

CORAL REEFS and 3D MODELS

Modules 3 and 10

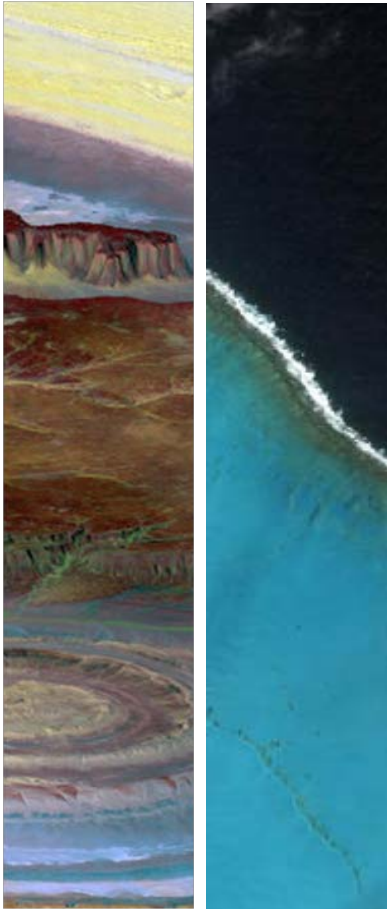
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16 juni 2009



SCIENCE EDUCATION THROUGH EARTH OBSERVATION FOR HIGH SCHOOLS

CORAL REEFS and 3D MOD



- Content of the modules:
 - Information Chapters
 - Educational Games
 - Exercises
 - Learn more

- Structure of the modules
 - Material for students
 - Material for teachers

CORAL REEFS and 3D MODELS

- Coral reefs
 - ▣ Identity card of Coral reefs
 - ▣ Importance of Coral reefs
 - ▣ Coral reefs under attack
 - ▣ Coral Bleaching
 - ▣ Remote sensing for coral reef mapping
- 3D Modules
 - ▣ Introduction
 - ▣ Some basic principles
 - ▣ 3D-Applications

CORAL REEFS and 3D MODELS


SEES Coral reefs

How do corals grow into reefs?

In constant evolution...

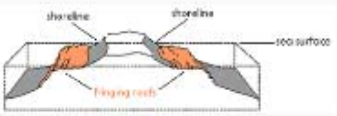
Like every living species on Earth, coral reefs have to go through different stages regarding their growth. They start as a fringing reef, change slowly into barrier reef, and may even turn into atolls (if the circumstances are right).

Fringing reefs



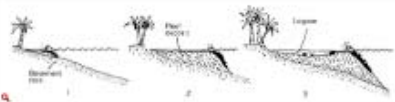
Fringing coral reef near Eilat (Israel). Photo: Wikimedia Commons, Mark A. Wilson.

Fringing reefs are relatively young. They can develop in shallow waters along the coast of tropical islands or continents. The corals grow upwards to sea level or just below and outwards towards the open ocean. Fringing reefs are generally narrow platforms a short distance from shore and don't contain a substantial lagoon.




Fringing reef. Source: NOAA.

With time, however, the narrow platform of the fringing reef may become hollowed out to form a shallow, lagoon-like channel and slightly transform into a barrier reef.



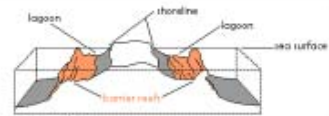
Fringing reef transforming into barrier reef. Source: NOAA.

Barrier reefs



Australia's Great Barrier Reef as seen by the Terra satellite (06/10/00). Source: NASA/GSFC/Earth/CITRIS/RSR Team.


Barrier reefs are similar to fringing reefs as they border the shoreline, however they occur at much greater distances from the land and a deep and wide channel or lagoon forms between both.




Barrier reefs. Source: NOAA.

Patch reefs

Patch reefs are isolated reef platforms of various shapes and sizes.





