Simulating anthropogenic and climatic influences on fluvial sediment load in the southeastern U.S. and Central Europe

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ABSTRACT

Quantifying variable riverine sediment discharge over time in response to climate and human pressure is crucial to understanding past, present and future patterns of sediment flux to the worlds' oceans. The need for this data is critical in light of changing anthropogenic activities, global warming and sea level rise; however, adequate observational datasets on most rivers are rare. In this dissertation, six medium to large watersheds from North America (Part I) and Europe (Part II) are examined using *HydroTrend (v. 3.0)*, a climate driven hydrologic model, and results are validated with modern-day data. Our results indicate that over a period of only 100 years, humans caused a significant increase (145%), followed by a decrease (55%) in suspended sediment load contribution to the Atlantic coastal region through deforestation and dam construction, respectively. On average, major southeastern rivers currently transport even less sediment (16%) than prior to European settlement. Similarly, modeled results suggest that reservoir impoundment in the Danube watershed has reduced sediment flux to the Black Sea by approximately 60%. This region of Europe was directly affected by the Little Ice Age (ca. 1500-1850) during which time suspended sediment flux was up to five times higher than under current conditions. Simulated results imply that without the impact of anthropogenic activities within the basin, current day sediment flux would be 5% higher today than during the Little Ice Age due to significantly warmer modern-day temperatures, which highlights the considerable control that man has on the natural environment. Projected future temperatures (IPCC) are implemented to simulate the potential impact of erosion and sediment flux in tributaries of the Danube and results suggest that sediment erosion could increase by up to 45% by the end of this century. This study is the first application of *HydroTrend* in these regions of the world and provides insight on how human induced modifications and climatic changes can alter sediment flux in a watershed over relatively short periods of time.