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INTRODUCTION

In a recent article, Houston and Dean (2011) attempted to quantify acceleration in the rate of historical sea-level rise (SLR) by analyzing monthly averaged, long-term, tide-gauge records for 57 U.S. tide stations. The data were extracted from the Permanent Service for Mean Sea Level (PSMSL) at the National Oceanography Centre in Liverpool, U.K. The investigation involved the calculation of accelerations for each station for the period of record, plus accelerations for the 25 stations whose records extended back to 1930. The authors calculated decelerations, i.e., a slowing in the rate of SLR, for 16 of the 25 selected long-term gauge records. The authors stated that there is no evidence of acceleration in 20th century SLR, despite rising atmospheric temperatures. Therefore, they contended the accelerations forecasted to accompany continued warming are highly suspect. They concluded that researchers must now determine why global warming has not produced an acceleration in SLR. We believe the authors’ conclusions are erroneous for a variety of reasons, including those argued in the accompanying rebuttals. We will focus our criticism on three issues in the sections that follow.

GEOGRAPHIC AND TEMPORAL LIMITITATIONS OF THE TIDE-GAUGE DATA

There are approximately 1800 global tide stations with reasonably long records in the PSMSL database that the authors accessed. The authors initially selected just 57 stations, and later reduced the number analyzed to 25 stations. The gauge locations were only in the United States. Additionally, the authors used data collected between 1930 and 2009, despite the fact that many of the PSMSL data sets extend back well beyond 100 years. Jevrejeva et al. (2006) employed advanced statistical analyses to examine the PSMSL tide gauge database and found that determining the rate of SLR was highly dependent on the time period chosen. They further noted large decadal-scale and regional variability in the global tide-gauge record, a variability that has increased toward the present. They noted that some of the problems with analyzing tide-gauge data are inherent in the system: poor distribution of tide gauges, sparse data from the southern hemisphere, regional tectonic activity, and the ongoing glacial isostatic adjustment following the last ice age. Taking such a small geographic and temporal subset of the PSMSL tide gauge data makes any conclusions based on that subset suspect.

UNIFORMITARIANISM AND THE INADEQUACY OF HISTORIC TIDE-GAUGE DATA TO REPRESENT FUTURE CONDITIONS

The Hutton (1788) dictum that the present is the key to the past has been a major tenet of the modern science of geology. For normal processes, the present is a useful analog for understanding past events. However, infrequent events that have occurred in the geologic past, such as major meteorite impacts or supervolcano eruptions, cannot be understood through study of present-day processes. Similarly, a study of processes of the recent past, such as long-term tide-gauge records, is not necessarily a good indicator of future circumstances. This is especially true in a future where models predict conditions that have not been experienced for many millennia. Climate models project that the global ocean–atmosphere system is likely to behave differently in a warmer future than it has since human civilization began. If the ice sheet contribution to SLR becomes significantly larger than at present, then the response in sea level will be quite nonlinear. As a result, the recent past is a poor predictor of the near future, and analyses of small subsets of the historic tide-station database are of little prognostic value. We believe that it is inappropriate to relate sea-level history during the past century with projections for the next century. Global conditions during the past century

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