SEES Exercise 2 - Teachers' instructions

Chapter 1. Identify card of a coral reef

A closer look at the reef

Objectives

Students can point out and give some information on the different parts of the reef.

Materials

- Download the worksheet [A closer look at the reef](#) (200 KB .pdf file)
- Internet access

Time needed

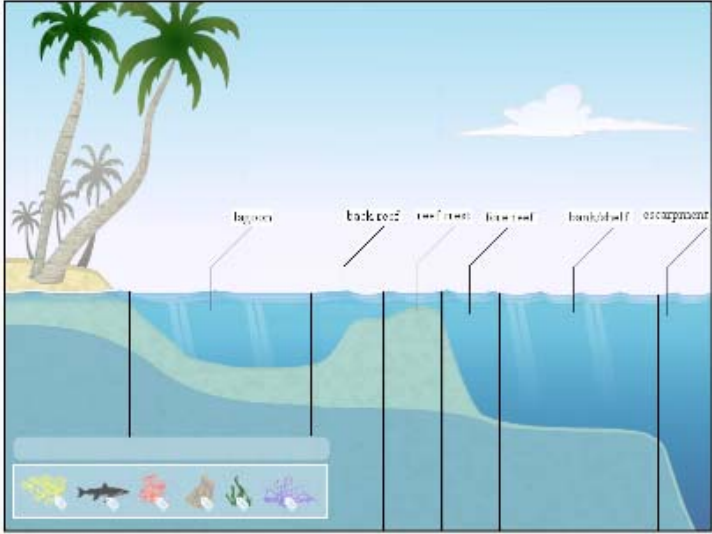
One class period

Procedure

Try to fill in the image and answer the questions by using the explanations in the [game](#).

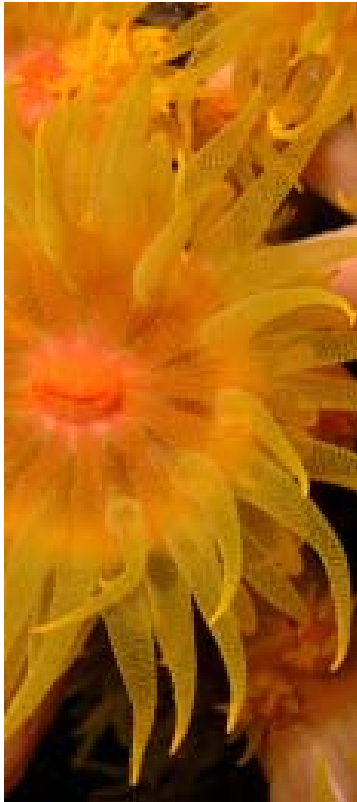
Answers

- The image below is a representation of a coral reef. Complete the image by naming every part of the reef. You can choose out of: fore reef, back reef, lagoon, bank/shelf, escarpment, reef crest. *TIP: If you haven't already, try to play the game.*



CORAL REEFS and 3D MODELS

Coral reefs



- Identity Card of Coral reefs:
 - What are they?
 - Global distribution of coral reefs
 - What do corals need?
 - How do corals grow into reefs?
 - From fringing reefs to atolls
 - A closer look at the reef

CORAL REEFS and 3D MODELS

Coral reefs



- Importance of coral reefs
 - ▣ Ecological treasure
 - ▣ Socio-economic value
 - ▣ Corals are the “canaries” of the seas

CORAL REEFS and 3D MODELS

Coral reefs



- Coral reefs under attack
 - ▣ Damage by storms,...
 - ▣ Coastal development
 - ▣ Tourism
 - ▣ Marine pollution
 - ▣ Destructive fishing
 - ▣ Global Change

