1. The obvious 3 tech innovations for climate are exascale, AI, and quantum computing. Exascale is in a mature phase, AI is in a gold-rush/peak hype phase, and quantum is a glimmer in the eye
    1. Nobody talked about quantum in our breakout. DOE is kind of behind the curve on AI, so it would be good to start brainstorming how quantum could benefit us. Ian mentioned that Johannes Mulmenstadt at PNNL has an LDRD using quantum computing for cloud modeling, but that's the only idea I've heard.
2. There's a lot of excitement about the high-resolution features exascale enables. Fixing model biases and adding new capabilities will be important for maximizing exascale opportunities.
    1. Someone in the extremes session pointed out that tropical cyclone research exploded once 25 km global atmosphere simulations became prevalent (because tropical cyclones could finally be resolved), and that km-scale global models enable analysis many new kinds of extremes. This is a growth area for DOE.
3. The breadth and volume of AI uses at this meeting was amazing. We think this diversity is good since there are many aspects of climate science that AI can help with and because the best AI strategies are still not clear.
    1. A challenge/opportunity is connecting AI experts and domain scientists. Cross-cutting meetings and SciDAC-like funding calls could be helpful.
    2. Using AI for climate science is challenging since AI typically performs poorly when faced with conditions it wasn't trained on and training on present day observations is very tempting. Emulating a physics-based model which can provide training data for all future climates is one way to avoid the extrapolation problem. Otherwise, Understanding the physical process being modeled with AI and being sure that the training data captures all conditions the model is likely to face is essential.
4. Increased focus on uncertainty quantification is needed in order to provide actionable predictions to stakeholders. AI and UQ are naturally entwined because UQ is often the source of training data for AI and AI acceleration can provide the efficiency needed to sample model variability.