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Mouvements verticaux de la croûte et variations du niveau marin: exemple des îles Torrès

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Geo
AZUR
TERRE - Océan - Espace





“possibly the world’s first community to be formally moved out of harms way because of climate change” [2005 Climate Conference in Montreal, UNEP].

Agriculture, forestry and climate change

Purpose

This brief focuses on four questions:

- How is climate change likely to affect Pacific agriculture and forestry?
- What assistance will farmers and resource owners need to adapt to climate change?
- How can agriculture and forestry help mitigate climate change?
- What policies are recommended to promote adaptation and mitigation?

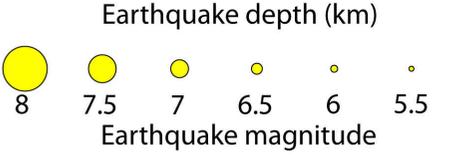
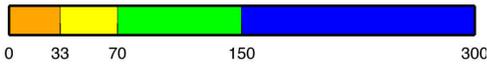
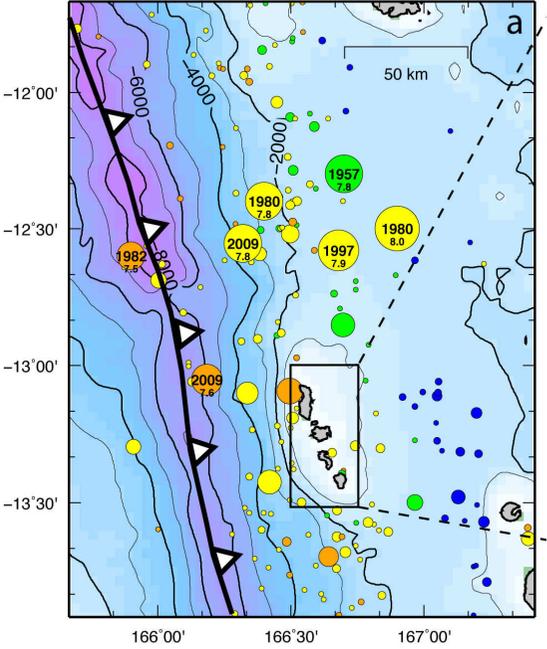
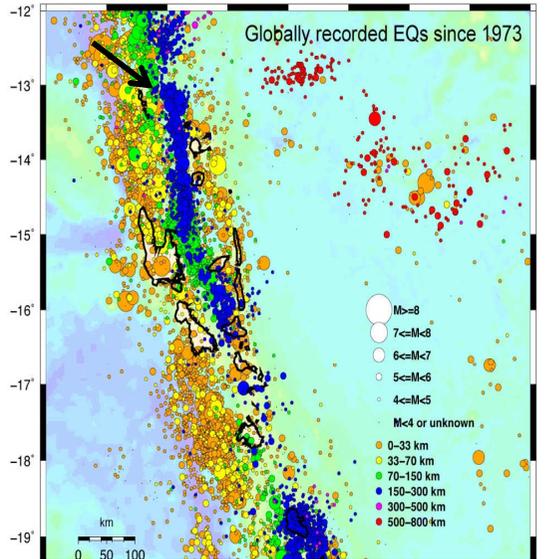
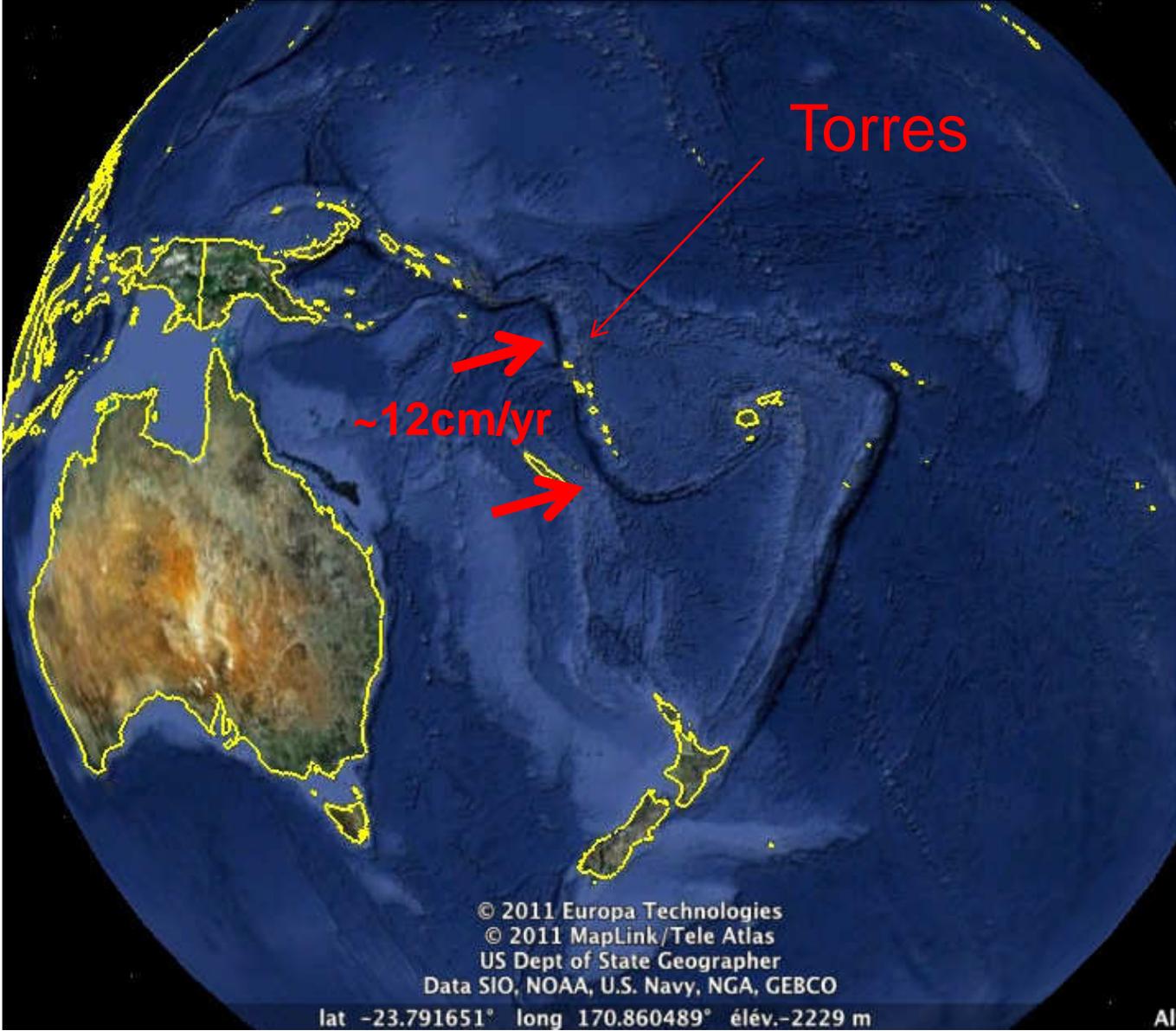
Key messages

- Climate change is projected to have dramatic consequences for agriculture and forestry in the Pacific. Changes in surface temperature, rainfall patterns, and the severity of tropical cyclones are expected to:
 - directly affect the crops, livestock and agricultural systems that underpin food security and livelihoods in the region; and
 - indirectly affect productivity by disrupting vital ecosystem services, such as maintenance of soil fertility, water regulation and biological diversity, and by altering the distribution of pests and diseases.
- Raising awareness of the likely impacts of climate change amongst all stakeholders is vital to ensuring that the appropriate political and economic frameworks are developed to support effective adaptation and mitigation.
- More detailed information about projected climate changes at regional, national and local levels is necessary to improve our understanding of the vulnerability of agriculture and forestry to climate change. Access to such information is essential to reduce the current uncertainty, and to ensure the effective planning and implementation of adaptation strategies.
- Scientific research is required to develop projections of the effects of climate change on Pacific agriculture and forestry – the models developed for agricultural commodities grown in other parts of the world, such as wheat, maize and rice, have little application here. Mechanisms must also be established to ensure that this research leads to activities on the ground that strengthen the resilience of rural communities to climate change.
- Pacific Island countries and territories (PICTs) can also contribute to global efforts to reduce greenhouse gases by promoting sustainable land and forestry management and protecting forests as important carbon sinks.