CORAL REEFS and 3D MODELS

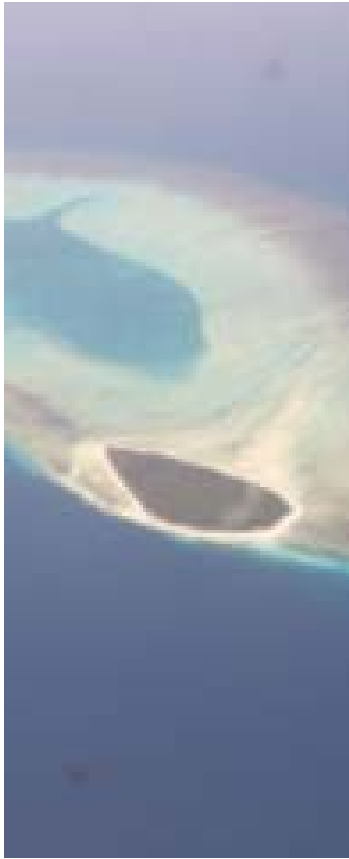
Coral reefs



- Coral bleaching
 - ▣ What is coral bleaching?
 - ▣ When does coral bleaching occur?

CORAL REEFS and 3D MODELS

Coral reefs



- Remote sensing for coral reef mapping
 - Why use remote sensing for coral reef research?
 - The advantage of satellite measurements
 - How to distinguish healthy from bleached corals
 - How deep is the sea?
 - Distinguishing the different parts of a reef
 - What's on the sea floor?

CORAL REEFS and 3D MODELS

3D Models



- Introduction
 - What is meant by 3D?
 - Why mapping in 3D?
 - History of 3D

CORAL REEFS and 3D MODELS

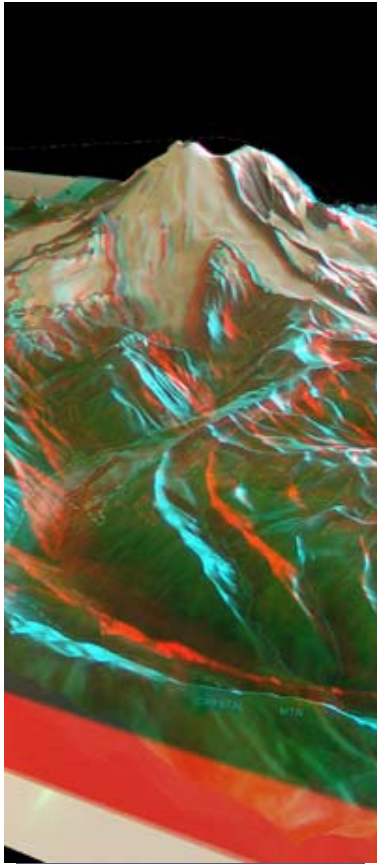
3D Models



- Some basic principles
 - Perspective projection
 - Relief displacement
 - Parallax
 - Stereovision

