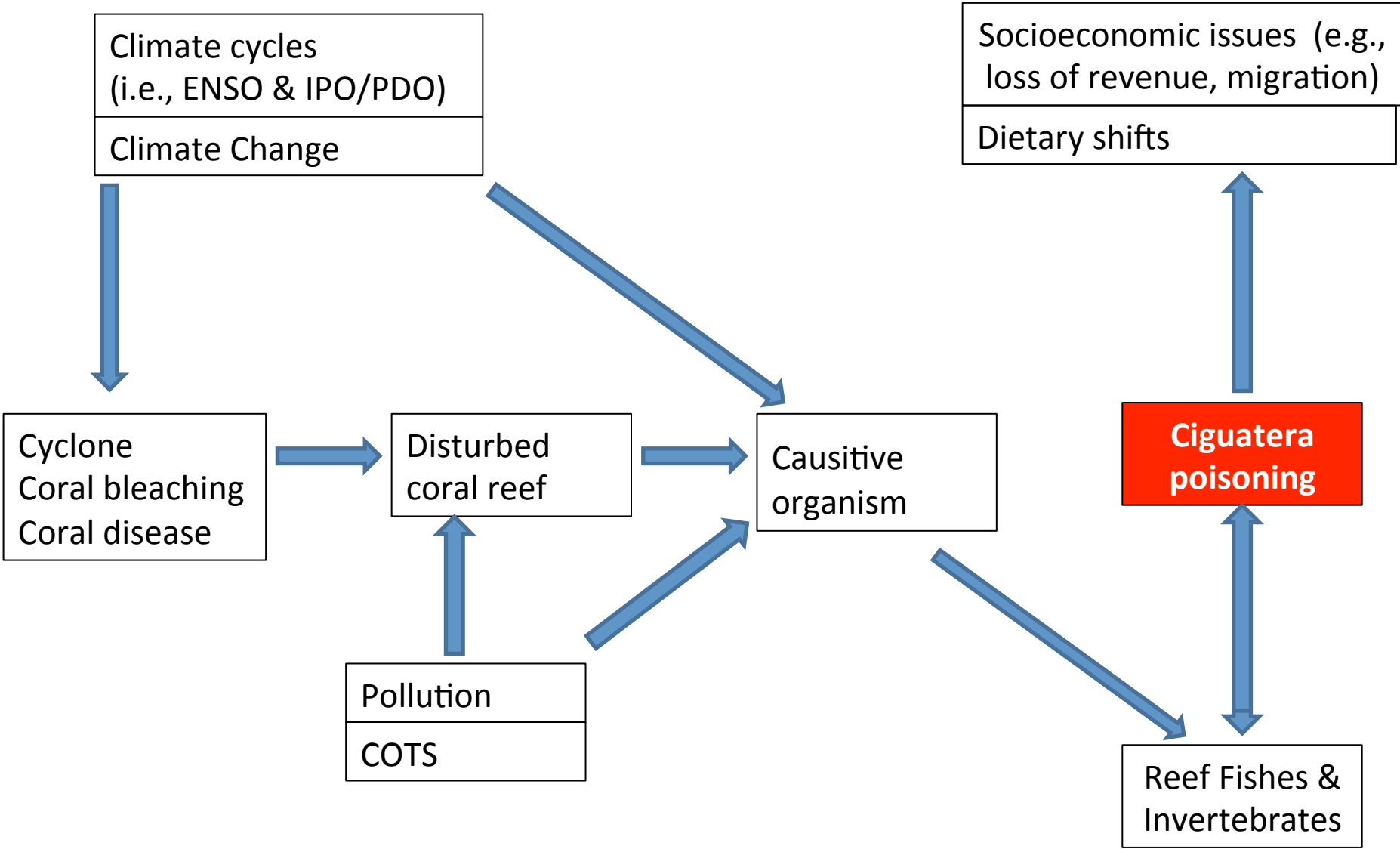
Case 2: Study location

Ciguatera poisoning has been problematic for over 20 years

- five deaths , few partial paralysis
- up to 1000 people affected each year
- 52% have experienced ciguatera at least once in the past

