Candidate Recommendation:

Sea Rise And Terrestrial Expectations (SeaRATE)

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ORIGINAL BIG IDEA
27: A hub should focus on the RATE of sea-level change and the ability of coasts to respond. So much research is focused on the total amount of sea-level rise that will take place by 2100 or 2500. But, we don't really need to know if sea level will rise by 50 vs. 60 cm by 2100 (and we can't anyway!) but we do need to know if it will change by 3 mm/yr vs 10 mm/yr in 2025. What is the predicted rate of change of the next decade and which coasts (or infrastructure) can keep up with that rate and which can't.

What is your specific* recommendation?

To bring storm-impact modelers, coastal geologists, coastal-zone ecologists, and social scientists focused on coastal resiliency together with glaciologists and other modelers focused on future sea-level changes together to develop 1) an understanding of what sea-level change is predicted over the next few years and decades, what are the local variabilities, the rate at which it will change, and ***what are the uncertainties around those predictions;*** 2) what are the rates of sea-level change that could overwhelm different shorelines or types of infrastructure and what rates are manageable; and 3) what questions are outstanding amongst coastal scientists and communities that sea-level predictions have not yet answered but may be able to address. Integration can be achieved by a series of interdisciplinary workshops focused specifically on short-term predictions of sea-level rise and the expected effects on different shorelines and communities, with at least one workshop focused on just early-career researchers, and shared Ph.D. students who engage with multiple faculty across participating disciplines.

Why is it valuable?

Across the country and world, almost all shorelines are experiencing sea-level rise. Much modelling about future sea-level changes focuses on the total amount of rise expected in the next centuries and millennia; a common focus is on either the year 2100 or 2500. However, sea level is not level and the rate of rise varies widely; the rate of rise in Alaska does not match that in California, Texas, or Massachusetts. At the same time, different shorelines handle sea-level rise differently. Clearly, a rocky shoreline in Maine will not respond to a centimeter of sea-level rise in the same way as a chenier plain in Louisiana. But, what about a Carolina barrier island that has withstood sea-level rise over the last decades but was recently cut off from its sediment source due to a new dam or road? ***What is the threshold sea-level rise rate that any given shoreline can survive? How does that compare to predicted rates?*** Planning and coastal resiliency is being developed at a local and regional level and focused on the immediate to medium-range needs of coastal communities. At the same time, most sea-level predictions are global and focused on medium- to long-range timescales. To become resilient, coastal communities and planners have a fundamental

need to know what is coming and how that will affect the local environment.

What's the reasoning or supporting evidence behind it?

Communities of people have lived near the coast for millennia. While the rate of sea-level rise has increased in recent decades, it is nowhere close to what it has been in the geologic past. In modern times, we are acclimated to a rate of sea-level rise that is actually lower than what communities in the past had to face. As glaciers retreat and contribute to sea level, their retreat rate can vary suddenly. While there is no evidence that retreat has ever stopped or slowed suddenly, there is plenty of geologic evidence of meltwater pulses, sudden increases in the rate of sea-level rise, and anthropologic evidence that long established communities had to relocate in response to such pulses. In general, models of future sea level predict not just rise but some increase in the rate of rise. However, most planning along coasts is being developed based on either the current rate of rise or a single predicted rate, rather than a range of rates. Preparing for coastal resiliency will almost certainly be expensive; it is a wasted expense if it falls short of achieving lasting protections.

Validation of Success: Generation of new sea-level rise predictions focusing on regional predictions over years to decades rather than centuries to millennia. Establishment of coastal resiliency models under those regional sea-level predictions. Engagement with communities to learn local concerns and share local, short-term predictions.