CORAL REEFS and 3D MODELS

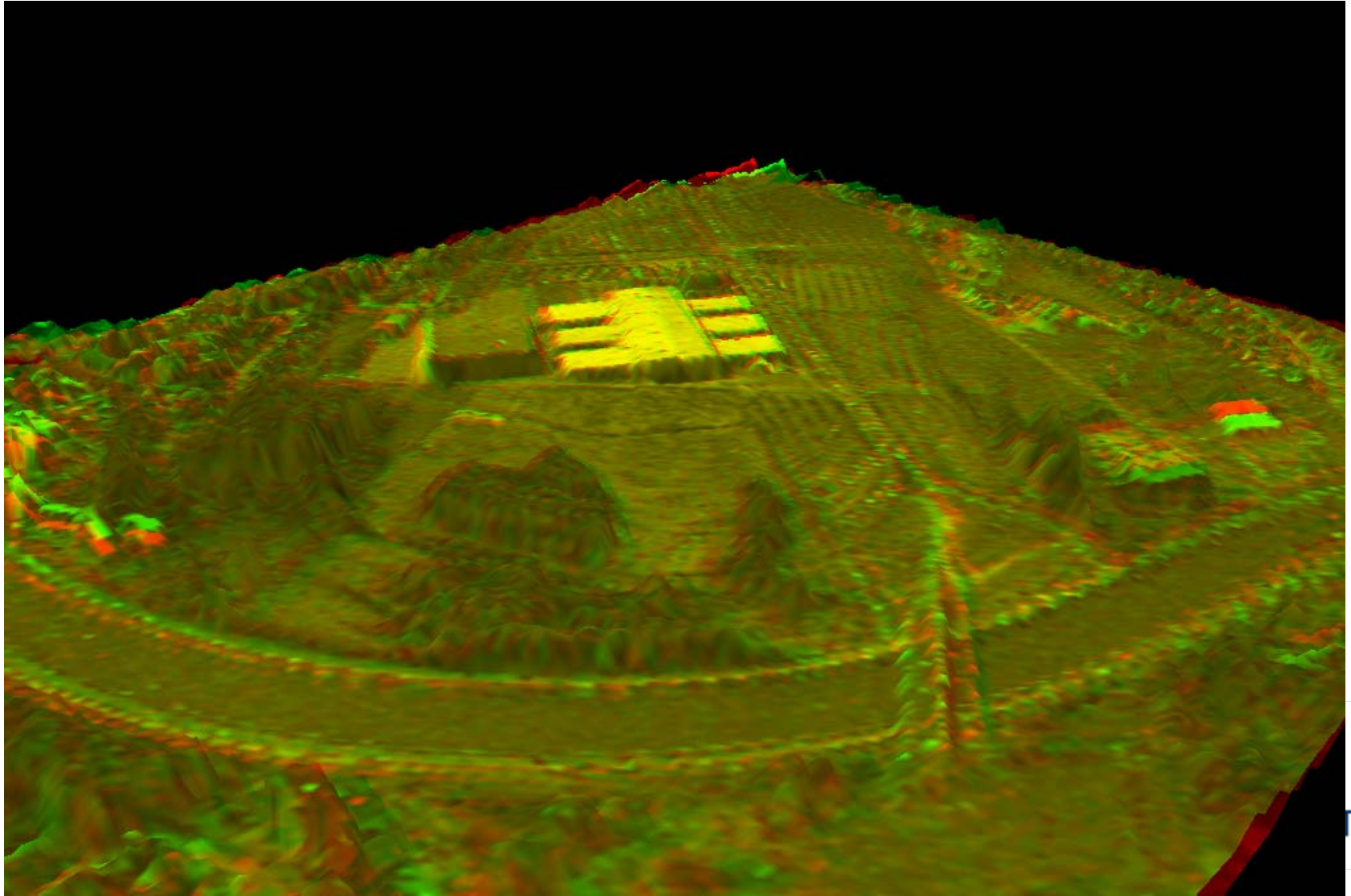
3D Models



- 3D-applications
 - Introduction to applications
 - DEM
 - Orthophoto
 - Drape
 - Anaglyph
 - Fly over