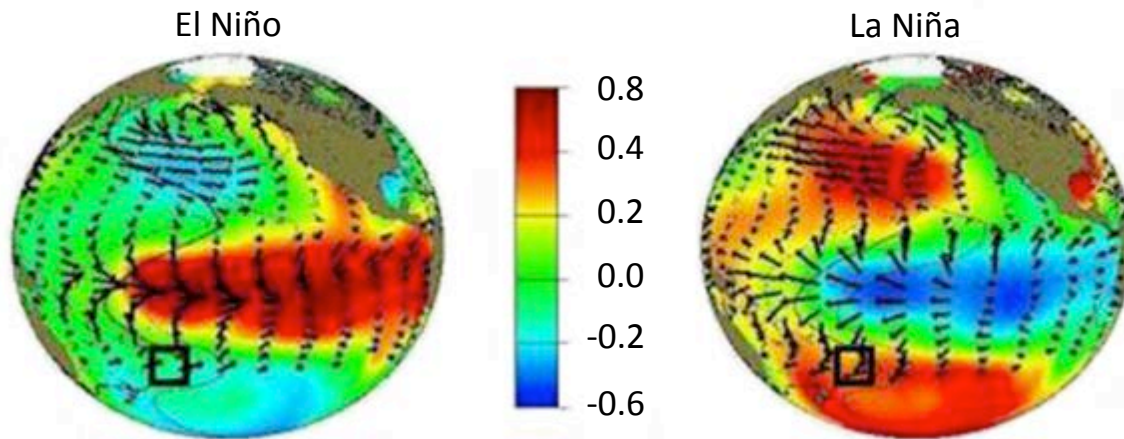


Rarotonga

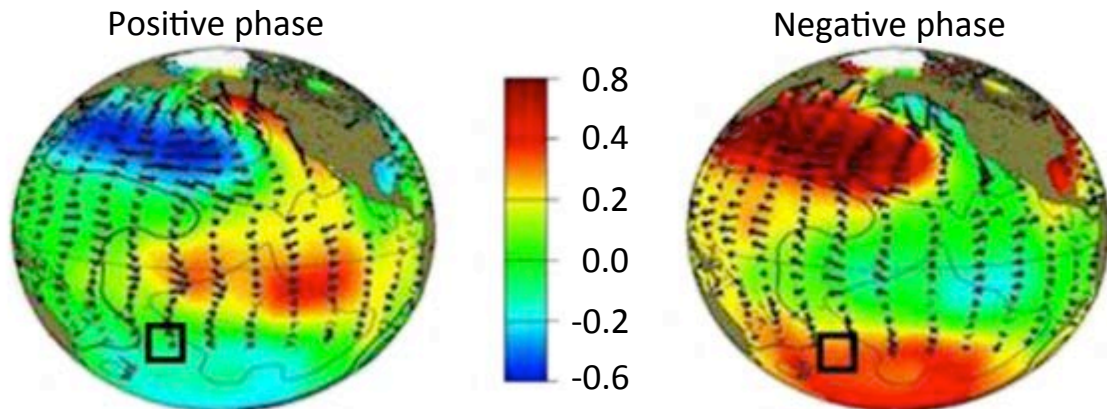


Climate Oscillations

El Niño Southern Oscillation



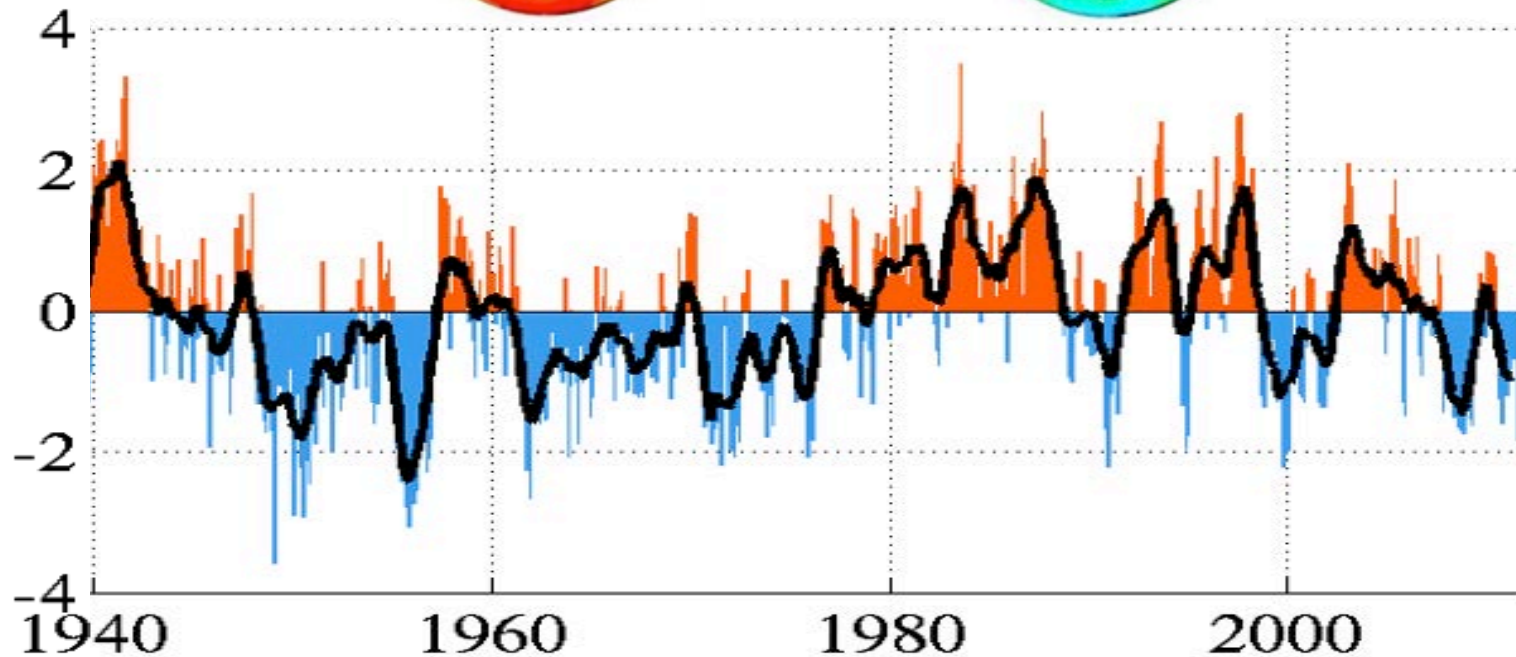
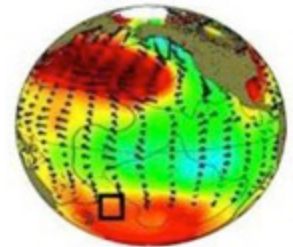
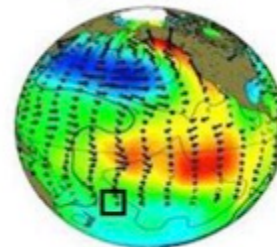
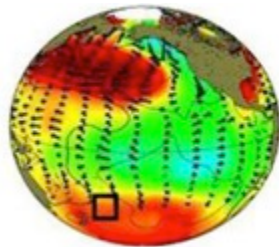
Pacific Decadal Oscillation



