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Past sea level reconstruction based on tide gauges and spatial patterns from OGCMs with assimilation

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Satellite altimetry has allowed precise mapping of the geographical variability of sea level rates over the last 15 years. Comparisons with steric sea level patterns based on in situ hydrographic data and outputs of ocean general circulation models have shown that altimetry-based spatial patterns are mainly caused by non uniform thermal expansion, but in some regions sea level trend patterns result from opposite effects of temperature and salinity change. For the past decades, there are no direct global-scale observations of the spatial trend patterns in sea level but past sea level reconstructions methods that combine long tide gauge records of limited coverage and short 2-D sea level patterns based on satellite altimetry have been developed, with the assumption that the satellite record correctly captures decadal variability of spatial trend patterns. Here we present a past sea level reconstruction over the last four decades based on tide gauge data and 40 years of spatial EOFs deduced from two different ocean general circulation models with assimilation (SODA and ORCA2). These spatial EOFs correspond to the spatial patterns of the steric sea level We compare the reconstructed sea level trend patterns with the steric sea level trends. We also analyse the dominant modes of temporal variability of the reconstructed sea level. Finally we discuss sea level hindcasts at tide gauge sites not used in the reconstruction.