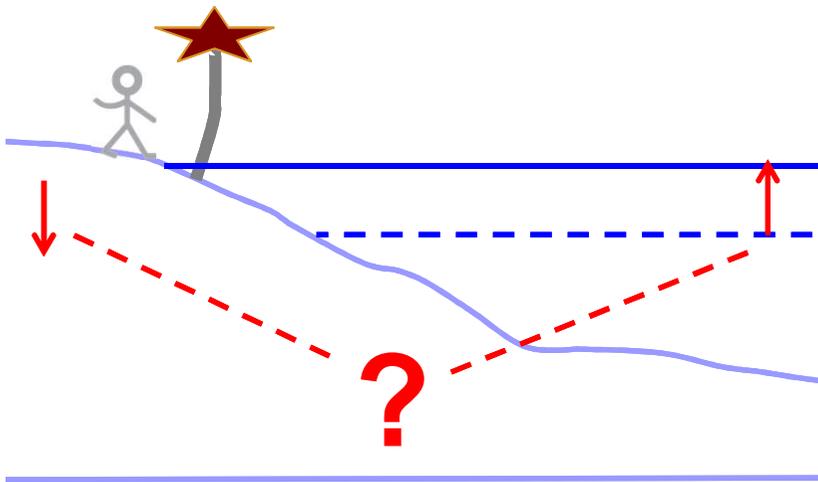
Photo: Brian Phillips

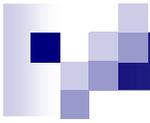
Coconut plantation suffering the effects of salt water inundation - Loh Island, Torres Group, Vanuatu



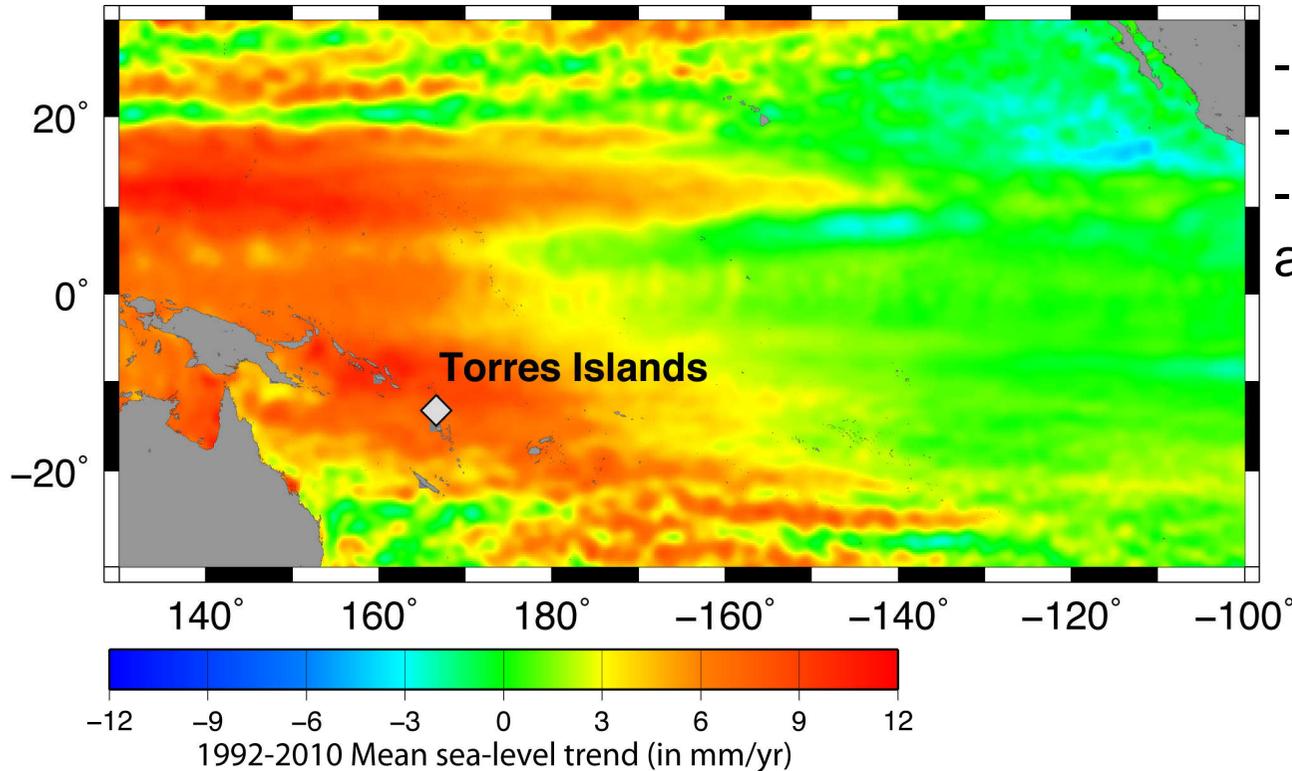
Inondations cotières aux Torrès:

- ✦ Montée du niveau marin dûe au réchauffement global?
- ✦ Subsidence du sol liée à la tectonique?
- ✦ ou une combinaison des deux effets?



