From Risk to Resilience

Climate Data to Drive Business Decisions
And where CESM fits

Josh Hacker, Jupiter Intelligence

The trusted leader in climate risk analytics

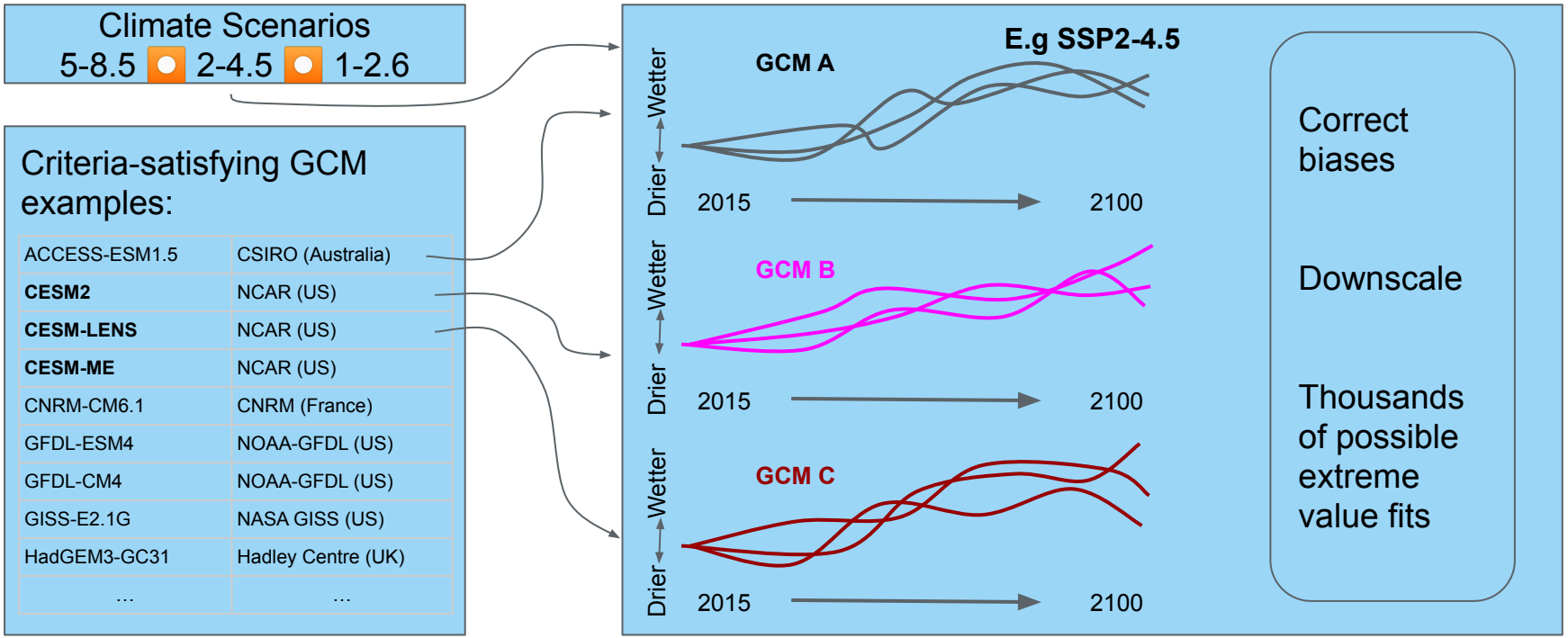
Jupiter turns sophisticated **climate science** into **actionable data** for organizations looking to strengthen their climate resilience – and delivers it as a service.

All Climate Perils	ClimateScore Global	Business Impact
 WIND	Portfolio-Level (90m) Analysis	Risk Assessment & Planning
 FLOOD	11,700+ Metrics per Location	Portfolio & Asset Management
 PRECIP	Latest, Vetted, & De-biased Global Climate Models	Loss Modeling
 HAIL	Scenarios in 5-year Increments	Resiliency Planning
 HEAT	Now to 2100 (50+ Year Horizon)	Regulatory Disclosure
 COLD		
 WILDFIRE		
 DROUGHT		

