

Projections of the impact of climate change on the marine environment around Madagascar

Katya Popova, Simon Van Gennip, Val Byfield



**National
Oceanography Centre**
NATURAL ENVIRONMENT RESEARCH COUNCIL

noc.ac.uk

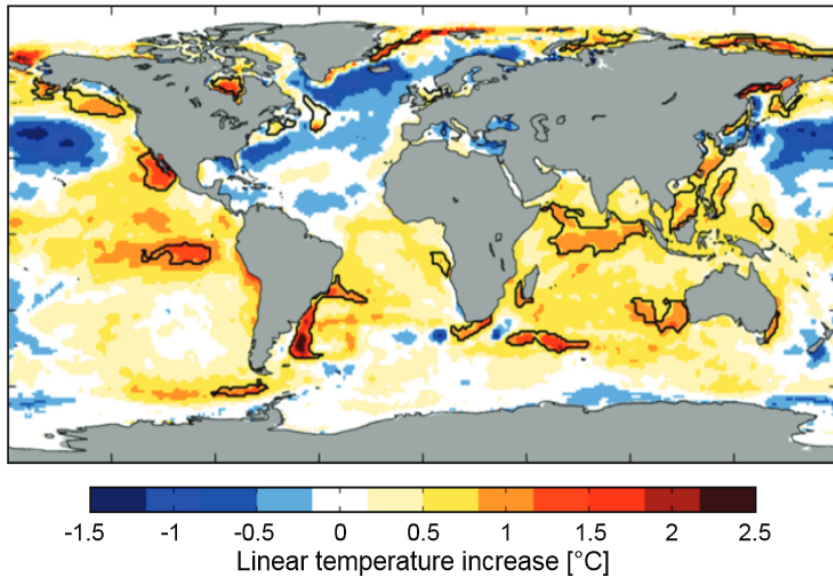
NERC SCIENCE OF THE
ENVIRONMENT

Climate change is a global problem

- Climate change is a growing threat to the planet
- Its consequences are being felt in all countries
- Its impact is accelerating
- The aim of this presentation is to show future projections for the marine environment around Madagascar



Madagascar is a Marine Hotspot



- Oceans do not warm homogeneously. Some regions warm much faster than the rest
- Madagascar is one of such marine hotspots where climate change impacts on marine environment is observed earlier
- At this workshop we have experts from other marine hotspots (Australia, Brazil and South Africa)

Future projections of sea surface temperature around Madagascar under RCP 8.5 (business as usual)

The movie show on this slide can be found at

http://gullswweb.noc.ac.uk/ocean_projections.php#sst



**National
Oceanography Centre**
NATURAL ENVIRONMENT RESEARCH COUNCIL

noc.ac.uk

NERC SCIENCE OF THE
ENVIRONMENT

Future projections and participatory approach

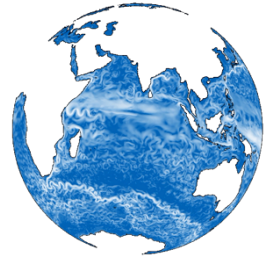
Anthropogenically-driven climate change is a **global phenomenon**

Impacts of the climate change on ecosystems and communities are **local and often unique**