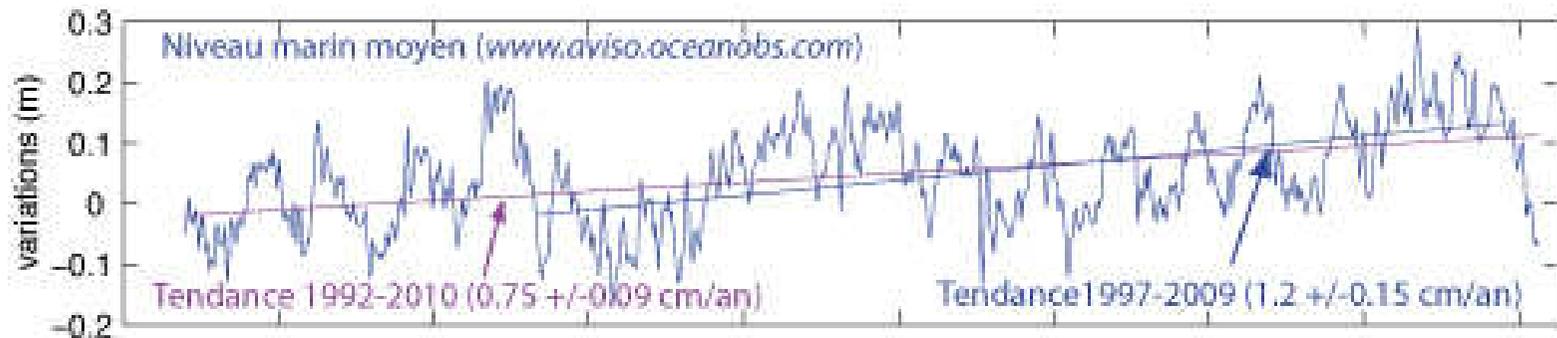


Variations absolues du niveau marin vues par satellites

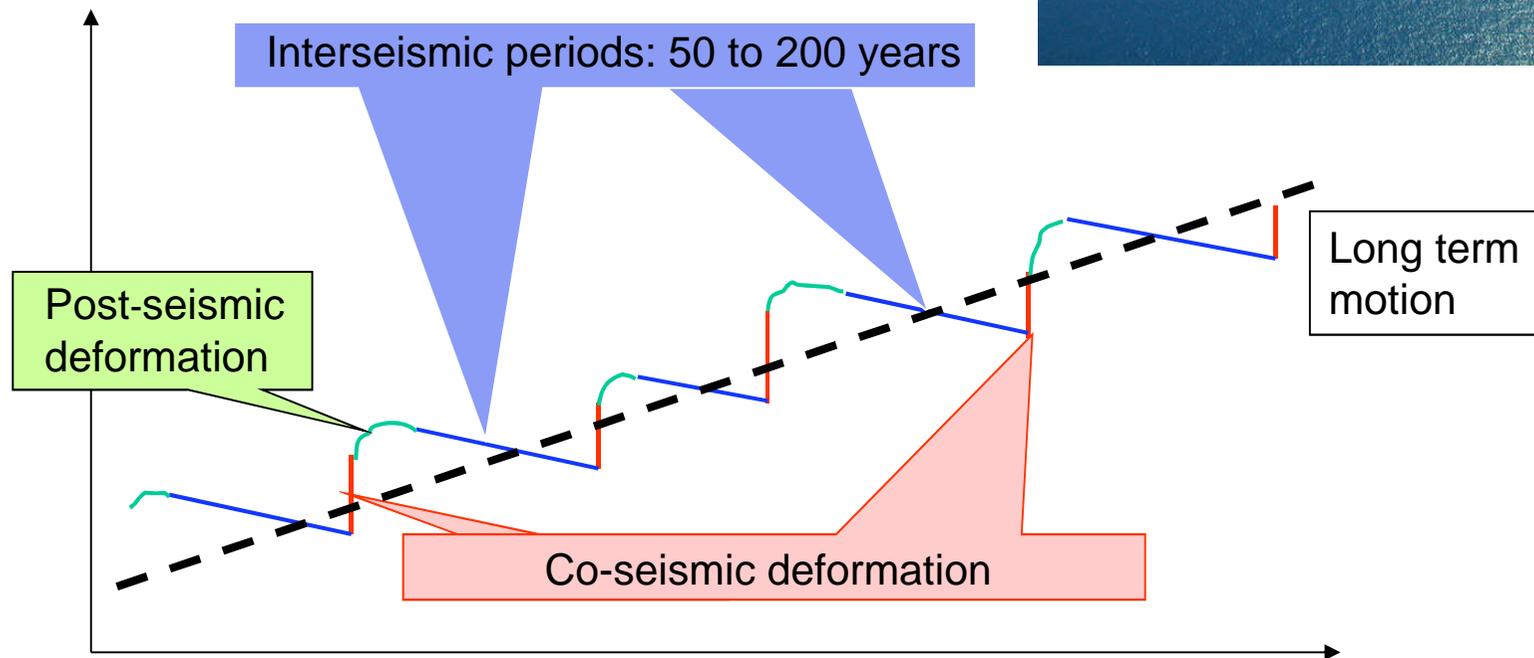


- >> 2-3 mm/an...
- Non linéaire
- rôle majeur de l'oscillation australe El Niño/La Niña

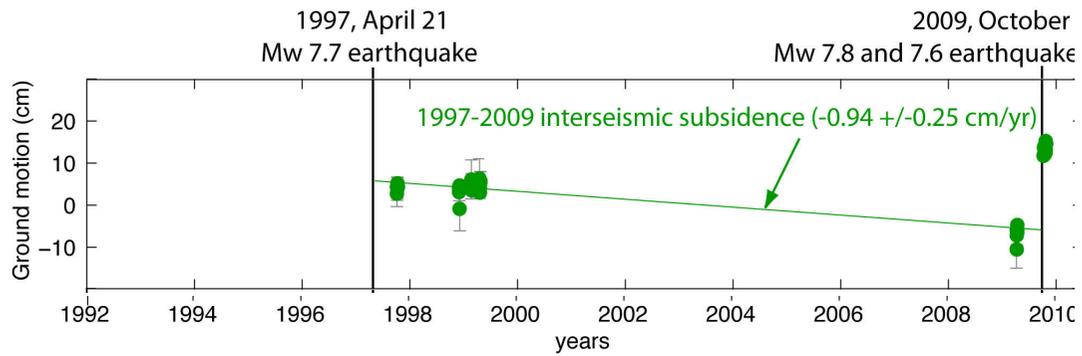
Source:
AVISO/CNES/CLS



- Sur le long terme, les îles Torres se soulèvent de $\sim 1\text{mm}/\text{an}$ (Taylor et al. 1985).
 - Plateaux coralliens soulevés
- Processus à différentes échelles de temps se superposent



Exemple de cycle sismique typique en contexte de subduction



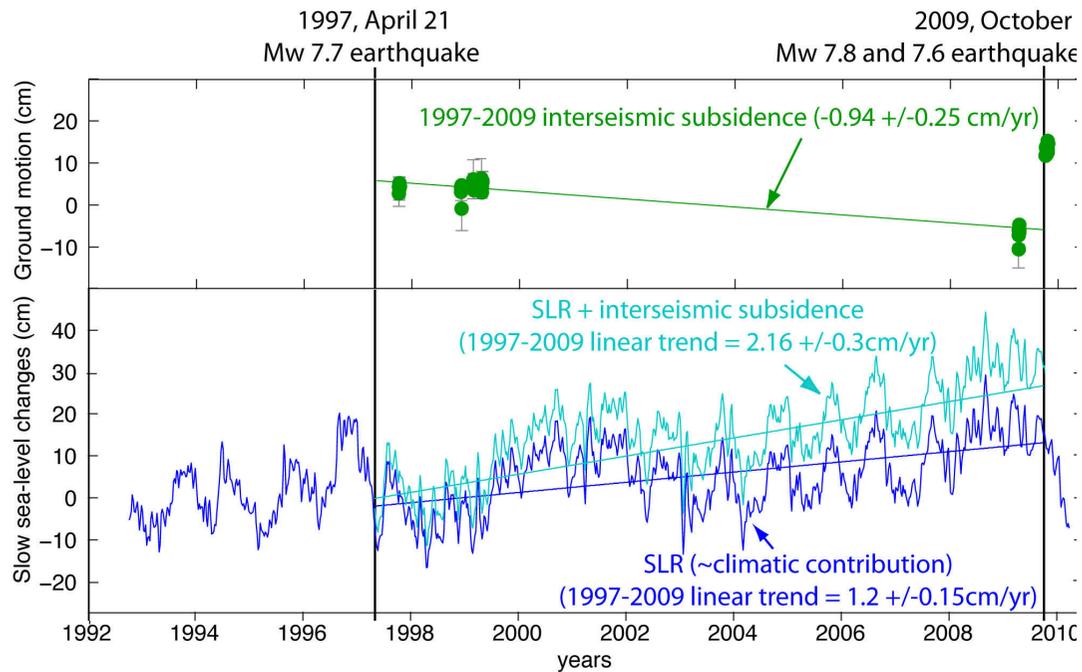
Mouvement vertical du sol:

- Intersismique (~1cm/an)
- Co-sismique



Avril 2009

2. Coastal flooding: Torrès Islands case



Mouvement vertical du sol:

-Intersismique (~ 1 cm/an)

-Co-sismique

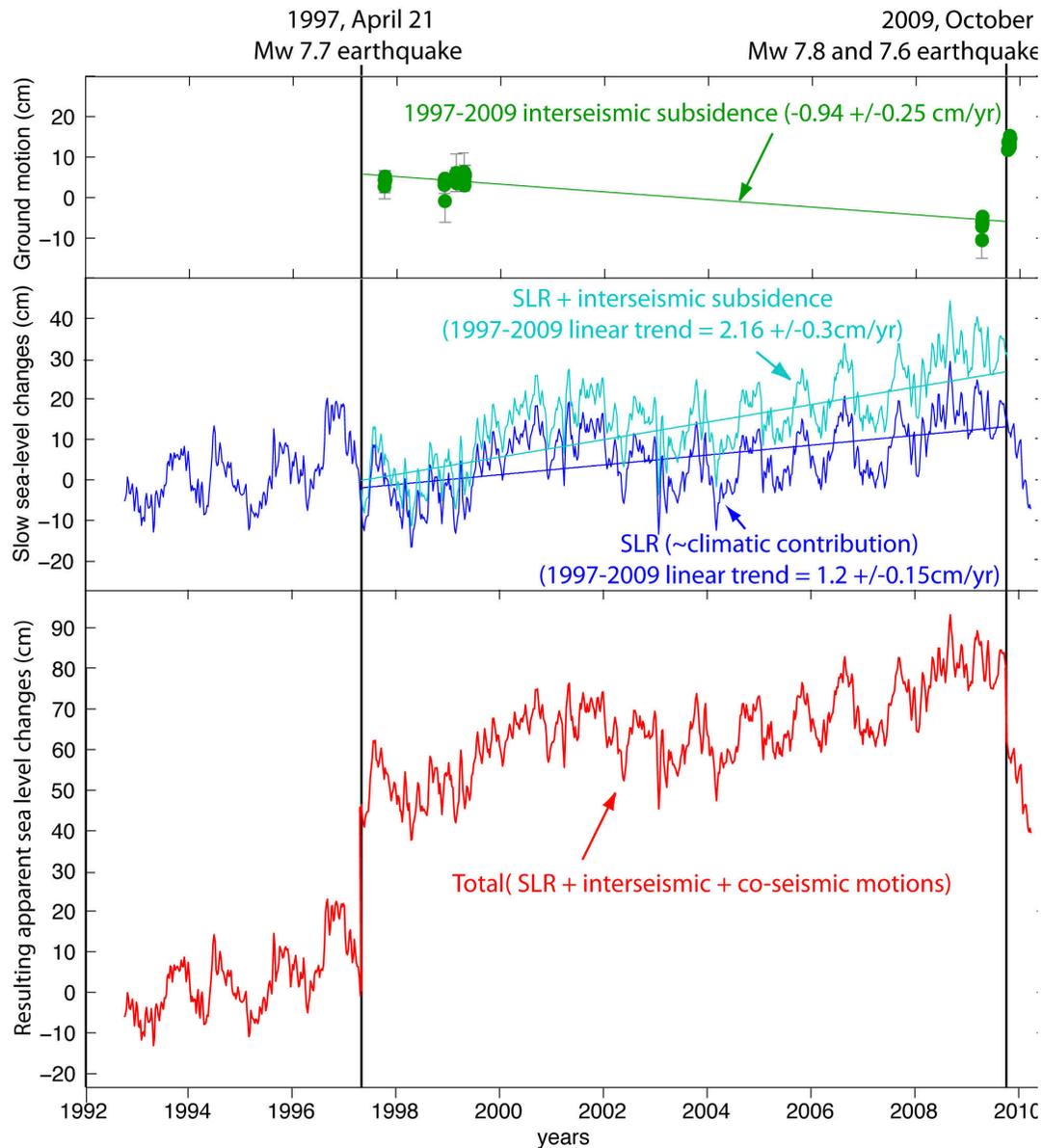
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Variations absolues du niveau
marin