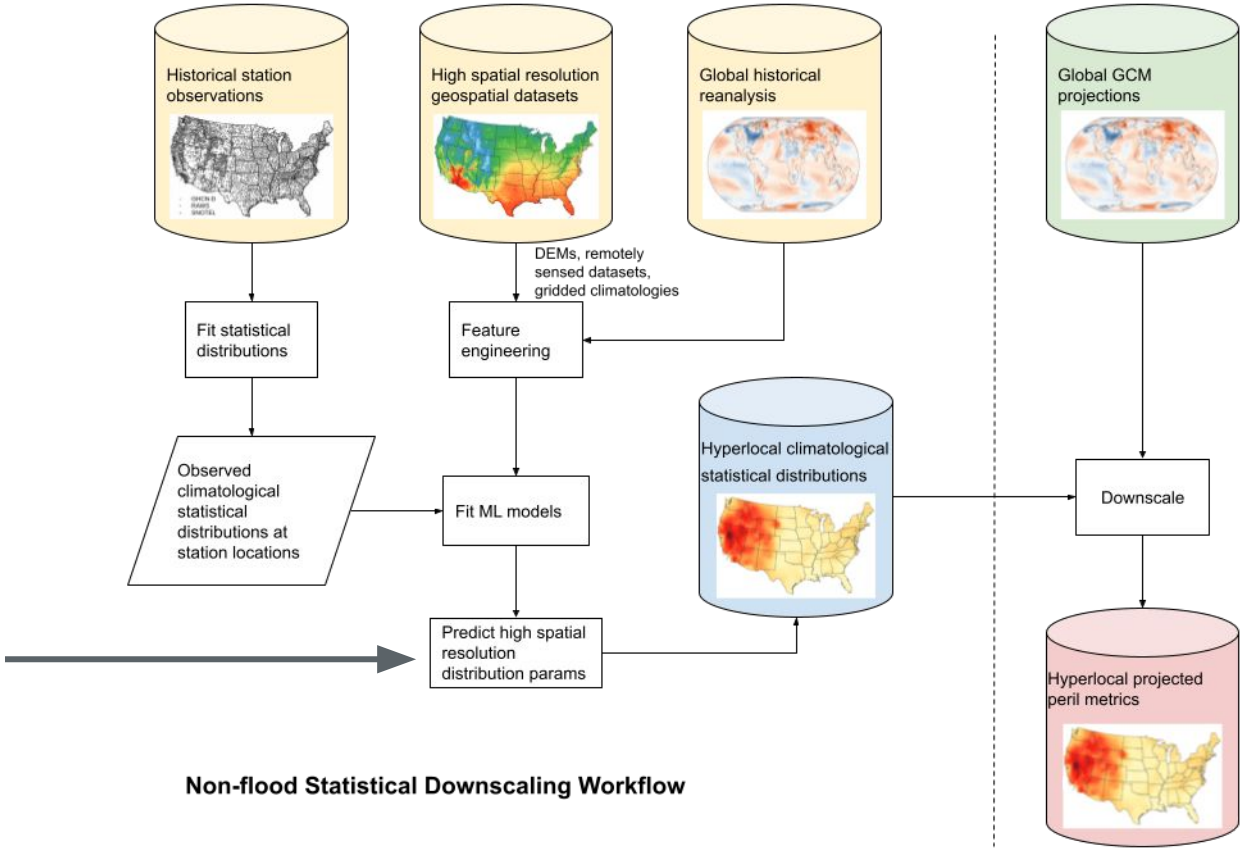
Climate leaders drive competitive advantage

	Novice *Data-Beginner*	Intermediate *Data-Lite*	Committed *Data-Enabled*	Advanced *Data-Focused*	Cutting Edge *Data-Driven*
Priority	**Not a Strategic Priority**	**Potentially a Strategic Priority**	**Strategic Priority <u>but</u> early in understanding**	**Strategic Priority & integrating into business**	**Fully Integrated; Competitive Advantage**
Value	"Check the Box" Resilience not a priority	Looking for guidance and data Don't have complete understanding of climate risk impacts	Risk processes & committees in place Climate data aware – know the right questions to obtain answers Open to innovation	Understand risk, ROI and value in climate risk data Quantifying asset risk used as competitive advantage	Climate risk part of company strategy & integrated into business Vision & strategy for value creation, competitive advantage and growth

