Coastal Environmental Changes: Impact of sea LEvel rise

A focus on geomorphological impacts and potential land losses

ANR Research Project « Planetary Environmental Changes » 2009-2012

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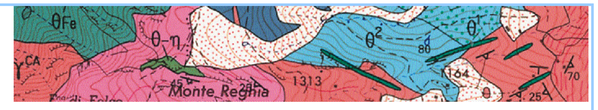
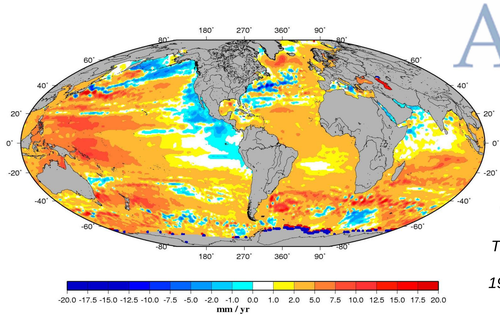
Sea level rise is a major consequence of climate change. Therefore, the primary objective of the CECILE project is to study the physical impact of sea level rise on coastal environments during the last ~50 years and in the coming century. This multidisciplinary project combines the expertise of seven partners to: observe and quantify past absolute and relative sea level rise, model the effects of climate change on future sea level rise, and assess the impacts on the coastal zone.





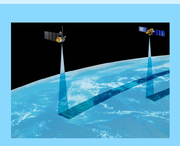
Regional sea level rise variability: linear trends estimaed with TOPEX/Poseidon satellite observations between 1993 and 2007 (Source: LEGOS)

WP1: Study site selection and database creation

WP2: Global and regional scale absolute sea level rise (LEGOS)

WP3: Relative and absolute sea level rise (LIENSS, LEGOS, SHOM)

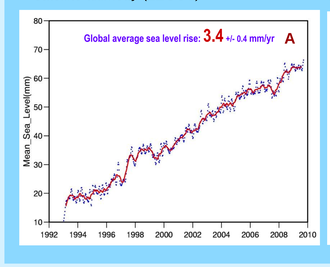
Historical and current observations

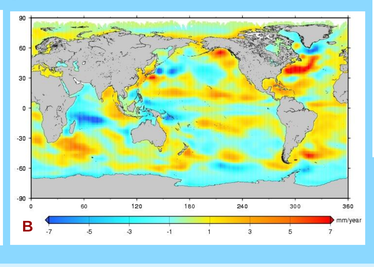


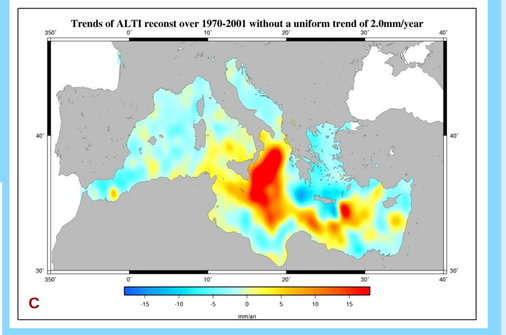
***A:** Sea level rise since 1993, as observed by TOPEX/Poseidon satellite altimetry (LEGOS)*

Observation and interpretation of absolute sea level *(1950-2010)*

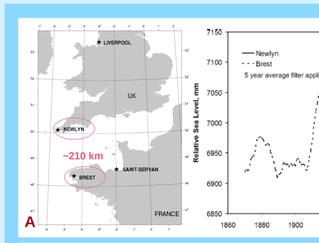
- *Satellite altimetry (since 1993)*
- *Sea level reconstructions using tide gauges (1950-2010)*
- *Regional scale sea level rise variability*
- *Study of the climatic contributions*

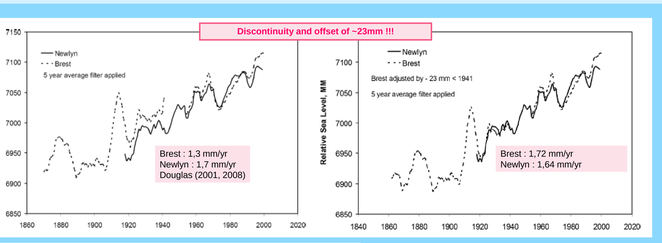






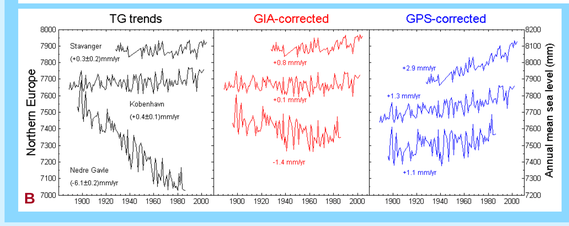
Reconstructions of historical sea level rise variability:
***B:** (1950-2003) on the global scale (Llovel et al. 2009)*
***C:** (1970-2001) in the Mediterranean Sea (LEGOS)*





