Appendix F: Projecting Future Sea Level Rise with the SLRRP Model

The Sea Level Rise Rectification Program (SLRRP) is a software package designed with a user-friendly interface to generate a suite of future sea level projections from various GCM models and scenario outputs obtained from the Intergovernmental Panel on Climate Change (IPCC) (2001). The SLRRP model allows the user to select a region-based tide station, GCM model, and SRES emissions scenario to generate a graph and output file of future sea level change. SLRRP rectifies the historical tide record and future eustatic sea level rise into a common datum (default = North American Vertical Datum of 1988 [NAVD88]) to facilitate comparison with landbased features and elevations. The SLRRP model generates a sea level prediction by wrapping the historical mean monthly records for the period of record for all future years up to year 2100. Because the historical record retains the long-term trend of local subsidence and historical eustatic change, an adjustment of removing the historical eustatic rate is accomplished before adding the predicted eustatic sea level rise based on a selected IPCC model and scenario. SLRRP uses a historical eustatic sea level rate of 1.8 mm/year (0.071 in) conferred by several sources as the best estimate for the global-mean since 1963 (IPCC, 2001; Douglas, 1997).

The SLRRP model uses a series of sequential pop-up windows to facilitate user selection of GCM models, scenarios, and manual entries for projecting future sea levels (figures F.1-F.3). The SLRRP and CoastCLIM models generate similar eustatic projections, but SLRRP retains the local tidal fluctuations that will contribute to short-term flooding above mean tides. The advantage of using the historical record includes the retention of the local variability and seasonality of sea level heights and the interannual variability and long-term climatic autocorrelation.

The program gives the user options for saving graphical and digital formats of SLRRP predictions and generating a supplemental graph to visualize the timing and extent of yearly flooding potential for a given elevation (NAVD88) for a transportation feature. After generating a future sea level projection, the user can execute a seawater inundation option that builds another graph that plots the timing and rate of flooding for a selected land elevation (figure F.4). In effect, the model shows the prospective data and time period for which sea level will overtop a given landscape feature under a future changing climate. Flooding potential is the percentage of months within a year when there is inundation by seawater at a select land elevation determined by the user.

References

Douglas, B.C. 1997. Global sea rise: A redetermination. *Surveys in Geophysics*, Volume 18, pages 279-292.

IPCC, 2001: *Climate Change 2001: Impacts, Adaptation, and Vulnerability*. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change [J.J. McCarthy, O.F. Canziani, N.A. Leary, et al. (Eds.)], New York, New York: Cambridge University Press. Page 944 (Available on-line at http://www.ipcc.ch/).

Figure F.1 User interface and simulated graph of historical sea level rise from a sample SLRRP model application displaying the pop-up windows for selecting tide gauge stations and constructing a sea level function based on local subsidence.