Negative phase

Positive phase

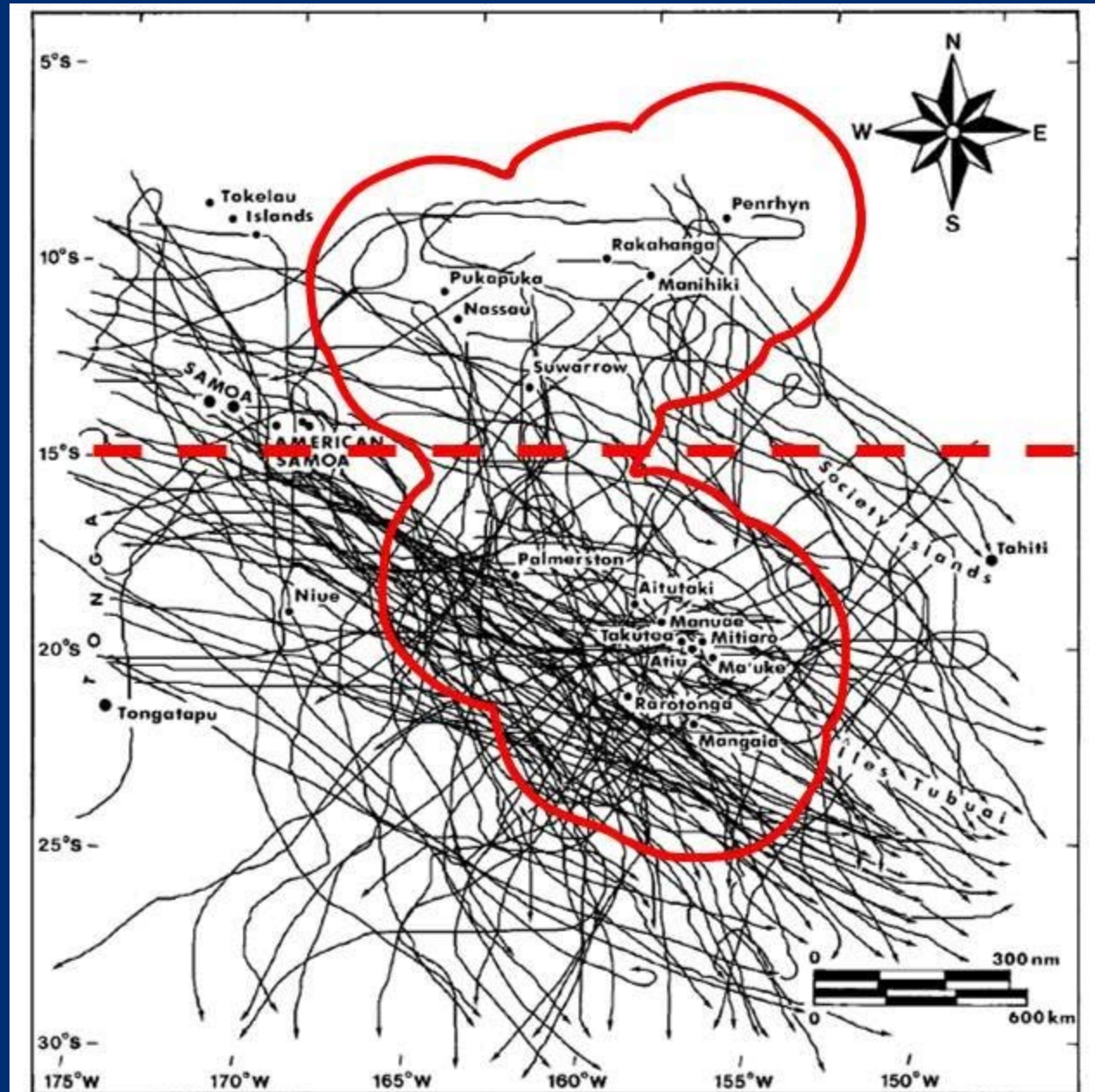
Negative phase



Cyclone tracks in the Cook Islands



Tracks of 104 cyclones in the Cook Islands from 1820–2006 (de Scally, 2008)



