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Regional variability in sea level trends since 1950: comparison between sea level hindcasts from the CNRM coupled climate model, past sea level reconstructions and ocean re analyses and observed steric sea level

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Satellite altimetry has revealed important regional variability in sea level trends for the past >15 years. Ocean re-analyses available for the past 4-5 decades also display non uniform spatial trend patterns in sea level, significantly different than those observed over the last 15 years. In situ hydrographic measurements and ocean general circulation model (OGCM) outputs indicate that non uniform steric expansion (i.e., thermosteric plus halosteirc) is the main cause of sea level regional variability. However other factors such as dynamic effects from land ice melt and solid Earth processes (post glacial rebound and gravitational changes due to ongoing land ice melt) also produce regional sea level trends. In this study, we perform a series of comparisons between reconstructed sea level grids over the past 50-60 years based on tide gauge data and gridded sea level from different sources (satellite altimetry and OGCMs), ocean re-analyses based on OGCMs with data assimilation, runs from the CNRM coupled climate model over the 20th century (focusing on the1950-2000 time span) and steric sea level grids based on historical in situ measurements of ocean temperature. These comparisons focus on trend patterns and Empirical Orthogonal Function decompositions. We analyze and compare the dominant modes of variability of each data set. These analyses also allow assessing the different past sea level reconstructions methods and regional sea level hindcasts from the CNRM coupled climate model. Finally we attempt to detect the fingerprint of non steric signals in gridded reconstructed sea level.