COMMENTS AND REPLIES

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Comment

COMMENT on "The geological legacy of Hurricane Irene: Implications for the fidelity of the paleo-storm record" by Scott P. Hippensteel, Matthew D. Eastin, and William J. Garcia

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Hippensteel et al. (2013) recently examined sedimentary and microfossil evidence of hurricanes preserved in North Carolina salt marshes. Sedimentary and foraminiferal evidence of Hurricane Irene (August 2011) was sought to help interpret the paleo-record. As motivation, the authors repeatedly make reference to significant controversy in the literature surrounding paleo-storm reconstructions but only cite the dialogue between Otvos and Liu and Fearn (Liu and Fearn, 1993, 2000; Liu et al., 2008, 2009; Otvos, 2002, 2009, 2011). This is misplaced because the criticism of Liu and Fearn's work was that they inadequately considered the geomorphologic variability of their study sites. It was not Otvos' intent to deride all overwash-based studies. Further, re-citing his comment regarding "sand layer counting" is outdated and reflects a lack of knowledge of recent methods (e.g., grain-size analysis, geochemical techniques, numerical modeling).

The premise of Hippensteel et al. (2013) is that hurricane proxy records somehow document all strikes. However, it has been obvious since this approach was first conceived (Blumenstock, 1958) and implemented (Emery, 1969; Liu and Fearn, 1993, 2000; Donnelly et al., 2001) that these sorts of archives faithfully record only more intense events. The literature provides little argument to the contrary. Indeed, the flooding thresholds of study sites may change over time, but nobody has argued that the approach is invalid, because the archives do not record every event. Intense hurricanes disproportionately result in more damage and loss of life, despite occurring less frequently than tropical storms and minor hurricanes. Thus, developing proxy archives in order to examine the climatic controls on these extreme events is essential to society.

The main conclusion that only severe events typically result in well-preserved overwash deposits is well established (e.g., Liu and Fearn 1993, 2000; Donnelly et al., 2001; Donnelly and Woodruff, 2007; van Hengstum et al., 2013; Brandon et al., 2013). In fact, this study offers little other than highlighting an obvious limitation of some approaches when applied to a particular setting.

Unsurprisingly, Hurricane Irene, which resulted in less than a meter of surge, left little sedimentary evidence of its passage. Relatively weak storms with modest storm surge frequently impact the American eastern seaboard, but only the most vulnerable areas are likely to record such an event. This perhaps explains why allochthonous foraminifera displaced by Hurricane Irene were only found at Alligator Bay.

Many factors must be considered when interpreting paleo-storm records, including the susceptibility to overwash, preservation potential, local geomorphic variability, and the archive's fidelity. Condemning all paleo-storm studies because the modest Hurricane Irene did not produce a discernable signal in Onslow Bay is misguided.

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