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The upliftment in the Mejillones peninsula during 1995-2015 with two subduction earthquakes

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The Mejillones peninsula in northern Chile show the significant Quaternary surface uplift, which contrast with the surrounding coastal areas. The continuous GPS sites in this peninsula have detected significant upliftment during propagation of subduction earthquakes. The Mejillones peninsula region shows the low locking degree [Métois et al., 2013 & Bejar et al., 2014] and acts as a seismic barrier for the last two megathrust earthquakes such as 1995, Mw 8.1 Antofagasta earthquake and the 2007, Mw 7.7 Tocopilla earthquake in the south and north of peninsula. However, significant afterslip has taken place beneath the Mejillones peninsula in both earthquakes.
We describe the vertical deformation in the Mejillones peninsula with the megathrust architecture during 1995-2015 with megathrust earthquakes and locking degree. We simulate the vertical displacement with the coseismic slip and 3.3 years afterslip of Antofagasta, 1995 by [Chlieh et al., 2004] and coseismic slip and 3.3 years of afterslip of Tocopilla earthquake 2007 modeled in this present study. With both earthquakes due to coseismic slip and afterslip in 3.3 years, Mejillones peninsula has exhibited ∼105 cm cumulative upliftment at the JRGN GPS site. The modeled new locking model by additional dataset of continuous and survey GPS from 2012-2015, it shows the low locking degree in the Mejillones peninsula region confirming the previous locking models. Our interseismic model and observation suggest that JRGN Continuous GPS site shows subsidence rate ∼2.0 mm/year after the Tocopilla earthquake 2007. But in contrast the continuous GPS sites UCNF, PB05 and VLZL show the significant upliftment. By considering the modeled locking degree same during 1995 to 2015, we conclude that Mejillones peninsula would have remained upliftment ∼98 cm. The vertical tectonic rate fluctuates at various timescale in the subduction zones, the study of elevated shorelines may provide an efficient tool to develop our understanding of long-term processes, which balance the observed vertical deformation.