

## Sea Level, an Essential Climate Variable and an integrator of climate change

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### Abstract content

Sea level is an important climate variable and a major indicator of climate change. In effect, sea level integrates changes and interactions of all components of the climate system (ocean, atmosphere, cryosphere, hydrosphere); it varies globally and regionally in response to internal climate variability and external –natural and anthropogenic– forcing factors. Sea level is one of the 50 Essential Climate Variables (ECVs) defined by the Global Climate Observing System for climate change monitoring and one of the 15 ECVs accurately measured from space within the ESA Climate Change Initiative (CCI) project. While sea level is routinely measured by high-precision satellite altimetry since 20 years, providing a long, homogeneous and accurate sea level record using all altimeters satellites in orbit is the objective of the CCI 'Sea Level' project. This allows addressing major issues related to climate change and sea level (e.g., how much is the global mean sea level currently rising? Has it accelerated during the 20th century? Can we close the sea level budget? What are the factors causing non uniform sea level change? Are observed spatial trend patterns due to internal climate variability only or can we already detect the signature of anthropogenic forcing?, etc.). The sea level products already obtained in the context of the CCI project have been proved to be superior to other existing products and are of great value for climate change studies. Moreover, combining different CCI-based ECVs (e.g., glaciers and ice sheet mass balances, in addition to the sea level ECV) plus Argo-based ocean thermal expansion leads to better closure of the sea level budget, allowing addressing important new issues, such as the amount of deep ocean warming (not measured by Argo) and its role in the present 'hiatus'. Finally, such long, accurate new ECV records are essential to validate climate models used to simulate future changes expected in response to anthropogenic global warming.

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