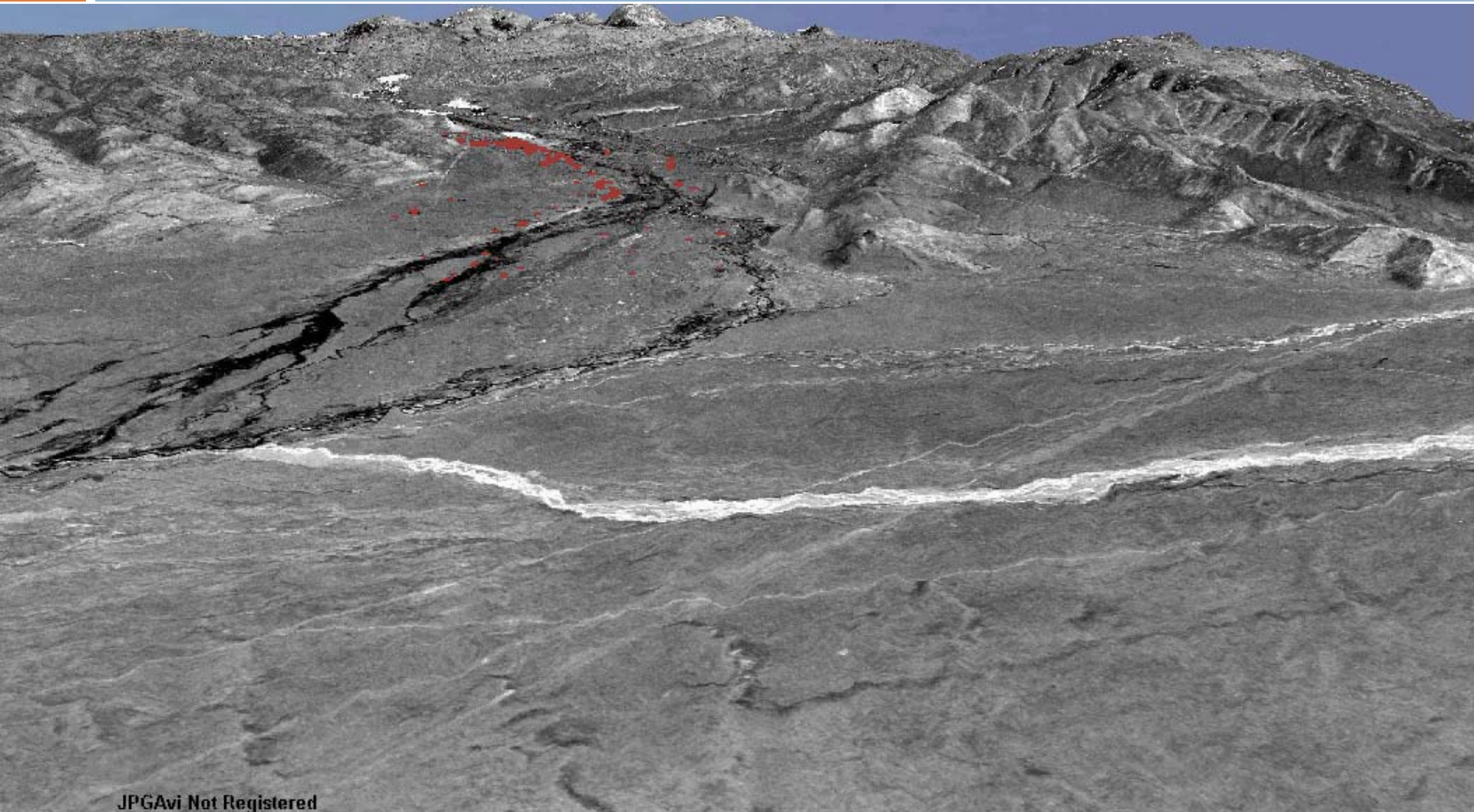
CORAL REEFS and 3D MODELS

3D Models



CORAL REEFS and 3D MODELS

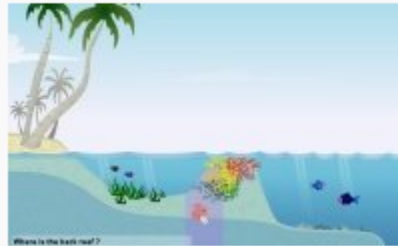
3D Models



CORAL REEFS and 3D MODELS

□ Educational games

A closer look at the reef



Studies of coral reefs show that most of the reefs have a similar structure where different parts can be distinguished.

This game helps you identify the different parts of a coral reef.

Coral reefs under attack!



Coral reefs become more and more stressed by several influences. These influences can be natural as well as human.