Capturing climate, extreme events, and uncertainty

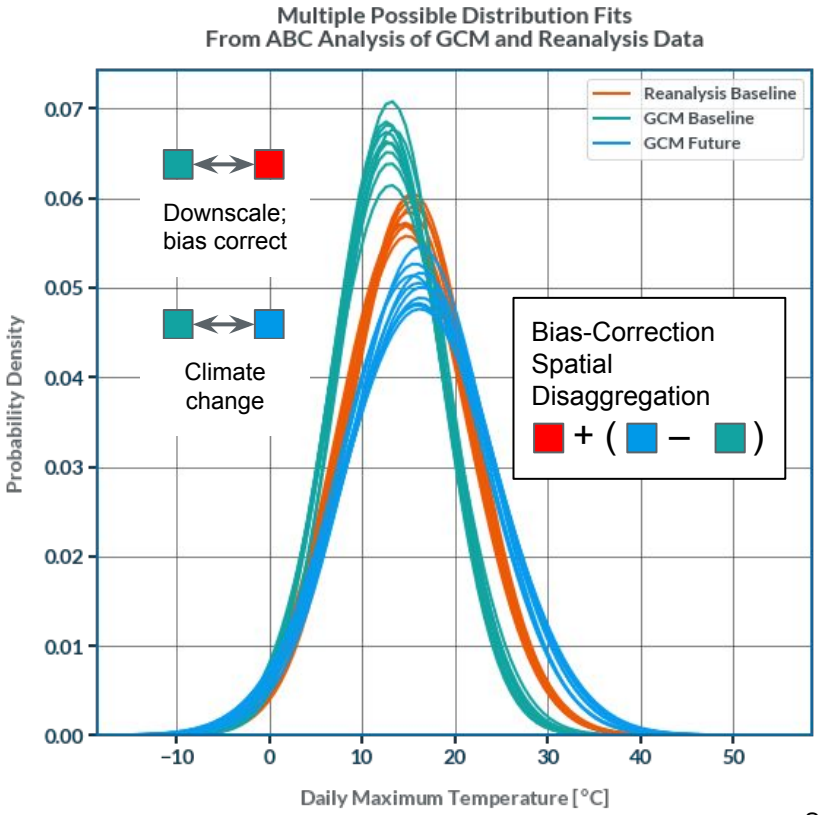


Typical Phase 2 Downscaling Workflow



Slide credit: Jared Oyler

Example Phase 1: Daily Maximum Temperature



The GCM is biased relative to the historical reanalysis/observed values at this location.

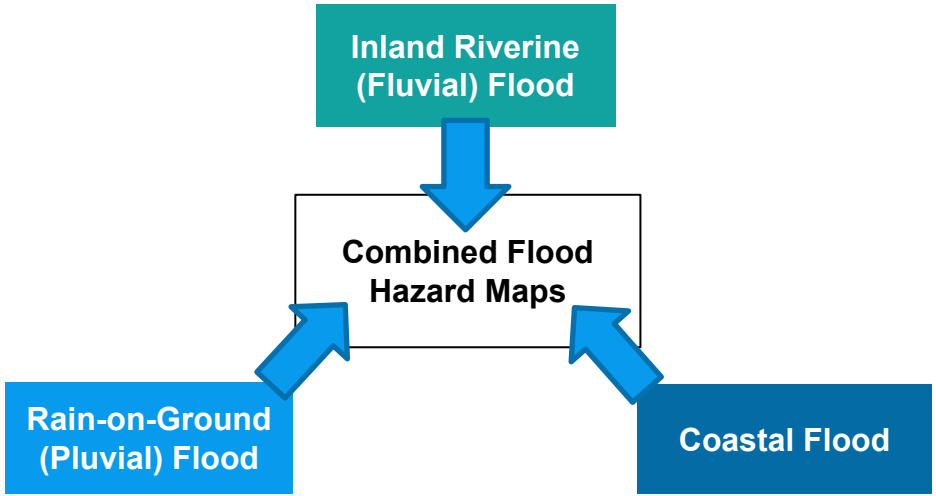
Use the ranges of possible changes in the distribution from the climate models instead of the raw climate model values themselves.

Apply those changes to the higher-resolution reanalysis distributions → downscaled and bias-corrected future distributions.

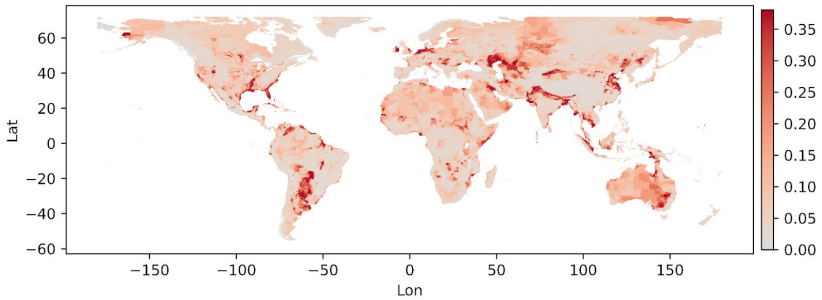
Slide credit: Luke Madaus

Flood hazard modeling

- **Combined flood hazard maps** at 90 m global resolution + 10 m for some regions
- **Medium complexity,** strong mechanistic basis
- **Range of climate projections and forcing** (sea level rise, rainfall and wind changes,…)
- **Dynamics of exposure over time** to 2100, uncertainty quantification
- **Extensive validation**



Fraction area inundated from 1 in 100-year flood



Mississippi River Flood Depth

CESM and risk analytics - going forward

- Advance:
  - Interannual to decadal prediction - emulators?
  - The model fidelity (e.g. internal variability) in a way that gains/retains confidence of stakeholders

- Continue:
  - To run large ensembles
  - To ensure permissive licensing
  - Provide output in cloud-friendly formats


JUPITER™
Thank You!