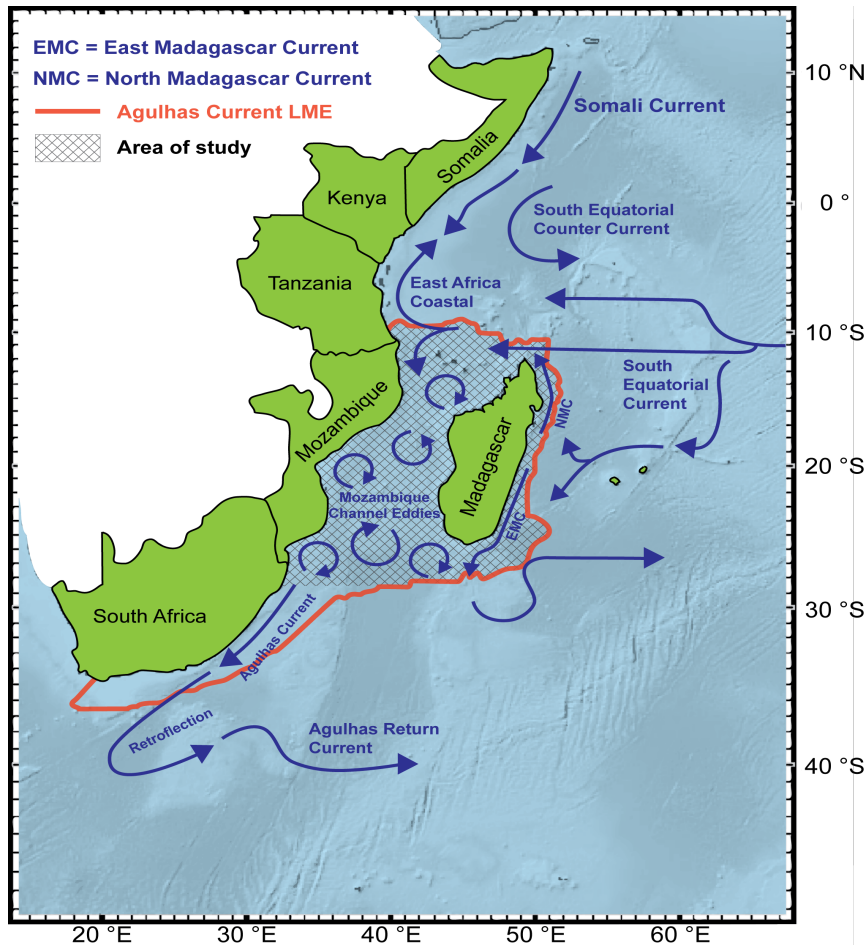
Information from global ocean models is immensely complex and includes multitudes of characteristics.

Long term trends of these characteristics can be of little relevance to local adaptation measures unless the model output is translated into a form that reflects local needs

Participatory approach combines climate models and local knowledge of ecosystems and communities depended on them to develop meaningful indicators



Geographical area



Red line: Agulhas Current Large Marine Ecosystem

Hatched area: focus of our projections

Ocean currents

- shape biogeography of marine ecosystems
- control dynamics of the productive upwelling zones
- will change under the changing climate



Ocean circulation

The movie show on this slide can be found at

http://gullsweb.noc.ac.uk/ocean_projections.php#currents



**National
Oceanography Centre**
NATURAL ENVIRONMENT RESEARCH COUNCIL

noc.ac.uk

NERC SCIENCE OF THE
ENVIRONMENT

Key climate change risk factors for marine ecosystems

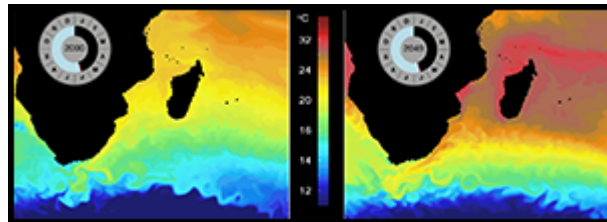
■ Sea Surface Temperature increase

- Long term trend
- Marine heatwaves
- Coral bleaching risk

Key Climate Change Indicators

Level of suggested impact:

- High
- Moderate
- Low
- Uncertain
- Projections unavailable



Key climate change risk factors for marine ecosystems



Changes in ocean circulation








Changes in connectivity

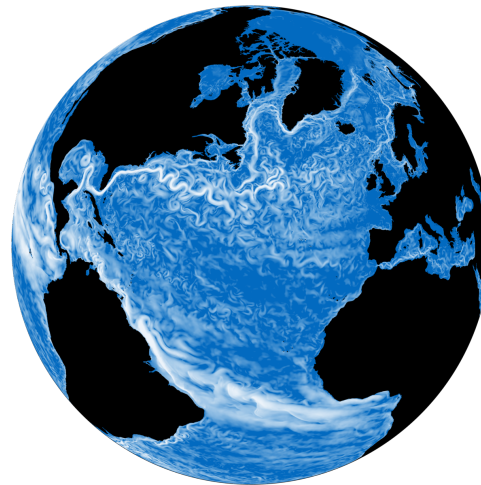


Changes in upwelling

Key Climate Change Indicators

Level of suggested impact:

