

MDG18a Evolution of Reef in the Mahafaly Seascape, South-Western Madagascar

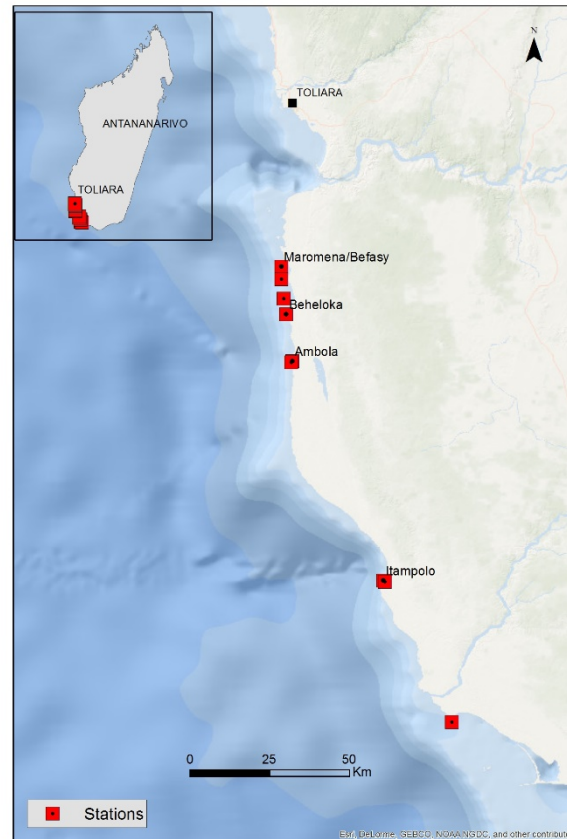
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Outline

- The project/operation C-RISe data was used for,
- What data was used,
- Summary of the main results
- Why is the information / analysis is useful,
- Future plans for the Use Case - will it be continued or repeated?
- Any recommendations (e.g. if other information, software or training would be useful).

Mahafaly



Use of the C-RISe data

- C-RISe Data was used to analyze the link with reef evolution from reef monitoring on 18 stations located on 09 villages, every 2 years from 2011 to 2016
- Correlation between climate data and reef monitoring results

Data used

- Different parameters targeted corals cover (hard coral, soft coral, dead coral) and algae cover (macro algae, encrusting algae and turf algae)
- Use of climate data (SST, rainfall, wave height, current direction) to understand the evolution of reef cover.

Main results



Figure1: Location of the study sites

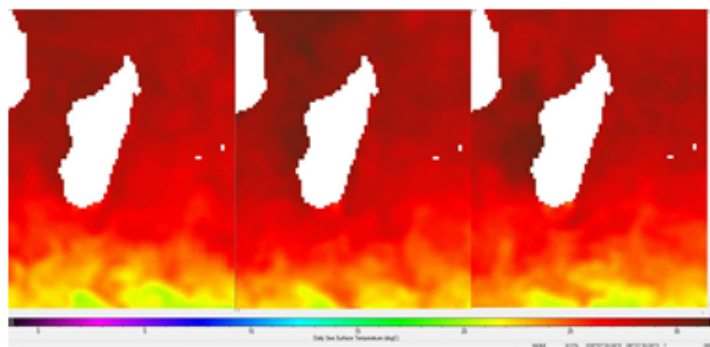


Figure 2. Sea Surface Temperature (January 2016), Images procuded by Bilko software from NOAA SST data

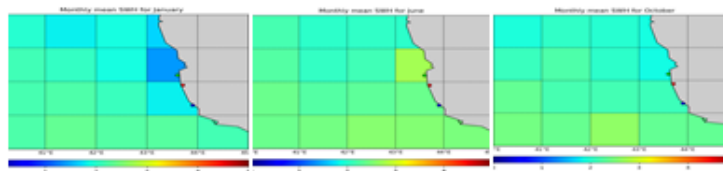


Figure 3. Monthly Mean Significant Wave Height, 1992-2016 (Maromena in green point, Ambola in red)

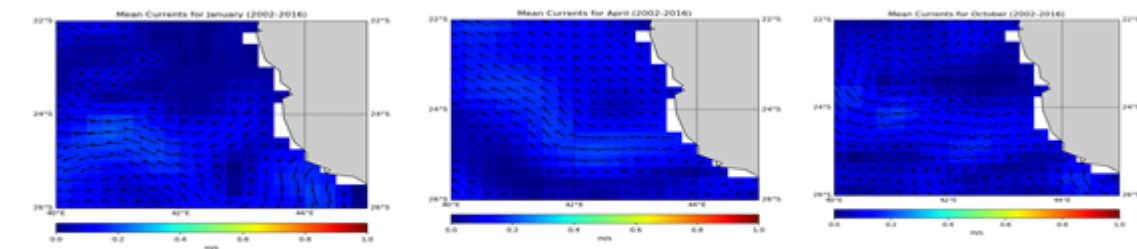


Figure 6 : Monthly Mean Current and Direction, 2002-2016 for January, April and October