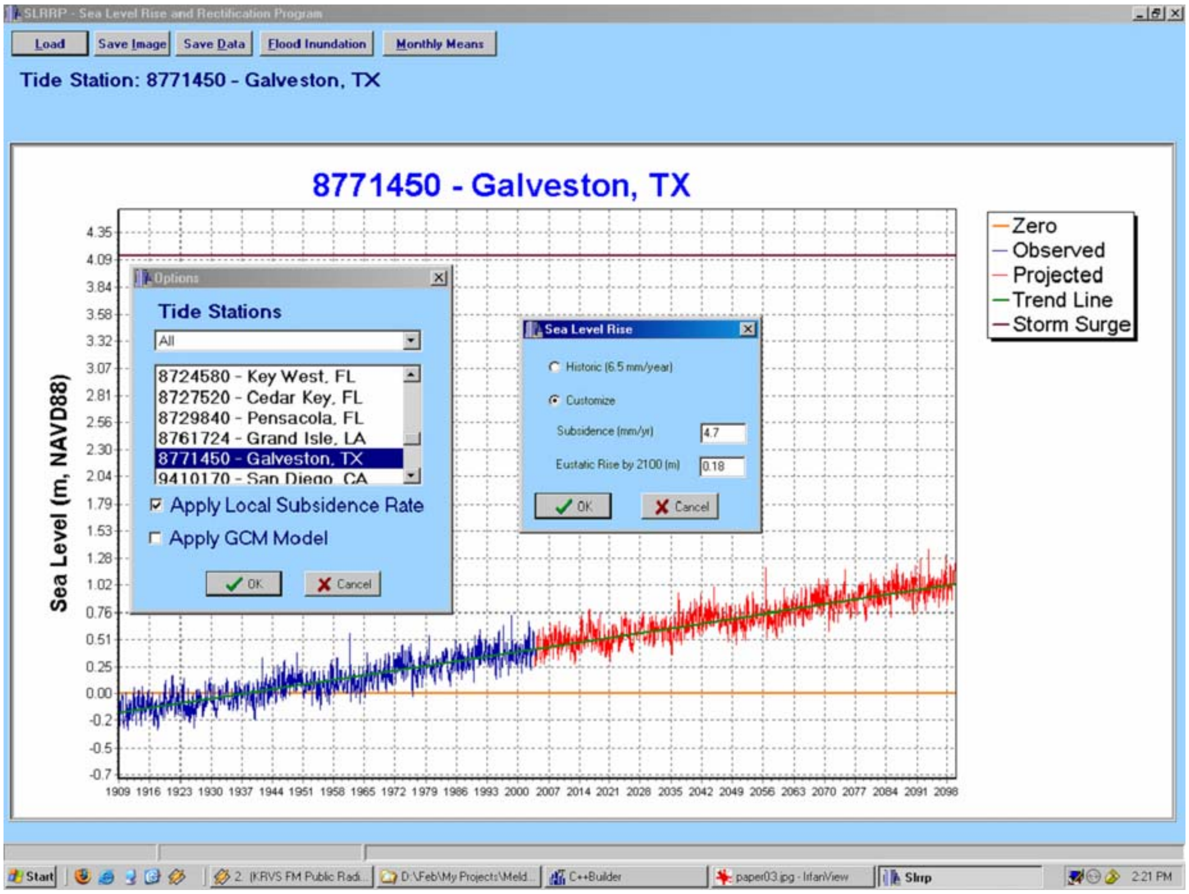

Figure F.2 User interface and simulated graph of historical sea level rise from a sample SLRRP model application displaying the pop-up window for selecting a GCM model and SRES emissions scenario.