-  High
-  Moderate
-  Low
-  Uncertain
-  Projections unavailable



National
Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

noc.ac.uk

NERC SCIENCE OF THE
ENVIRONMENT

Key climate change risk factors for marine ecosystems



Ocean acidification

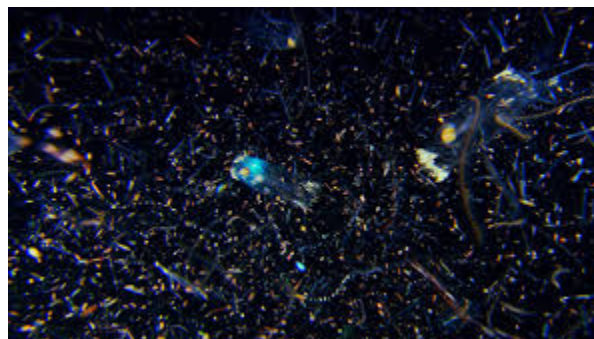


Ocean productivity

Key Climate Change Indicators

Level of suggested impact:

- High
- Moderate
- Low
- Uncertain
- Projections unavailable



Ocean acidification

The movie show on this slide can be found at

http://gullsweb.noc.ac.uk/ocean_projections.php#ph



**National
Oceanography Centre**
NATURAL ENVIRONMENT RESEARCH COUNCIL

noc.ac.uk

NERC SCIENCE OF THE
ENVIRONMENT

Key climate change risk factors for marine ecosystems



Sea level rise (0.5-1m)



Key Climate Change Indicators

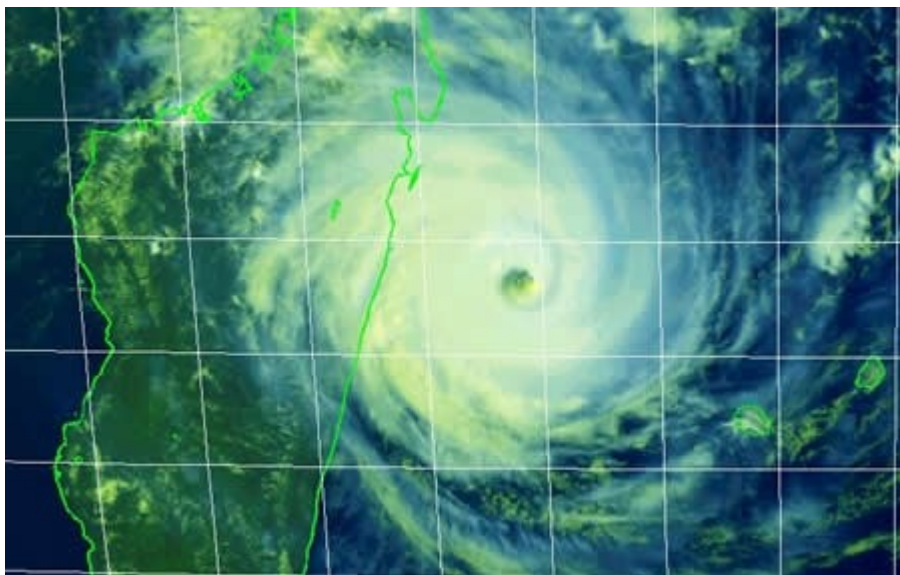
Level of suggested impact:

- High
- Moderate
- Low
- Uncertain
- Projections unavailable

Key climate change risk factors for marine ecosystems



Increase in the hurricane frequency and intensity (atmosphere)



Key Climate Change Indicators

Level of suggested impact:

- High
- Moderate
- Low
- Uncertain
- Projections unavailable

Climate change projections: main sources of information

CMIP5 and IPCC AR5 (2012-13) – ocean components of the Earth System Models had not yet reached sufficient resolution for regional projections

CMIP6 (2018-19) and IPCC AR6 (2020-21) – some of the Earth System Models in CMIP6 will have sufficient resolution for realistic regional projections on a scale of Large Marine Ecosystems

Pre-CMIP6 (now): some modelling groups have performed high resolution global ocean-only projections forced by emission scenarios. NOC (UK) is one of them. These projection can be used for regional analysis.

Workshop activities: marine climate change indicators

Goals:

- To inform workshop participants about future projections for the most generic climate change indicators (videos, report card)
- To work with local scientists and stakeholders to develop more regionally applicable indicators of climate change which can be routinely extracted from climate models