-saisonnieres+ ENSO

-Long terme

2. Coastal flooding: Torrès Islands case



Mouvement vertical du sol:
-Intersismique (~1cm/an)
-Co-sismique

+

Variations absolues du niveau
marin
-saisonnieres+ ENSO
-Long terme

=

Variations relatives du niveau
marin

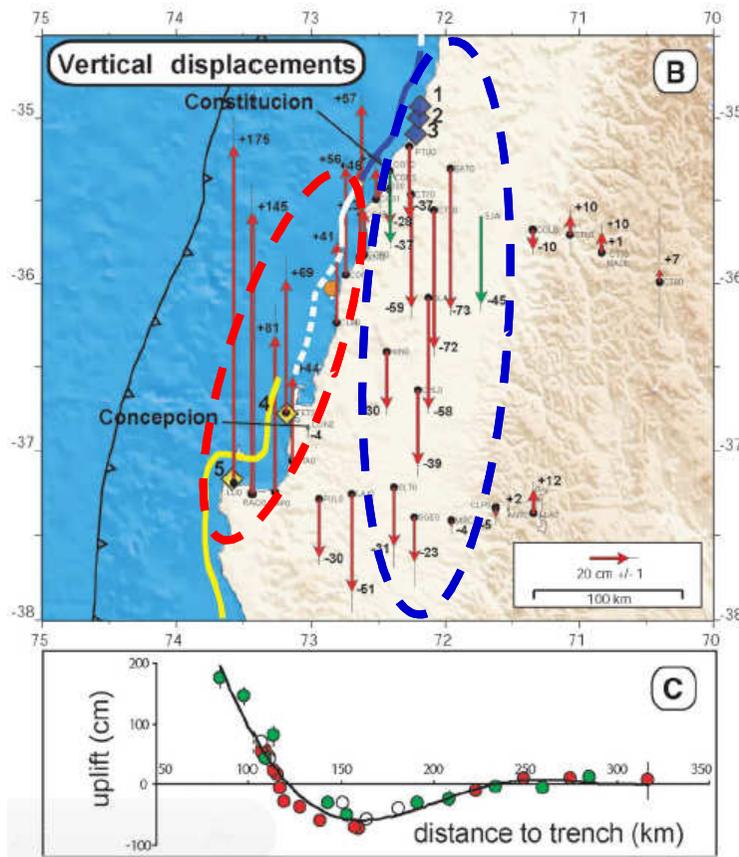
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- **Mouvements du sol**
 - Intersismique: proche de 1 cm/an (continus)
 - Co-sismique: 10 cm- 1m (fréquents)
 - **Variations du niveau marin : OUI**
 - Rôle important de l'oscillation australe El Nino / La Nina. +/- 20 cm
 - **Rôle du changement climatique?**
 - Montée des eaux à long terme possible/probable
 - Mais ce n'est pas le rôle dominant

- Le facteur dominant, dans ce cas particulier, n'est pas le changement climatique...
- Est-ce un problème de se tromper de cause, à partir du moment où le village a déménagé?
- Probablement oui... ils auraient pu bouger dans un endroit plus sûr..., moins exposé aux mouvements futurs et aux tsunamis.



- Le cas des Torrès est une illustration parlante, mais pas un cas isolé...
- Dans les zones tectoniquement actives, ça bouge... et pas seulement en horizontal.