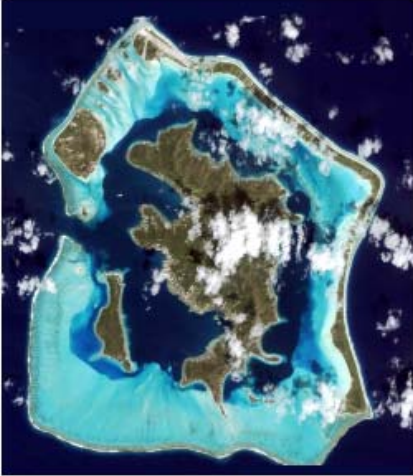
The following interactive image will show you the main threats to coral reefs.

CORAL REEFS and 3D MODELS

SEAS Exercise 1

Chapter 1. Identify card of a coral reef

Global distribution of coral reefs - What do corals need?



Data from seen by HROKOS (Table). Source: © 2006 GeoEye.

Objectives
Students learn to read and interpret the distribution of physical phenomena on a global map.
Students learn how to work with a basic GIS programme.

Materials

- Download the worksheet *Global distribution of coral reefs - What do corals need?* (3 MB .rtf file)
- Internet access

Procedure

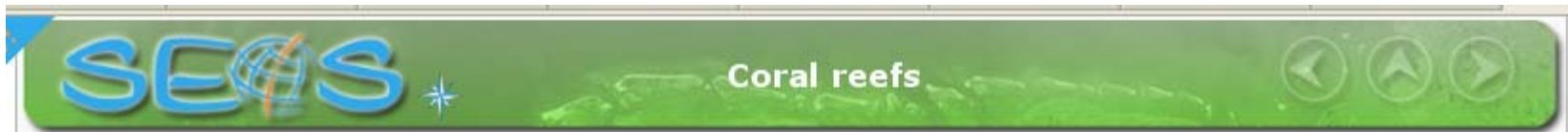
To localize the areas where corals occur, open the following site: <http://reefGIS.reefbase.org>
Go to 'Maps - Location of coral reefs'. Switch on the layer 'Reef Basemap'.

- Look for the latitudes in your atlas. Between which latitudes can the majority of the corals be found?
- Name 4 important regions where corals are located.
Why do you think the coral reefs are located in these regions and not in Alaska, for example?
- Can you explain why coral reefs are rare or absent in the tropical Atlantic of the west coast of South America and west coast of Africa?
TIP: Study the map of all oceans currents on earth in your atlas and make a link with previous question.
- Find out in your atlas where the Amazon and the Congo River systems flow into the ocean. Are there a lot of corals in this region?

- Exercises:
 - ▣ as online worksheet
 - ▣ + downloadable PDF
- Learn more
- References
- Links

CORAL REEFS and 3D MODELS

□ Teacher's Corner



SEOS Coral reefs

Worksheets, exercises and case-studies for use in the classroom

Chapter 1: Identity card of a coral reef

- **Exercise 1 - Global distribution - What do corals need?**
Go to the [online worksheet](#).
Download the [worksheet \(rtf\)](#) for use in class.
Check out the teachers' instructions and answers.
- **Exercise 2 - A closer look at the reef**
Go to the [online worksheet](#).
Download the [worksheet \(rtf\)](#) for use in class.
Check out the teachers' instructions and answers.

Chapter 2: Importance of coral reefs

- **Exercise 3 - ...**

Chapter 3: Coral reefs under attack




- **Exercise 4 - ...**

Chapter 4: Coral bleaching

- **Exercise 5 - Sea Surface Temperature and coral bleaching**
Go to the [online worksheet](#).
Download the [worksheet \(rtf\)](#) for use in class.
Check out the teachers' instructions and answers.

Chapter 5: Remote sensing for coral reef mapping

- **Case study - What's on the sea floor?**
Check out the [case study](#) of a bottom-type classification near Jebel Ali in the southern Arabian Gulf.
- **Exercise 6 - Mapping the risks**
Go to the [online worksheet](#).
Download the [worksheet \(rtf\)](#) for use in class.
Check out the teachers' instructions and answers.



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Thank you for your attention.....and questions?