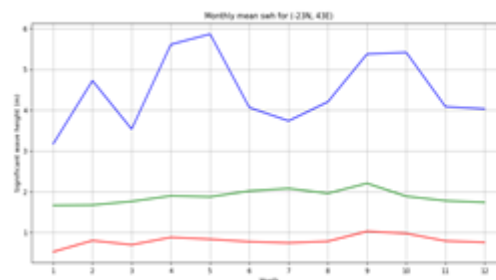


Figure 4 : Significant Wave Height Monthly Maximum (blue), Mean (green) and standard Deviation (red), at Maromena, 1992-2016

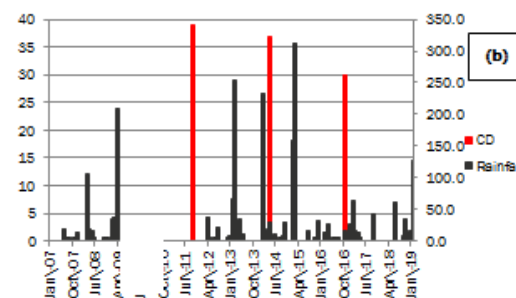
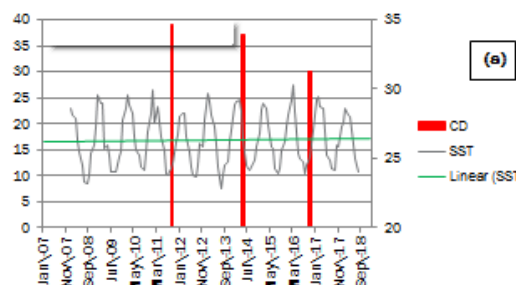


Figure 7. Evolution of hard coral cover (CD) and its relation with SST (a) and rainfall (b)



Figure 5 : Significant Wave Height Monthly Maximum (blue), Mean (green) and standard Deviation (red), at Ambola & Itampolo, 1992-2016

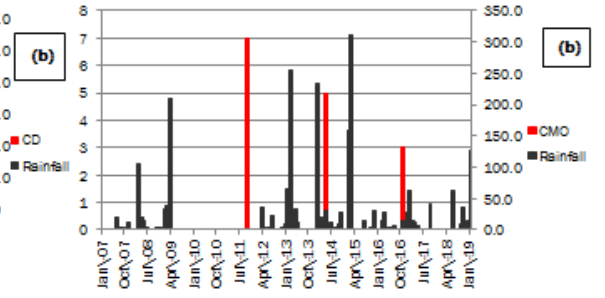
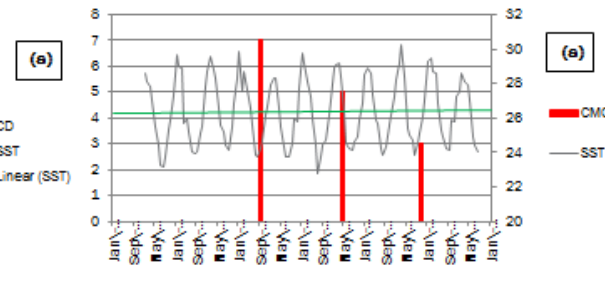


Figure 8 Evolution of soft coral cover (CMO) and its relation with SST (a) and rainfall (b)

Main results

- **Decrease** of the hard coral cover, soft coral cover; **Increase** of turf algae; Macro algae cover and incrustated algae cover remained **constant** (2011-2016)
- High precipitation means transportation of important sediments and pollutants from land into the sea by river, covering the reef.
- **Increase** of the SST ($0.013^{\circ}\text{C}/\text{year}$) was observed
- Heavy waves **might affect** the coral reef : For Maromena, significant wave height maximum is on May and may reach more than 5m. For Ambola and Itampolo, significant wave height maximum is on June with more than 4 m. The mean height varies from 1.5 m to 2.5 m.
- The ocean current speed is low, not exceeding 0.2 m/s. The **direction of the current is variable** during the period. It may have an impact on the health of the coral reef.

Utility of the information and analysis

- The reef system provides a physical barrier, ecosystem services for fisheries and shoreline protection.
- The livelihood of fishermen on the Mahafaly coast (South-Western Madagascar) depends on it.
- Data on the evolution of the reef system health and the causes of its perturbation provide important information to ensure their sustainable management and protection.
- The evolution of coral and algae cover is very complex as many factors (human, physical or climate factor) can contribute on it. Therefore, a deep understanding of these factors, through C-RISe data analysis, is key.

Future plans

- More refine reef monitoring:
 - To have details information, reef monitoring must be done more regularly (two per year: during the dry and the wet season), as current data (every two years) cannot be used to significantly conclude the trends of the change observed.
 - Prospecting the use of high resolution satellite data for reef monitoring
 - Field visit to understand and verify the results from climate data, including C-RISe Data (waves, current, etc.).
 - Effects of human activity which is a great reef degradation factor.
 - Effect of cyclones.

Recommendations

- Support for:
 - Training on satellite data processing and interpretation (including coral reefs image), statistical analysis
 - Access to specific and precise data (Chlorophyll concentration, CO₂, Wind speed, current direction, wave height, coral reefs satellite image, etc.)
 - Use of higher resolution SST (MUR SST) to explore patterns of seasonal and interannual variability
 - Analyse of SST to assess coral bleaching risk during warmest months