2010 Séisme M8.8 Maule/Chili



Vigny et al. Science, 2011

2011 Séisme M9 Tohoku

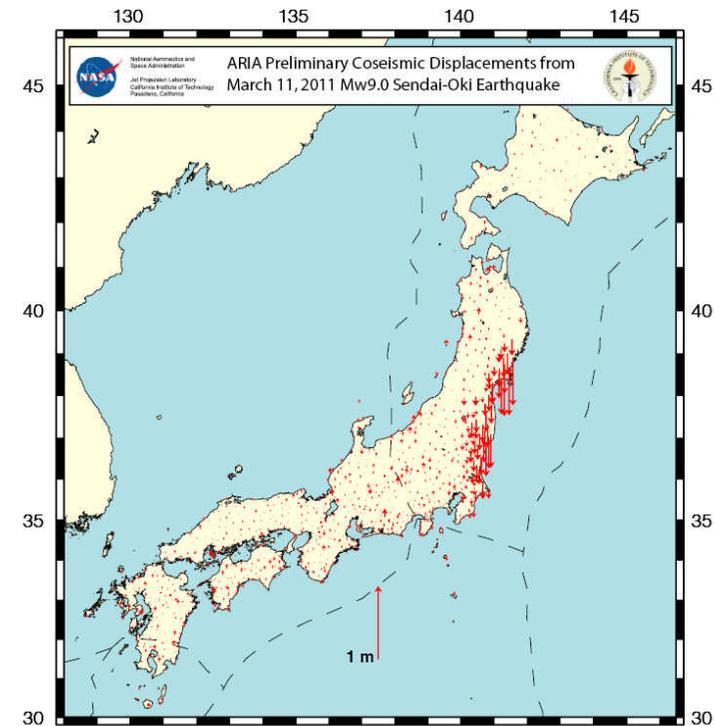
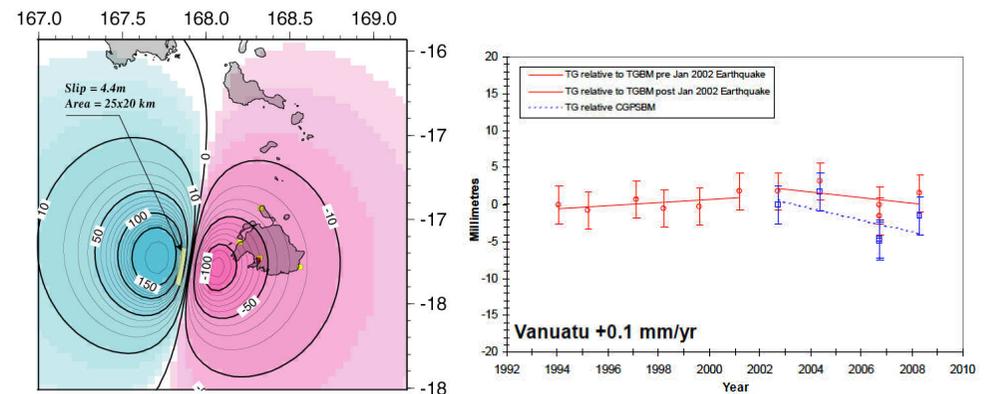
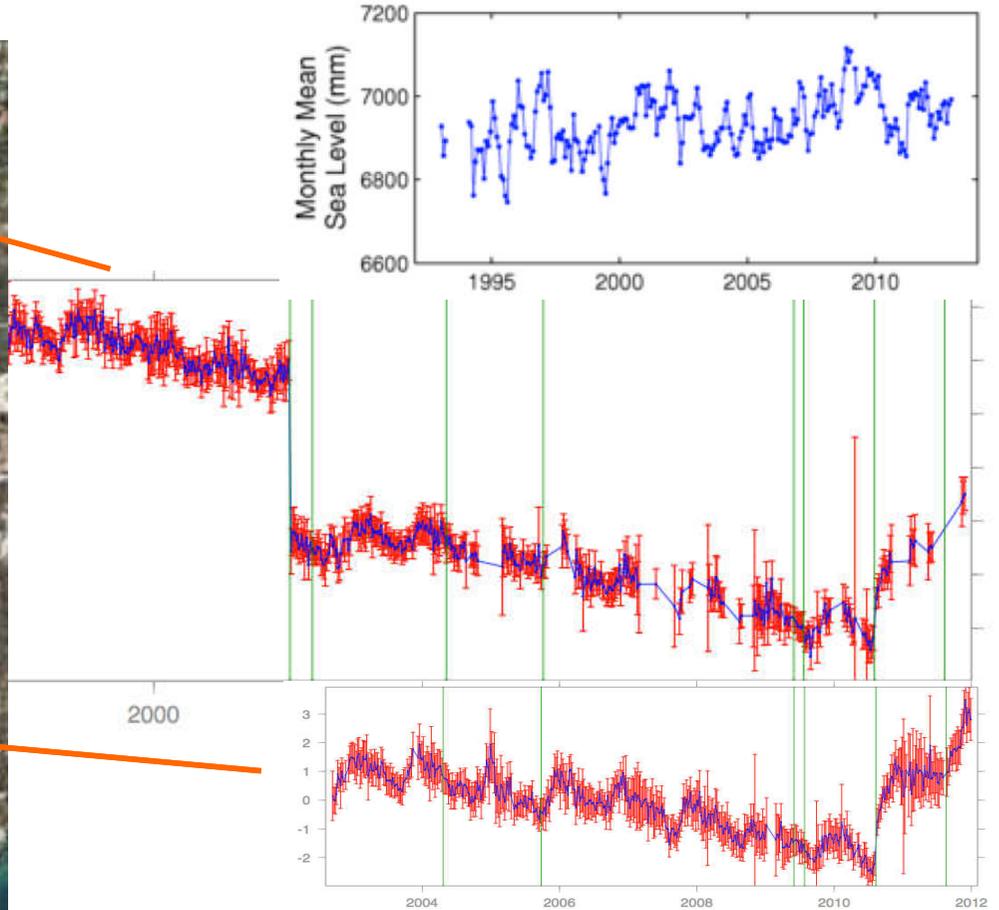
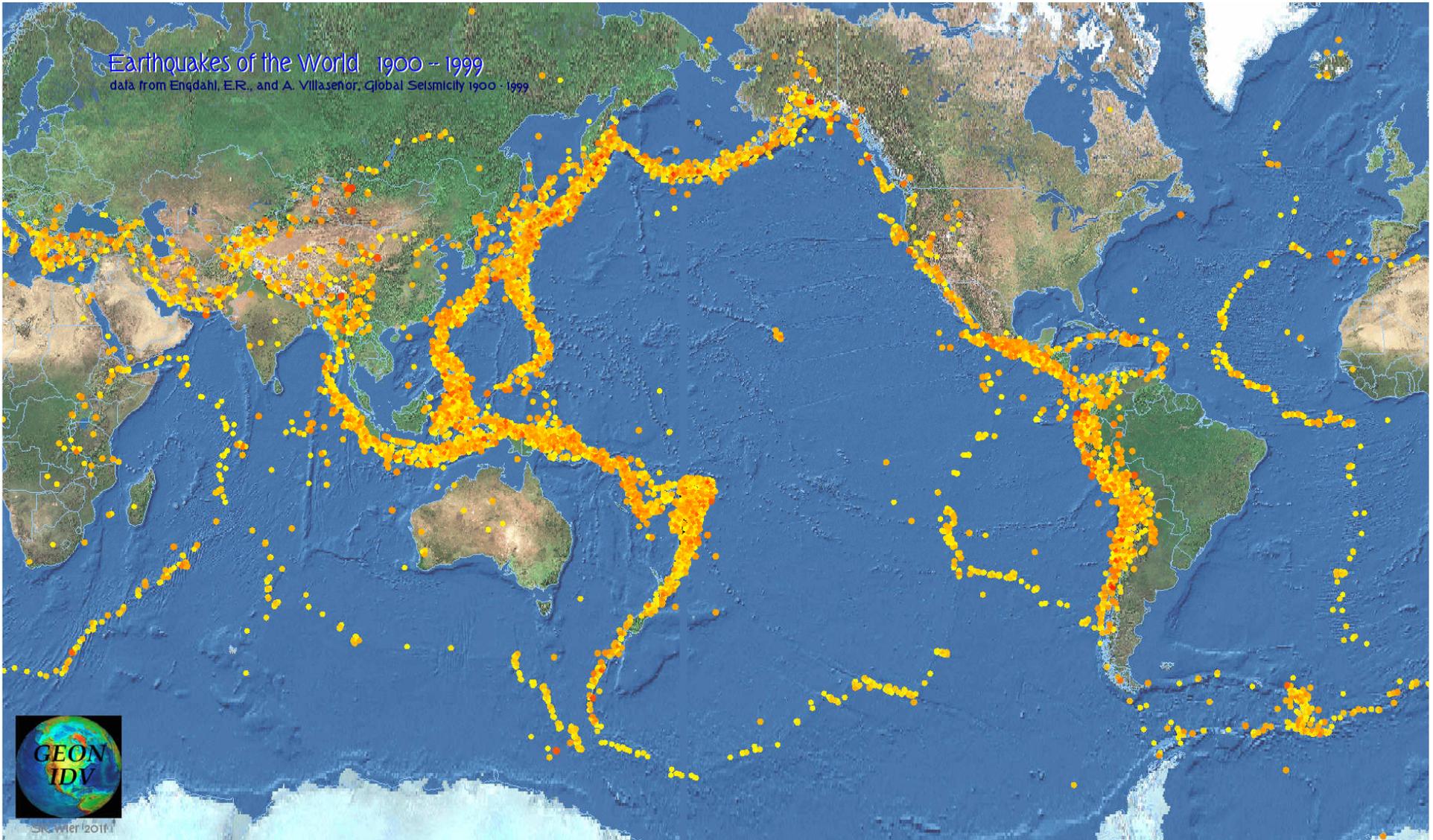
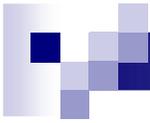


Figure shows version 0.2 vertical displacements based on difference between estimated positions of GEONET stations at 05:00 and 06:30 UTC on March 11, using JPL's Rapid orbit solution and using JPL's GIPSY-OASIS software. Solutions courtesy of ARIA team at JPL and Caltech. All original GEONET RINEX data provided to Caltech by the Geospatial Information Authority (GSI) of Japan.