***A:** Demonstration of detection methods used to identify problems in tide gauge time series. Example: Brest and Newlyn tide gauges, source: Wöppelmann et al. 2008 (LIENSS)*

***B:** Estimated tide gauge (TG) trends (left), and corrections using a glacial isostatic adjustment (GIA) model (center) and GPS observations (right). Source: Wöppelmann et al. 2009 (LIENSS)*



Observation and interpretation of relative and absolute sea level rise at the coast (1800's-2010)

- *Quality and consistency of historical tide gauge time series*
- *Analysis of non-linear terms and low frequency variability*
- *Local studies (Gulf of Mexico, Alexandria, Madagascar)*
- *Analysis of tide gauge and GPS time series at regional and global scales (« the fingerprint issue »)*

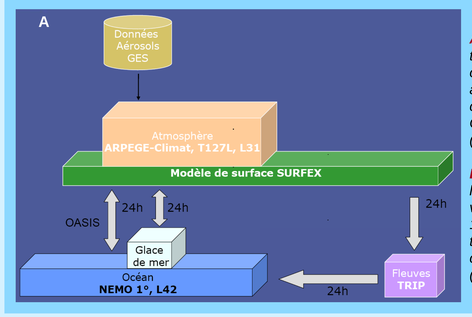
WP4: Future sea level rise predictions (CNRM, CERFACS, LEGOS)

WP5: Coastal vulnerability (BRGM, CREOCEAN, LEGOS, LIENSS, CNRM, CERFACS)

Future evolution

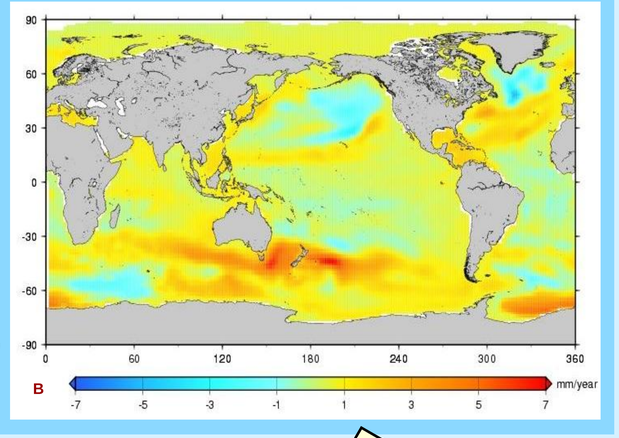
Climate modeling (1805-2100)

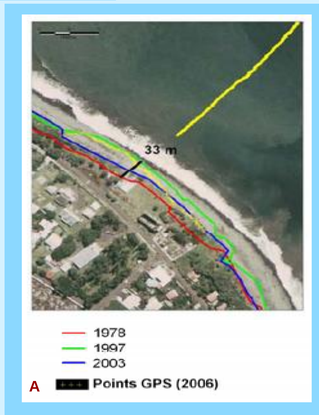
- *Sea level rise predictions in 2100*
- *Analysis of global and regional-scale predictions*
- *Improvement of climate models with comparisons between hindcasts and historical reconstructions*



***A:** Diagram of the coupled ocean-atmosphere climate model CNRM-CM5 (CNRM)*

***B:** Global sea level rise variability since 1950, based on the coupled climate model (CNRM)*





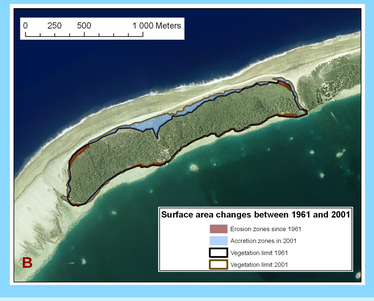
***A:** Observations of cliff and shoreline retreat at La Réunion (source: De La Torre, 2004)*

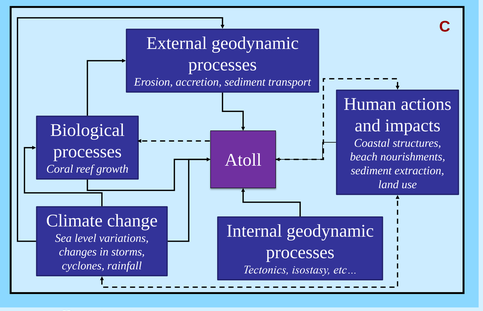
Assessment of coastal vulnerability (1950-2100)

- *Observations of coastal evolution at several study sites (since ~1950)*
- *Analysis of factors contributing to historical change*
- *Identification of the impacts of sea level rise*
- *Assessment of future hazard evolution at the study sites (in 2100)*

***B:** Analysis of motu evolution on the atoll Manihi, French Polynesia*

***C:** Diagram of primary factors impacting the coastal evolution of atolls*





WP6: Presentation of results

Project internet site:
http://www.anr-cecile.fr/

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