Sedimentary records of paleo-extreme events in marine cores offshore East Taiwan

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Taiwan gathers many conditions favoring extreme events. Uplift rates close or over a cm/yr together with tropical and sub-tropical climate favor strong erosion of the young mountain belt. Landslides are common and their occurrence is amplified by the high level of seismicity. East of Taiwan, the collision between the northern tip of the Luzon volcanic arc and the crustal wedge of the chinese continental platform is paroxysmal. There, changes in both onshore and offshore morphologies are extremely rapid. Huge amount of sediment supplied by rivers feed the submarine slopes and marine basins, active faults offset structural domains, submarine landslides and turbidity currents occur, and canyons incise within the steep slopes. Time series of climatic and seismic events are known for the last century but what about the last thousand years? Can we extrapolate our recent observations to the period older than 1900 and can we seriously estimate seismic, tsunami and climatic hazards?

To tackle this fundamental questioning, we have decided to investigate the sedimentological record of extreme events trapped in perched basins offshore East Taiwan. In this study, we aim to better constrain the occurrence of paleo-extreme events over the last ~4000 years. Eleven cores 0.4 to 4 meters long were collected during two cruises onboard R/V Ocean Researcher 1 in 2012 and 2013. Coring sites were selected for their various sediment sources: river-supplied turbidites (associated to major climatic events such as typhoons and floods), earthquake-triggered marine slope unstabilities and background hemipelagic sedimentation (reference core). Some complexity may appear since earthquakes may sometimes be triggered by typhoons, earthquakes can trigger landslides or tsunamis, submarine landslides can also trigger tsunamis or heavy rains on slumped material may produce floods.

Preliminary results from cores analyses are discussed. We primarily focused on the sites, which minimize the terrigenous component from rivers mouths. We studied the reference core collected on a bathymetric high of the submarine slope, 25 km off the coast, separated from the coastal slope by a trough so that we "theoretically" exclude any possibility of turbidite deposit on that site and expect to record mainly the hemipelagic sedimentation. Average sedimentation rates over the first 4 meters is estimated around 1±0.5 mm/yr and

increases to about 2±0.5 mm/yr near the seafloor. We count about 30 turbiditic events that could likely be triggered by paleo-earthquakes. The most recent one being dated around 1999 ± 1 yrs AD using $^{210}Pb_{ex}$ (Chi-Chi earthquake ?) and the oldest one around 3460 ± 30 yrs BP estimated from ^{14}C dating on planktonic forams which should correspond to 1100 ± 150 yrs BC taking into account reservoir age corrections. Detailed analyses on cores including granulometry, mineralogy, magnetic suceptibility, and major elements (XRF) are still under process.

This study done at the scale of the whole East coast of Taiwan leads us to test the capacity of investigating sedimentary records of paleo-extreme events in a marine environment characterized by recurrent earthquakes and landslides, huge erosional products from the nearshore washed after typhoons and strong oceanic surface currents such as the Kuroshio current. Our first results show that the modern ^{14}C reservoir age (R(t)) is larger, by up to 241 yrs, than the global mean surface reservoir age. This high value is probably due to local upwellings. We intend to model sea circulation offshore the east coast of Taiwan accounting for the rough bathymetry, the Kuroshio current and forcings from the wind in order to better constrain sedimentological processes offshore Taiwan.