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Sea Level Dynamics and Coastal Erosion on the Baltic Sea Region

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Zentrum für Material- und Küstenforschung

- **Author Team**
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- **Structure**
  As proposed (Introduction; Current state of knowledge; Knowledge gaps; Conclusions and key messages)

- **Parameter**
  Mean sea level; Extremes (surges, waves, Baltic Sea volume, seiches, interactions, …); Coastal processes and erosion

- **Status**
  Preliminary draft of about 17 pages without references

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Key messages: Mean sea level

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- **Measurements**
  primary sources: tide gauges & radar altimetry
  tide gauge network dense with some of the longest records (reference levels)
  radar altimetry problematic (sea ice, proximity of land & small islands, some correction models typically applied unsuited for the Baltic Sea)
- **Trends**
  Global values AMSL: ~1.8 mm/yr last century & 3.2 mm/yr for satellite era
  Baltic Sea: RMSL -8.2 mm/yr (Bothnian Bay) & 1 mm/yr southern Baltic; 3.3 mm/yr for satellite era (AMSL); number for AMSL from tide gauges? (models ~2 mm/yr for the past 50 years); consistency EN-CLIME; Global MSL rise is expected to provide largest contribution t future changes
- **Variability**
  atmospheric forcing (wind, precipitation, run-off, …)
- **Acceleration**
  can be detected (robust) but small (EN-CLIME); pattern corresponds to what would be expected from deceleration of GIA; however, estimates from Earth crust models much smaller

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Key messages: Extreme sea level

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- **Factors considered**
  Baltic Sea volume; storm surges; waves; seiches; meteo-tsunamis;
- **Trends**
  Trends in extremes mostly due to changes in the mean except for northernmost stations
  No significant long-term change in waves and surges; little to nothing known for seiches, meteo-tsunamis, wave set-up, …
  Projections highly uncertain except for contribution from MSL
- **Variability**
  atmospheric forcing (wind, surges, waves, …)

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Key messages: Coastal processes and erosion

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- **Description of knowledge**
  coastline regression in the Northern/Southern parts since onset of Holocene
  Baltic Sea different from other coats: lack of tides, lack of long swells, seasonal sea ice
  primary driver of sediment transport are surface waves
  most rapid changes when high waves approach ice-free coast with mobile sediments at large angles
  most of the energy flux during 3-4 most stormy days/yr.
- **Trends and variability and future changes**
  speculation that changes in the driving factors are important; no references found that describe changes

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Knowledge gaps

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- **Mean sea level**
  future contribution from WAIS; quantification of GIA; trends in GPS; estimate of Baltic AMSL trend from tide gauges?; sources for acceleration (contribution from GIA); coastal altimetry
- **Extreme sea level**
  Very *little is known about seiches or meteo-tsunamis and their long-term changes; little is still known about future wave climate; quantification of non-linear interactions;*
- **Coastal processes and erosion**
  assessment of alongshore sediment transport and associated spatial and temporal variability along the subsiding southern Baltic coast; trends; trends wave set-up, …
- **General**
  need for decadal predictions (MSL and extremes)
  contributions from non-linear interactions, especially near-shore
  digitalization of historical data (long-term trends)