Marégraphe de Port-Vila / CGPS



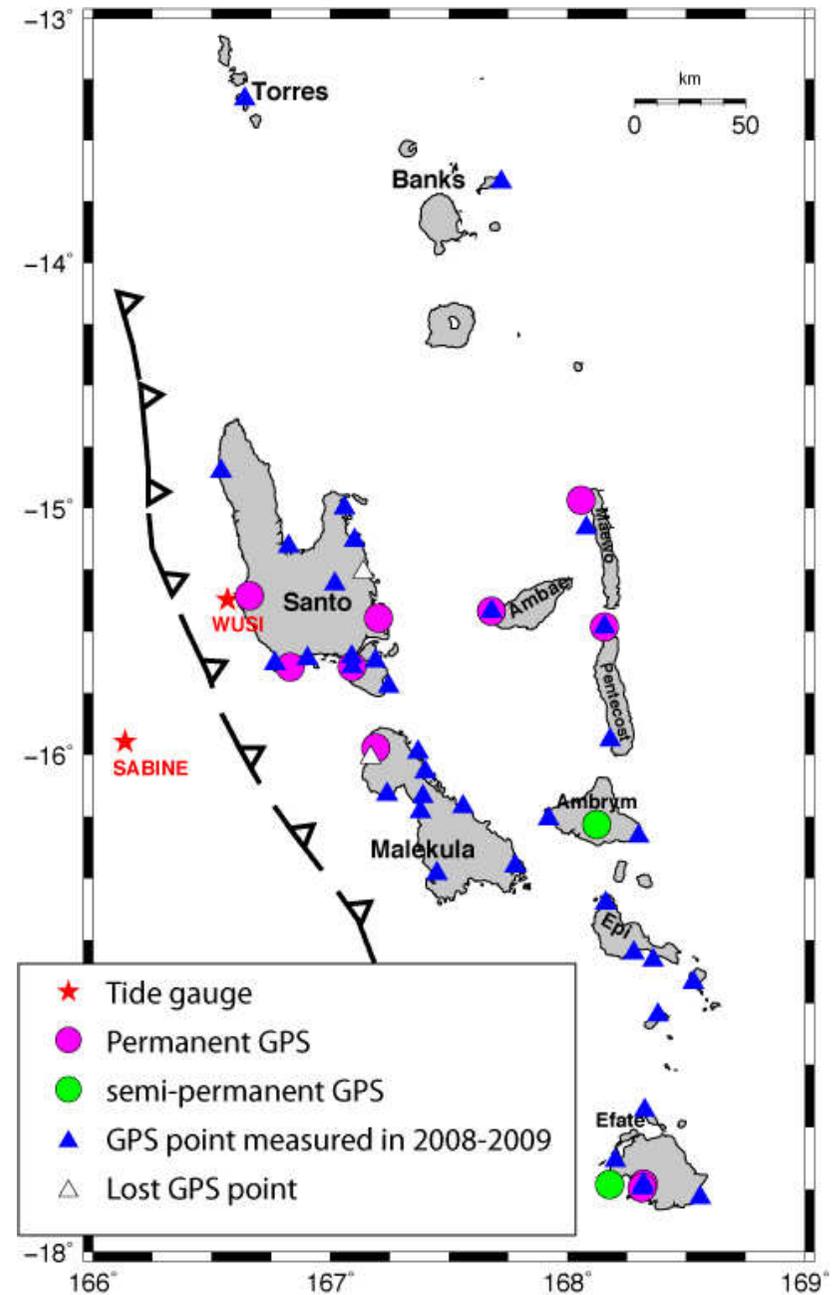


Not many EQ free coastlines around the Pacific ocean

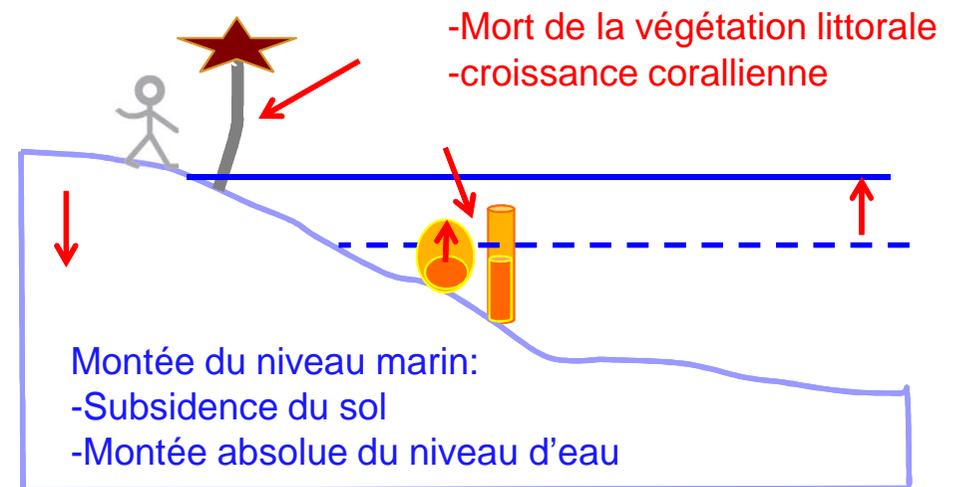
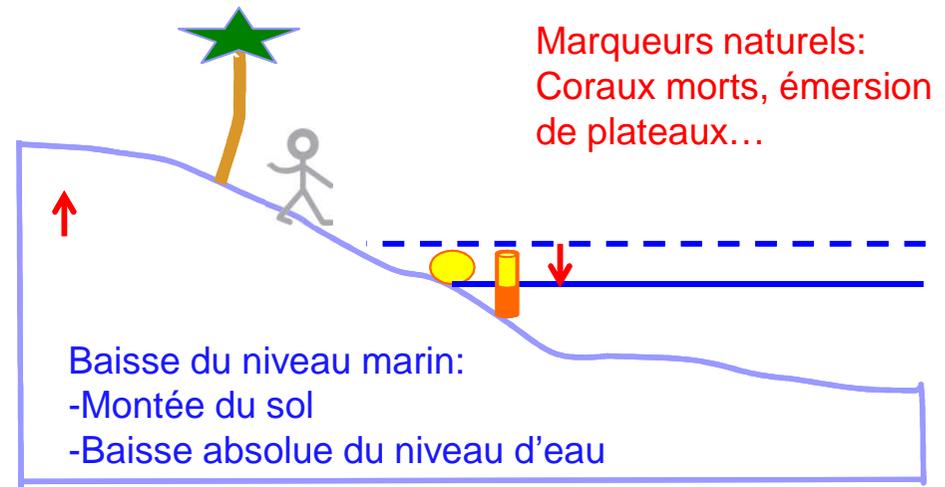
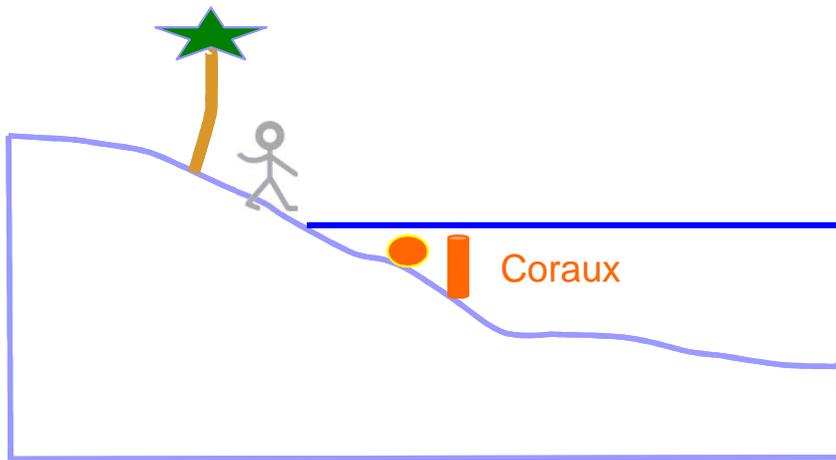
- Geodetic network installed in 90's (U. Texas, Orstom, ST, DGM)
- Periodic reoccupation



