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ESEAS Development of Regional Indices of Sea Level

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As part of the requirements for the European Sea Level Service Research Infrastructure ESEAS-RI project the spatial coherency of sea level was examined. Empirical orthogonal functions (EOFs) were used to create long term time series containing spatially coherent signals. The regional EOFs were determined using an iterative technique which ensured that for each region most of the variability in the tide gauges was represented in the first EOF. A major problem identified was the existence of gaps within the records. Several techniques were developed to extract EOFs that spanned over periods with gaps. The methods for filling in the gaps of the tide gauge time series are also discussed. The temporal variability of the EOFs was also explored. Areas where the EOFs are unstable in time were identified in the open oceanic regions thus indicating that EOFs derived for short periods of time, for example on the basis of TOPEX/POSEIDON data cannot be combined reliably with long tide gauge records to extrapolate the present TOPEX/POSEIDON patterns backwards in time. On the contrary, EOFs from semi-enclosed seas and continental shelfs appear stable thus such extrapolation can be accurately determined there.