

Climate Modeling @ Ai2

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Building breakthrough AI to solve
the world's biggest problems

External partners



M²InES



GFDL



LLNL



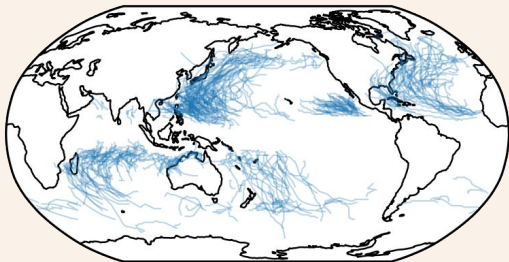
NVIDIA

We build “emulators” of physics-based models

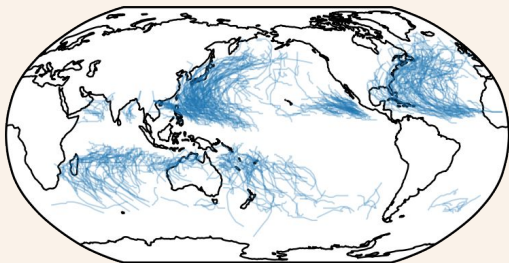
Atmosphere (ACE2)

Tropical cyclone track comparison

b) ERA5 (n/year=51.4)



d) ACE2-ERA5 (n/year=66.2)

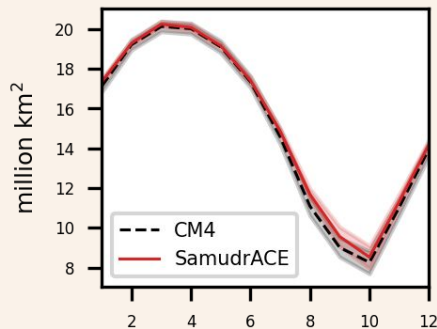


Watt-Meyer et al. 2025

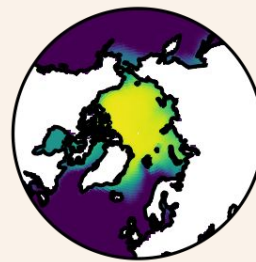
Atmosphere + Ocean (SamudrACE)

Annual cycle of sea ice in Northern Hemisphere

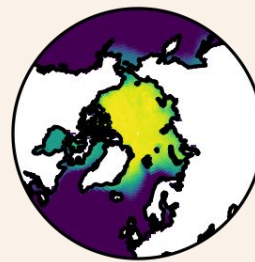
a) Northern hemisphere sea ice extent



c1) CM4



c2) SamudrACE



0.0 0.2 0.4 0.6 0.8 1.0
sea ice fraction [-]

They are fast! (~1500 simulated years per day on a single GPU [H100])

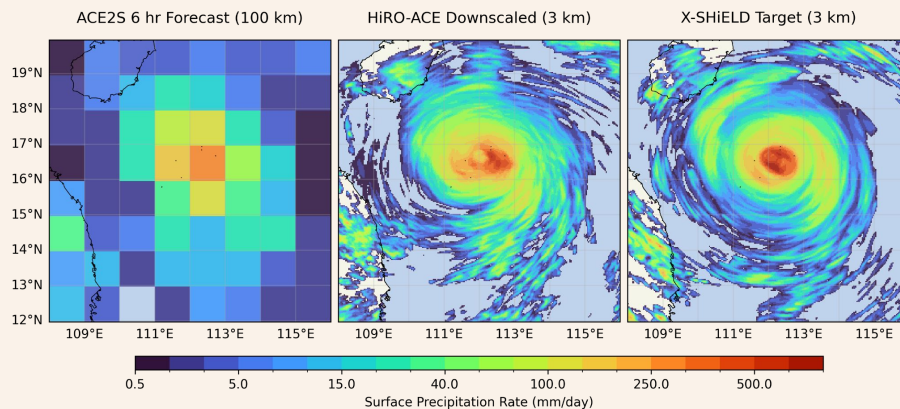
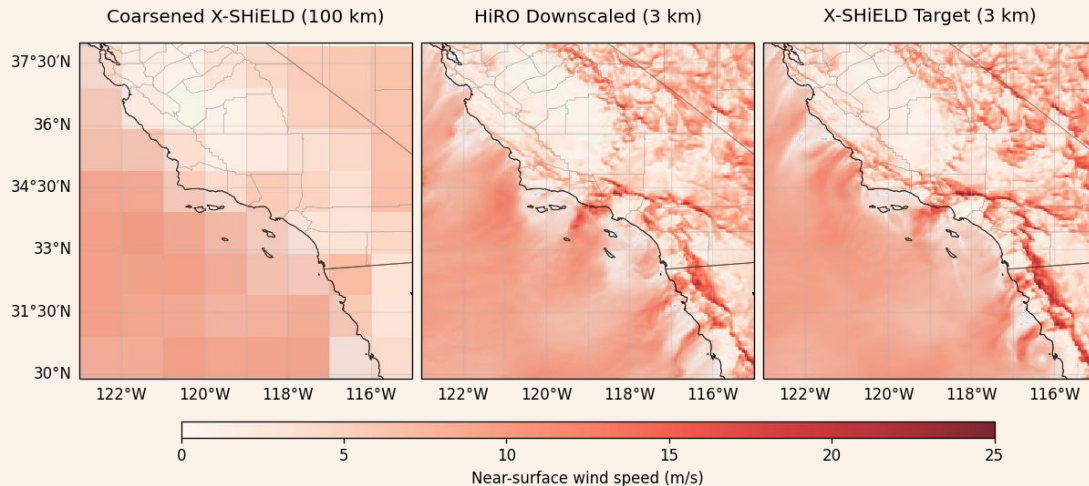
Skillful (e.g., low differences on average from parent model) and stable for long-term simulation (>1000 years)

High-resolution emulation for local impacts

HiRO-ACE: Coupling ACE2 with a downscaling model to provide 3 km precipitation or winds anywhere on the globe

Can simulate decades of 3 km model output for any region on a single GPU[H100] in ~ 45 min

Built for exploring the range of outcomes (i.e., large ensembles)



Open data Open models Open science

- Deeply investigating how these models can be used successfully and more importantly, where do they fail?
- Our strategy is to partner with large modeling institutions as a proof of concept so hopefully others can pick it up and iterate alongside us
- See more at about our recent work at:
<https://allenai.org/research?tags=climate-modeling>