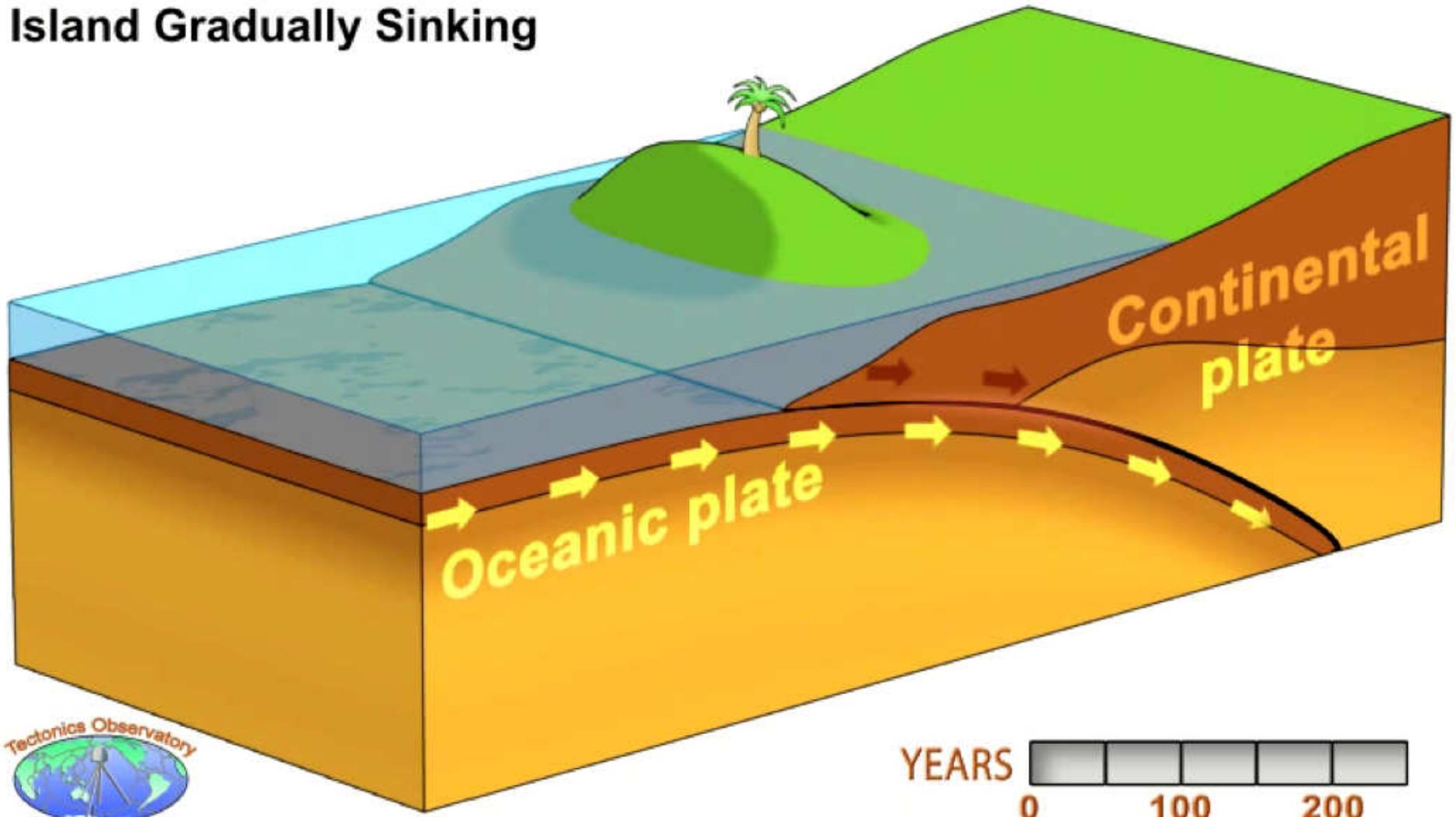
April 2009

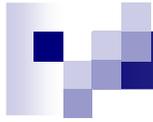


Variations du niveau marin relatif

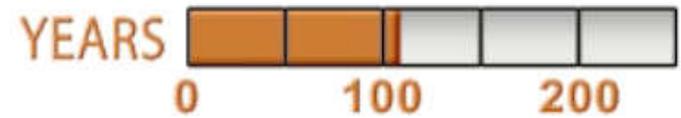
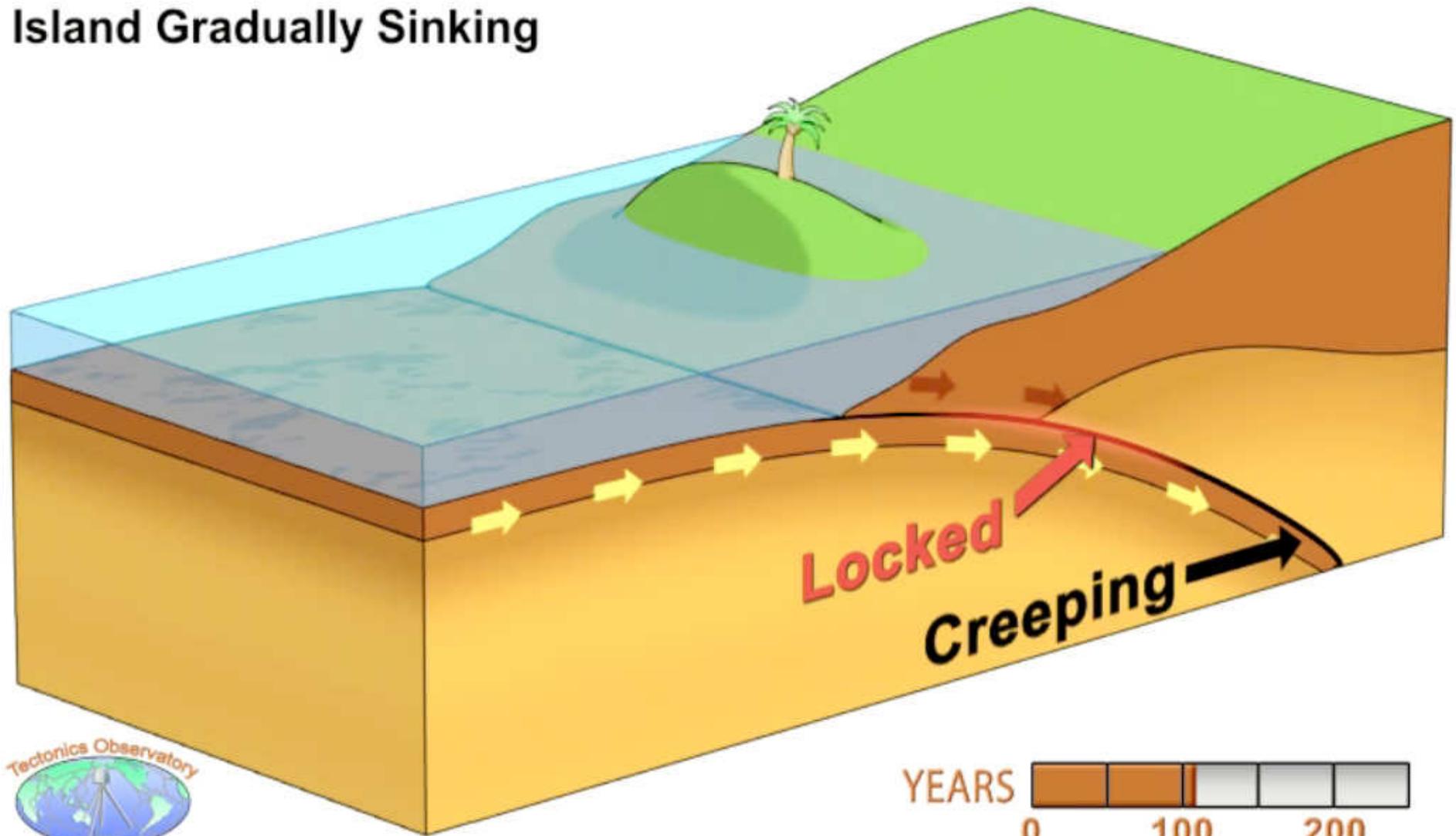


