Rivers play key role in destructive coastal flooding, new research shows

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If you think living away from the coast keeps you safe from climate change and rising waters, think again.

New research from a University of South Carolina scientist shows that rising rivers pose a danger, too, both at the coast and farther inland.

Steve Dykstra, a post-doctoral research fellow in the School of the Earth, Ocean and Environment, says scientists need to pay more attention to how climate change is affecting rivers and what that means for those who think they are safe from coastal flooding. Why it matters: Destructive coastal floods are occurring more often and may be caused by climate change. Dykstra says river processes are largely ignored in the conversation surrounding coastal flooding, but they need more attention.

Dykstra's research, co-authored with Brian Dzwonkowski, is a regional look at precipitation, river levels and river discharge in the Northeast Gulf of Mexico. It is the first to show how:

- Larger amounts of precipitation move faster downstream to the coast. This results in more river flooding and a greater likelihood of compound flooding—a flood where ocean storm surge mixes with river discharge.
- Compound flooding events are largest inland, where tides become small and disappear. This phenomenon puts people who live near inland rivers in danger.
- Coastal flooding will likely increase as the climate continues to warm and intensify precipitation.

State of play

Dykstra says current coastal flooding research focuses mainly on how global warming trends affect ocean processes, overlooking how river flooding can affect coastal regions and even combine with ocean processes to cause more intense flooding. The warming atmosphere can hold more water and causes more intense precipitation. Dykstra shows that this affects entire watersheds down to the coast, a region where river

floods were previously thought to play a minor role. "People who study oceans stop where there is salt. People who study rivers stop where there is a tide, sometimes 200 miles inland," Dykstra says. "We're missing the other side of the puzzle." Dykstra is working to close this gap. He says an important part of understanding flood risks is taking an approach that changes through time. He looked at 90 years of river data and 120 years of precipitation data to piece apart the natural river processes from those caused by climate change.

What Dykstra says can be done

- Scientists and policymakers need to account for rivers when talking about coastal flooding.
- Data sets used to track river processes need to extend over significant lengths of time.
- Researchers need to account for changes over time to understand flood risks.
- Scientists need to use this new insight to better identify the highest risks for compound flooding.

The bottom line

River processes contribute to coastal flooding and should be included in discussions surrounding how climate change impacts flood risks.

The findings were published in *Water Resources Research*.

More information: S. L. Dykstra et al, The Role of Intensifying Precipitation on Coastal River Flooding and Compound River-Storm Surge Events, Northeast Gulf of Mexico, *Water Resources Research* (2021). DOI: 10.1029/2020WR029363

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