

Climate change, sea-level rise and coastal flooding

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Global sea level has been rising over the last hundred or so years. The rise is expected to continue, and even to accelerate, in the future due to the global climate change. Some recent storm-surge events, such as those related to the hurricanes Katrina (2005), Nargis (2008) and Sandy (2012), have revealed how sensitive the coastal population is to flooding. The future sea-level rise will obviously exacerbate the sensitivity. The presentation starts with a brief overview of the past temperature variability, based on both observations and modeling. Moreover, some temperature projections for the twenty-first century are presented. The presentation then turns to three different methods that are used to determine sea-level change: reconstruction based on geological, biological and archaeological sea-level indicators, measurement with tide gauges of various types and measurement with satellite altimeters. Global sea-level variability revealed by these data is then commented. It is pointed out that the variability depends on an increase of the ocean volume due to the absorption of heat, on an increase of the ocean mass caused by the melting of glaciers and ice sheets and on a change of the ocean mass related to the varying water storage on land. The modeling of sea level is considered next. It is shown how modeling is used to project sea level for the twenty-first century. These projections are compared with those obtained with an independent method, which utilizes various empirical relationships between global temperature and global sea level. It is found that the two methods give different results and the reasons for the discrepancy are commented upon. The presentation then focuses on the Mediterranean area. It is shown that during the second half of the twentieth century the sea-level trends were close to zero in the Mediterranean Sea and that therefore they considerably departed from the global trends. A recent shift in the Mediterranean dynamics and the projections available for the area are considered as well. Finally, analysis and prediction of extreme flooding events are addressed and some possible ways of adaptation to inevitable changes are mentioned.