Coral bleaching from extreme low tide events





Hospital cases



Survey cases



El Nino years



Cyclone

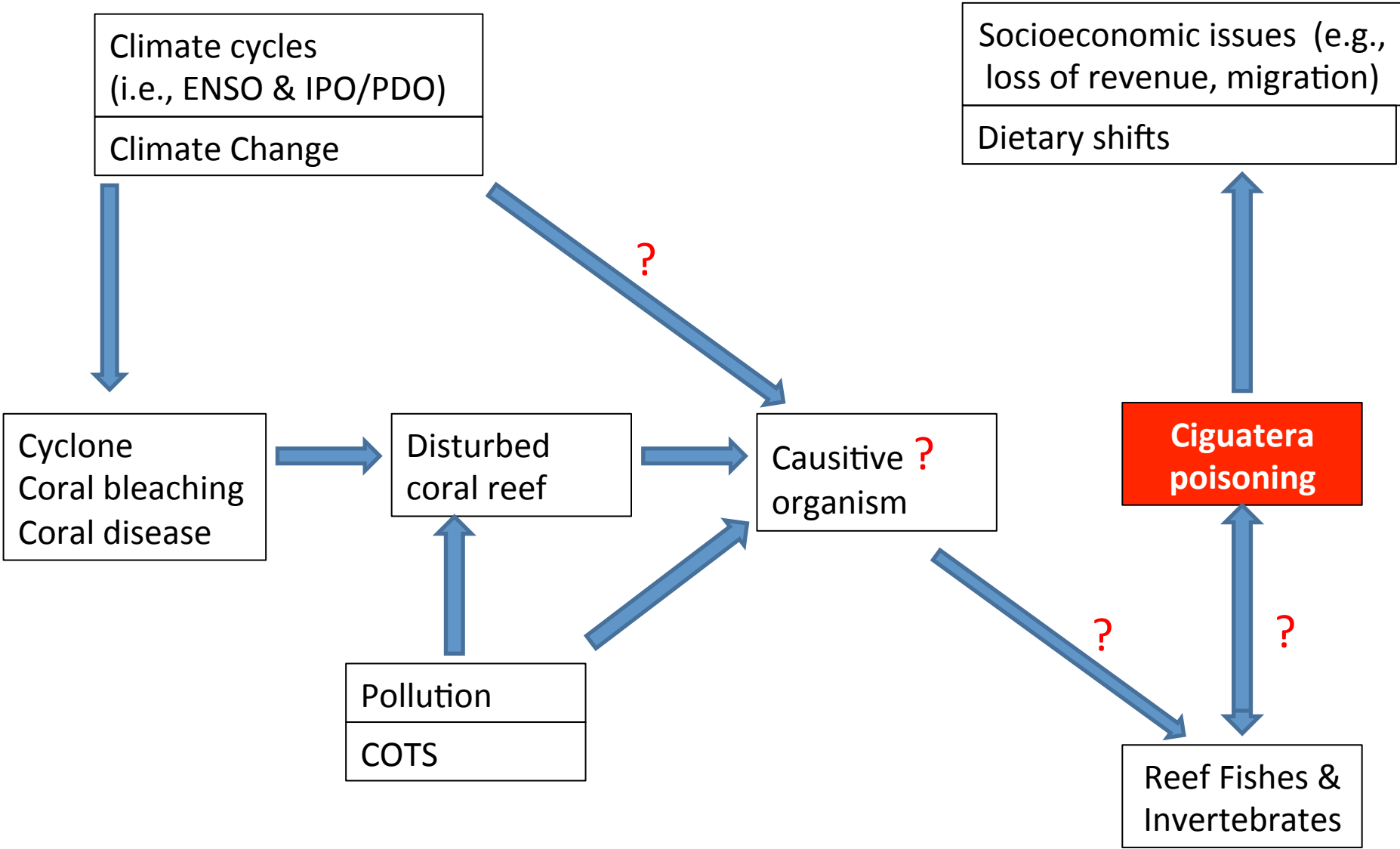


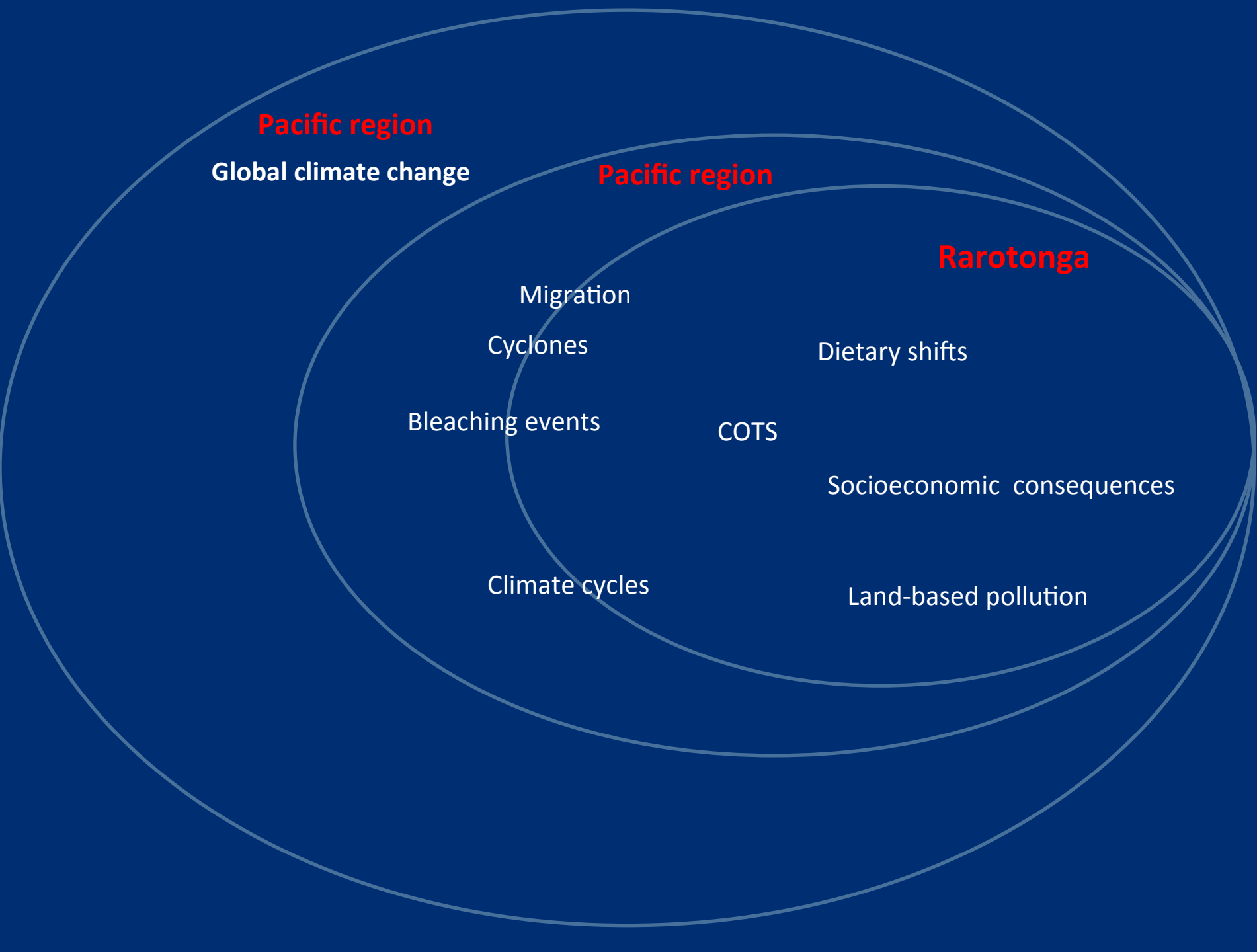
Major cyclone



Acanthaster planci outbreak

$$(\chi^2_{(1, N=39)} = 4, p < 0.037)$$





Problems and gaps

7 - Lack of consistent monitoring

5 - Lack of capacity in research and monitoring

4 - Lack of ability to predict when blooms will occur

3 - Lack of specific causative chain & baseline info

3 - Lack of long-term data (time series)

1 - Insufficient use of data (e.g., remote sensing)

1 - Lack of sharing of data & knowledge among scientists, managers, communities

1 - Lack of knowledge of species & locations affected (-> awareness)

1 - How do toxins affect fish?

1 - Lack of understanding of CC forces, esp. Ocean acidification

What works well

- 5 - Good general understanding of systems**
- 4 - Highly dedicated researchers that complement each other**
- 2 - Networking among groups
- 1 - Traditional/local knowledge

Priorities in research

- 10 – Start regional long-term monitoring using consistent approaches / methodologies that incorporates all drivers
- 4 – Identifying toxins involved
- 4 – Better understanding of potential positive effects (e.g. *Trichodesmium* as CO₂ sink and MPAs)
- 4 – Feeding ecology in HAB systems, e.g. role of sea cucumbers

Priorities in technology & innovation

- 8 – Integrated meta-data web portal or similar data sharing system**
- 6 – Cost-effective rapid-detection test**
- 3 – Developing new automated sensors (e.g. buoys) for key species and key drivers
- 2 – Data mining & automated meta-analysis system
- 1 – Information dissemination technology for reporting cases
- 1 – Nano-technology /microsensors for remote sensing
- 1 – Unmanned drones for monitoring blooms and coastal areas