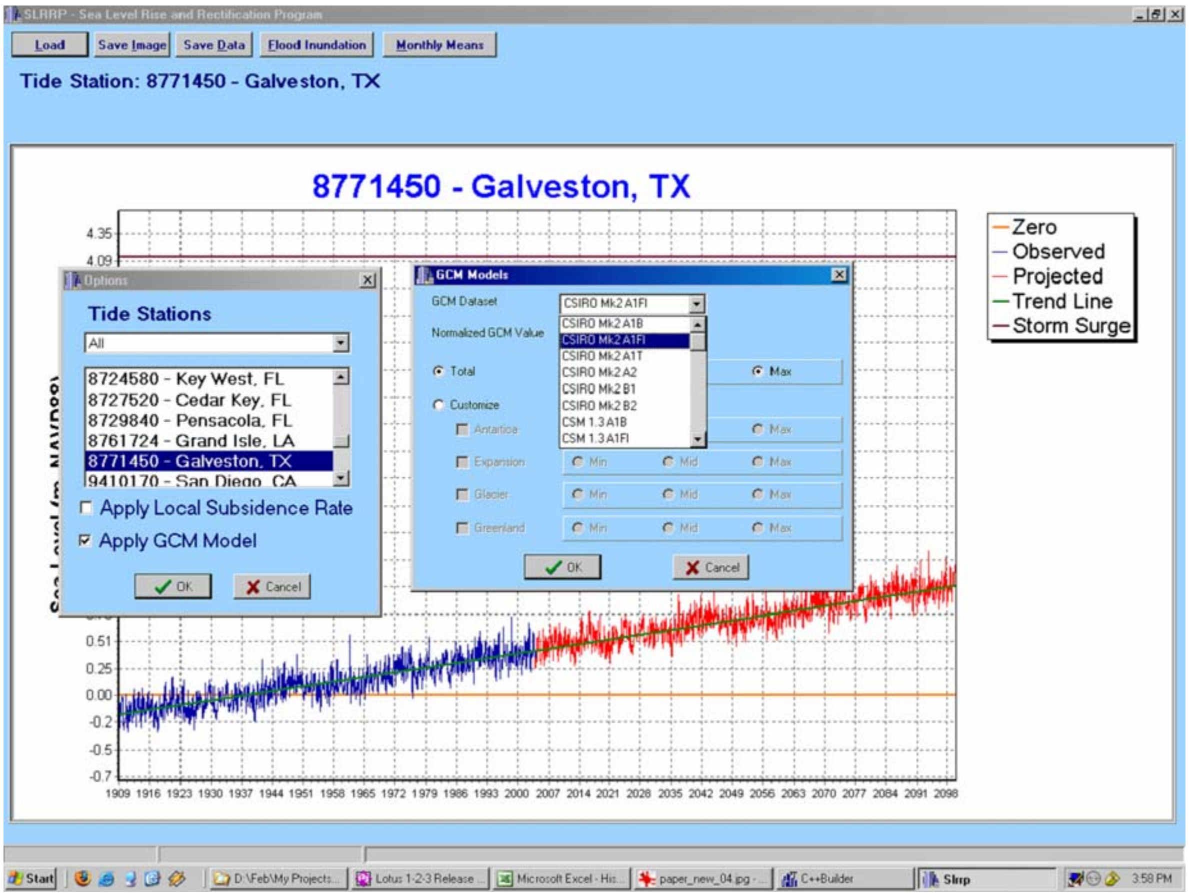

Figure F.3 User interface and simulated graph of future sea level rise from a sample SLRRP model application displaying the historical trend line, datum relationship, and maximum historical storm surge stage for the selected tide gauge location.

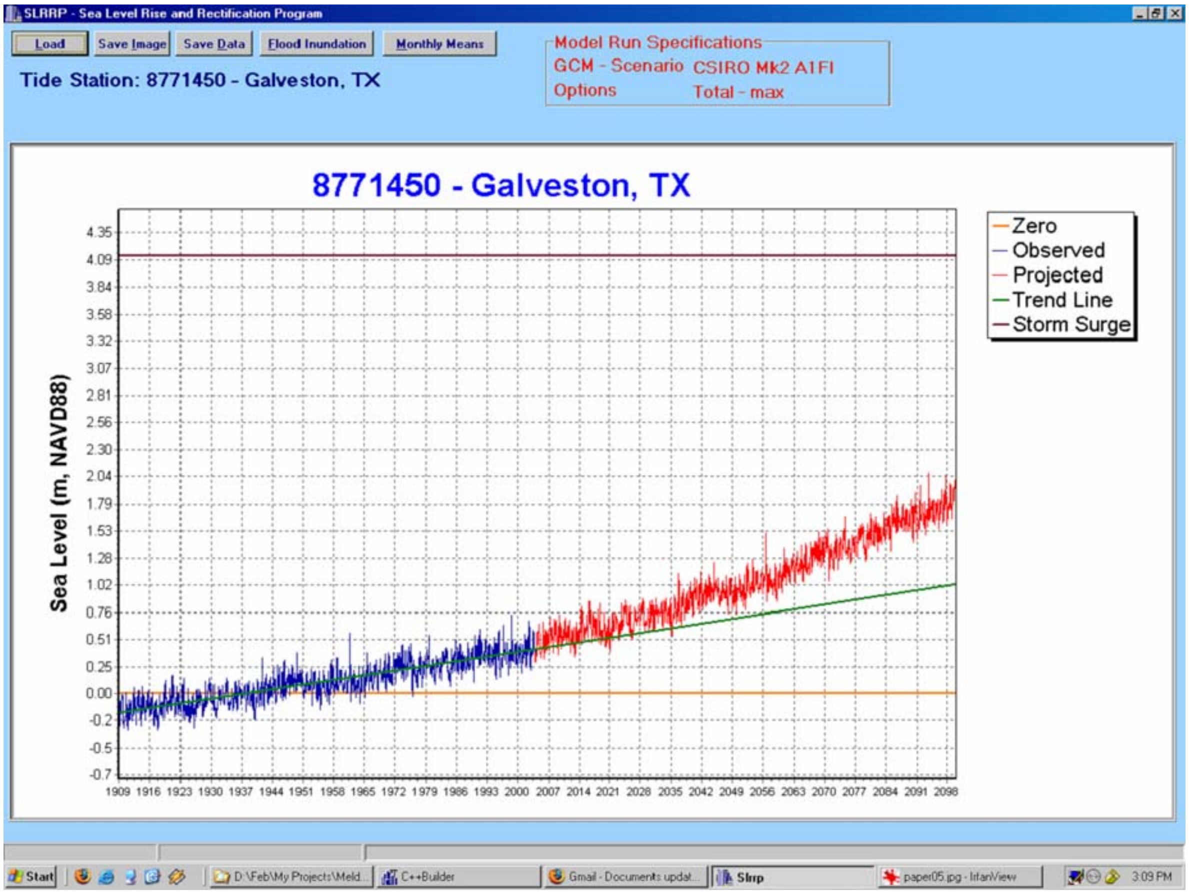

Figure F.4 Sample flood graph displaying flood timing and extent based on the hydroperiod or percent of days within a calendar year that flooding is likely to occur for a given land elevation and sea level rise projection.