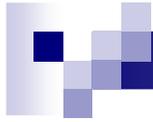
Island Gradually Sinking



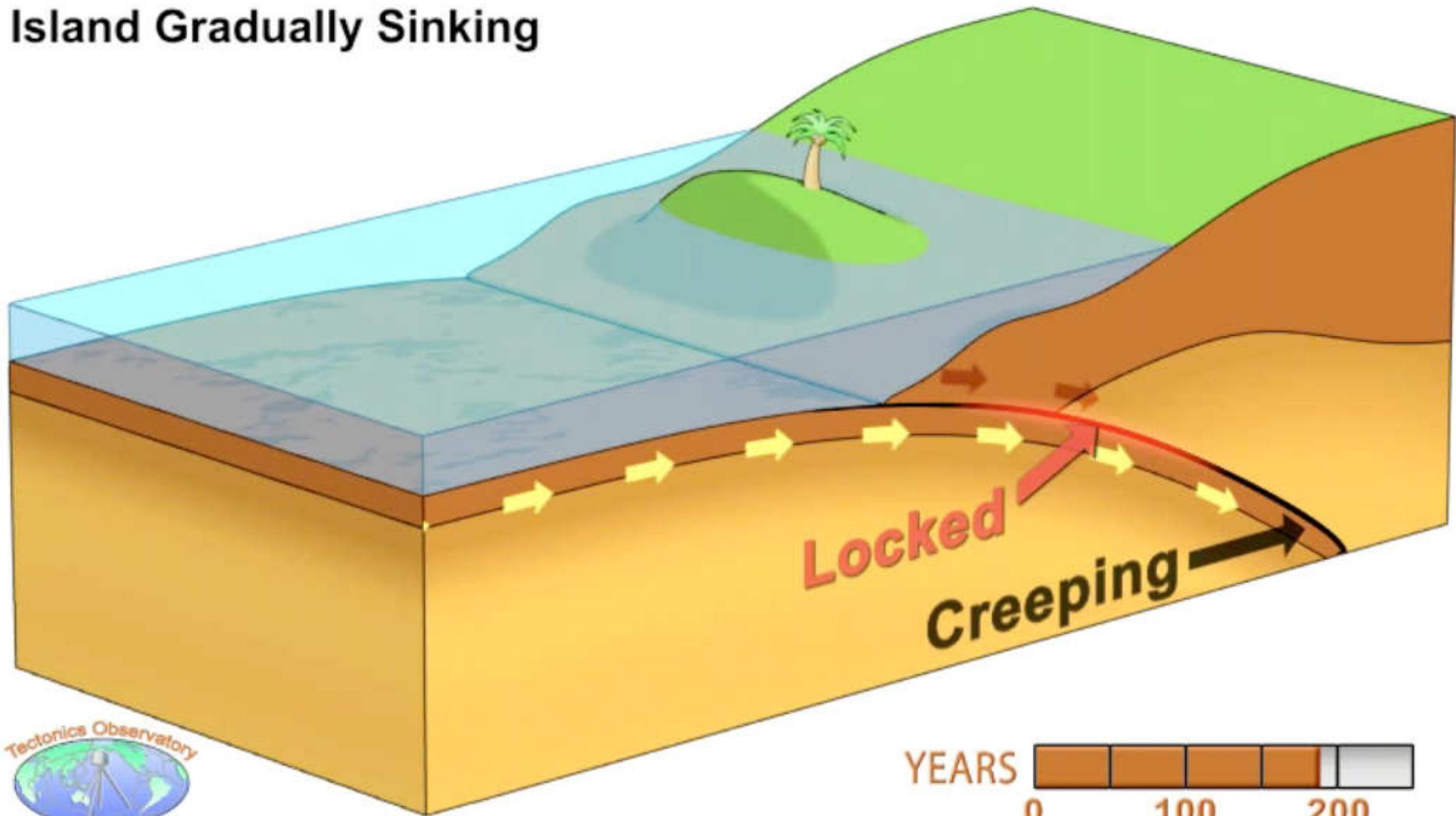


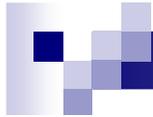
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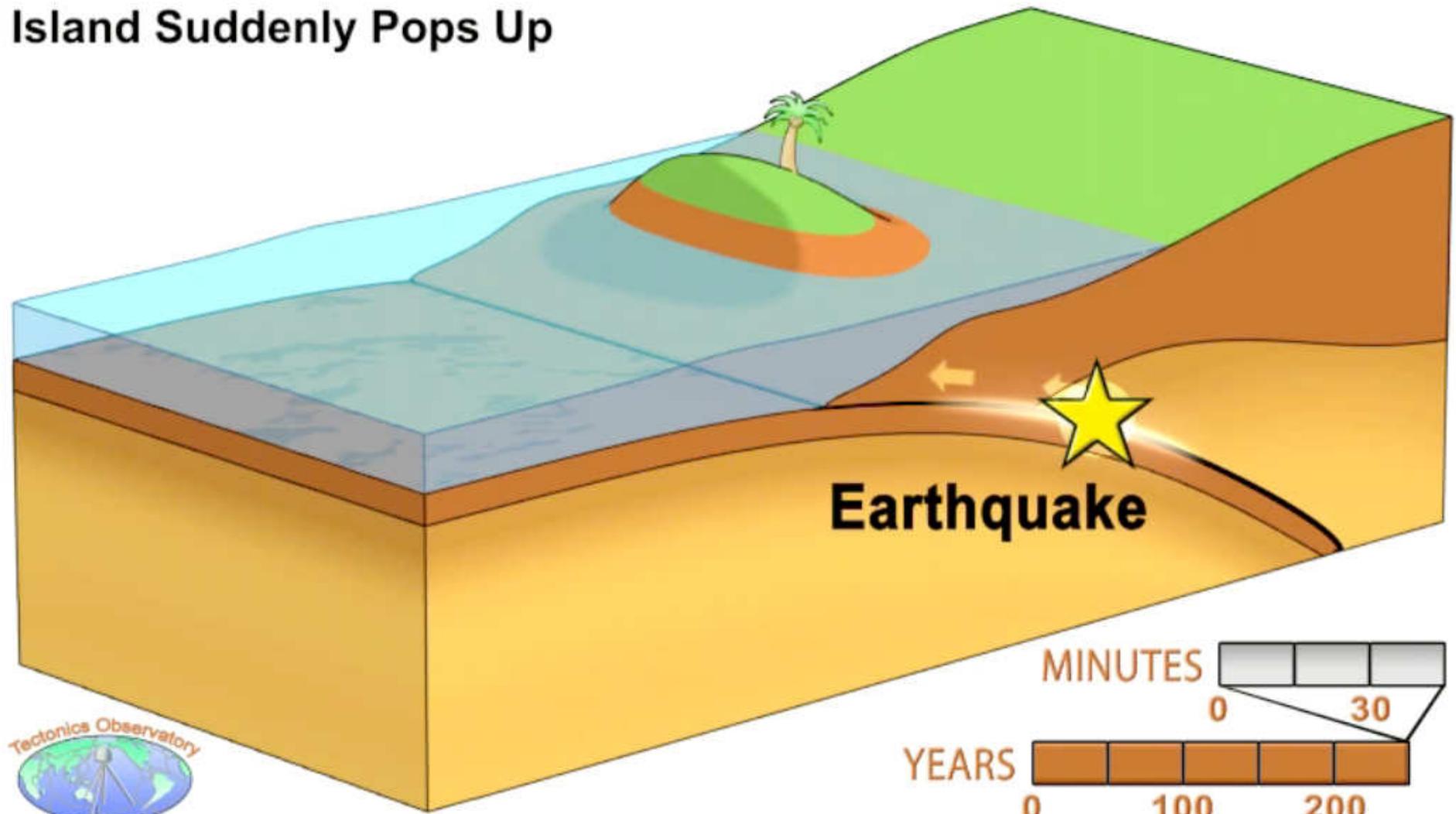


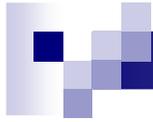
Island Gradually Sinking





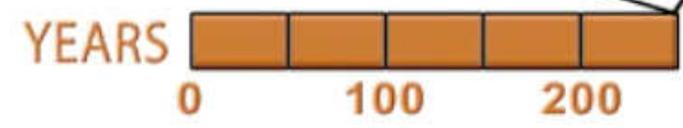
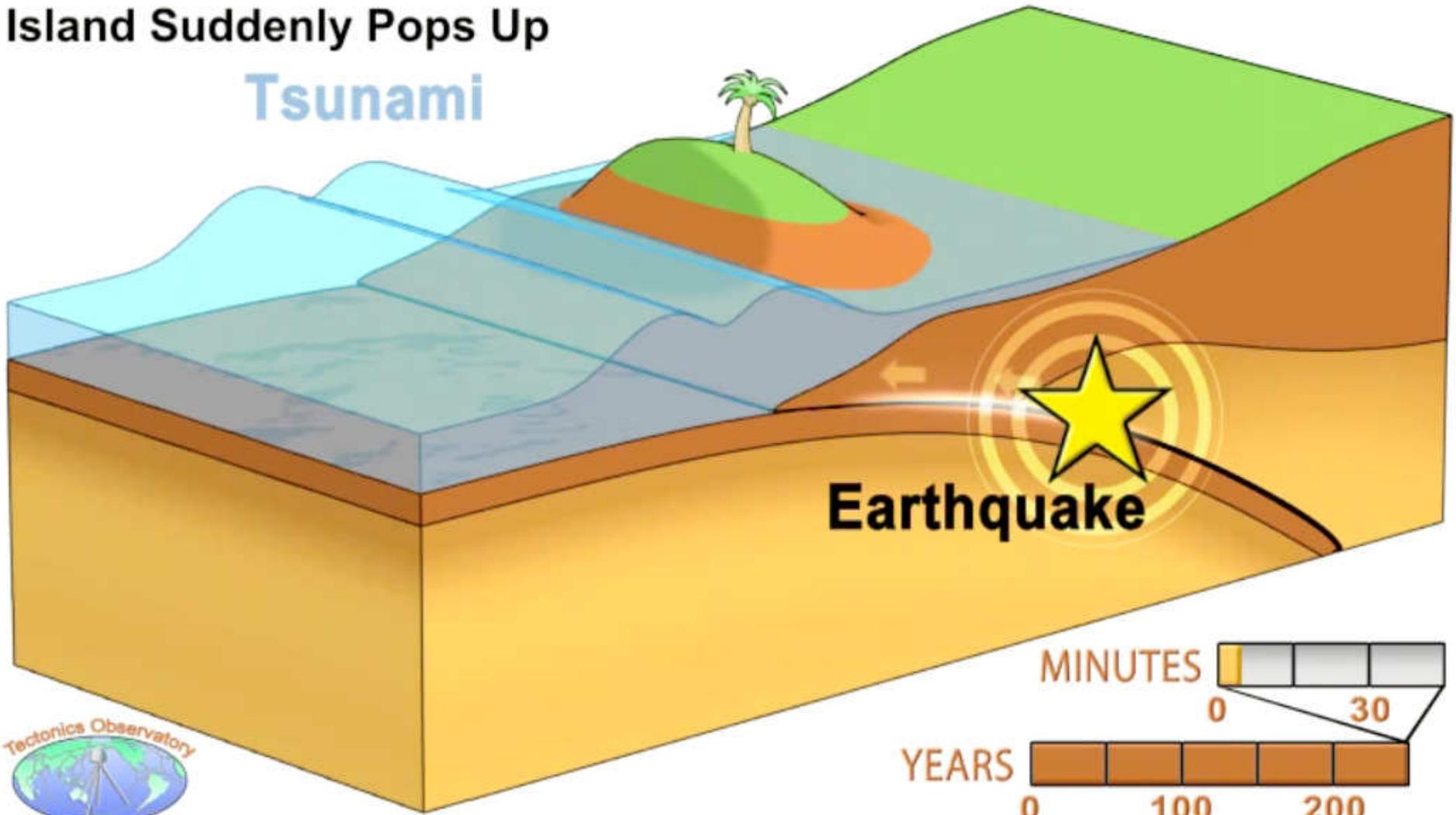
Island Suddenly Pops Up

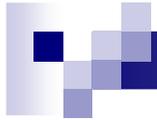




Island Suddenly Pops Up

Tsunami





Island Suddenly Pops Up Tsunami

