Closing thoughts from the EESM PI Meeting – Casey Burleyson
Sessions Co-Chaired: Digital Earth and AI/HPC

1) This was a productive and engaging meeting. I'm amazed by the breadth and depth of science being done. I also think the level of our scientific visualizations has taken a massive step forward since the last time we met. I saw some really great visualizations from all three program areas.

2) The data issue is becoming more prominent. We simultaneously have not enough observational data to constrain our models and too much simulation data to store, analyze, or manage. I think the observational-constraints issue has actually gotten better with the addition of the urban IFLs and some good examples of OSSEs. Both are examples of modeling teams working directly with observationalists to go out and collect the exact data they need to inform or improve their models. The volume of model simulations is only getting worse as we add more resolution and more processes (which translates to needed output variables) to our models. We talked a lot about in-line data analysis and novel forms of data compression as solutions to the big data problem, but I've yet to see any concrete examples of projects doing these in robust and repeatable ways. There could be an opportunity to advance all three communities by funding a project that demonstrates in-line data analysis (e.g., finding hurricanes or heat waves and only outputting the data for those periods/locations) for a high-resolution E3SM run.

3) The other thing that was very noticeable was that our models have become overwhelmingly complex. We've been able to make decades of progress relying on scientists who have some programming skills. That's not really cutting it anymore. In order to port models to GPUs and solve some of the most pressing computational issues we need to be working collaboratively with bonafide computer scientists. This is happening in most lab-based projects, but I worry about what it means for investigators at small or mid-sized colleges. They have great ideas and want to contribute, but if they don't have access to the right computer scientists at their institution then they may be squeezed out of model development or evaluation in a model as complex as E3SM. Yes they can partner with the labs, but most university-led FOAs now limit the amount of funding that can go to a lab (e.g., no more than 10%). It's going to be hard to make real progress with those constraints.