

Weather forecasts can inform projections of electricity demand months ahead...



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BACKGROUND: Circulation types (or weather regimes) are used to convert weather forecasts to energy demand forecasts. But there are any possible circulation types to choose from. How do you know which is best? Can you work out when to swap from one to another to optimize value?

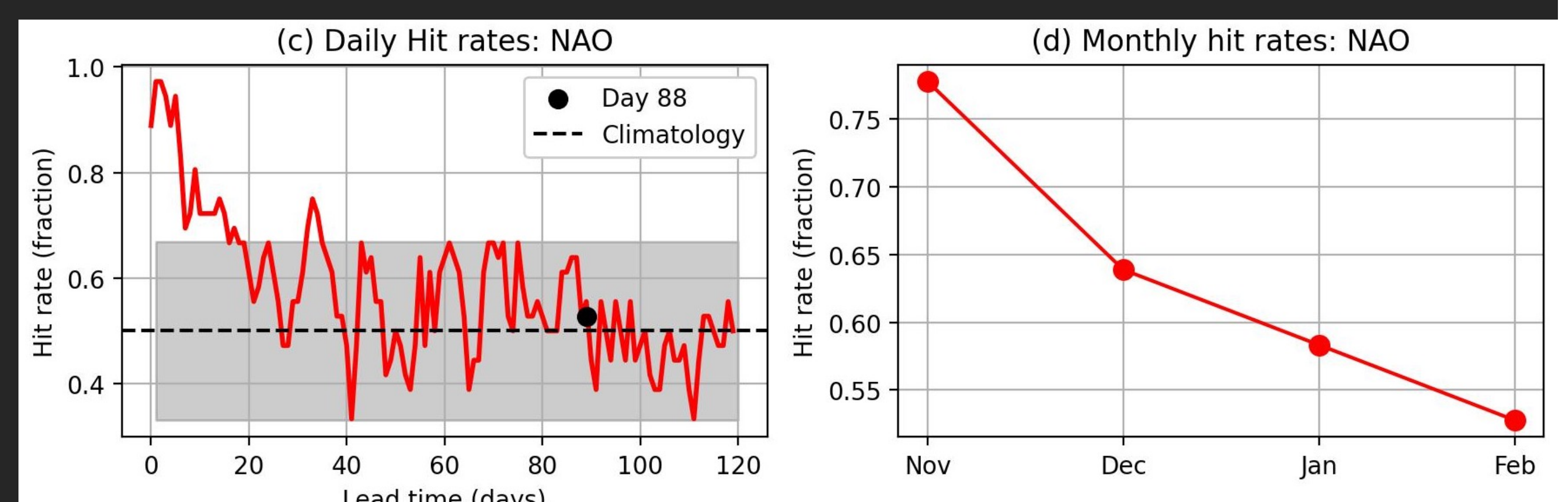
METHODS

1. Consider case of winter (Nov to Feb) Great British energy demand.
2. Compare a simple 2-state framework (positive/negative NAO) against a framework with 30 patterns.
3. Develop theory for estimating total forecast value as function of (a) how informative the framework is and (b) how skillful forecasts for that framework are.
4. Apply theory to our case.

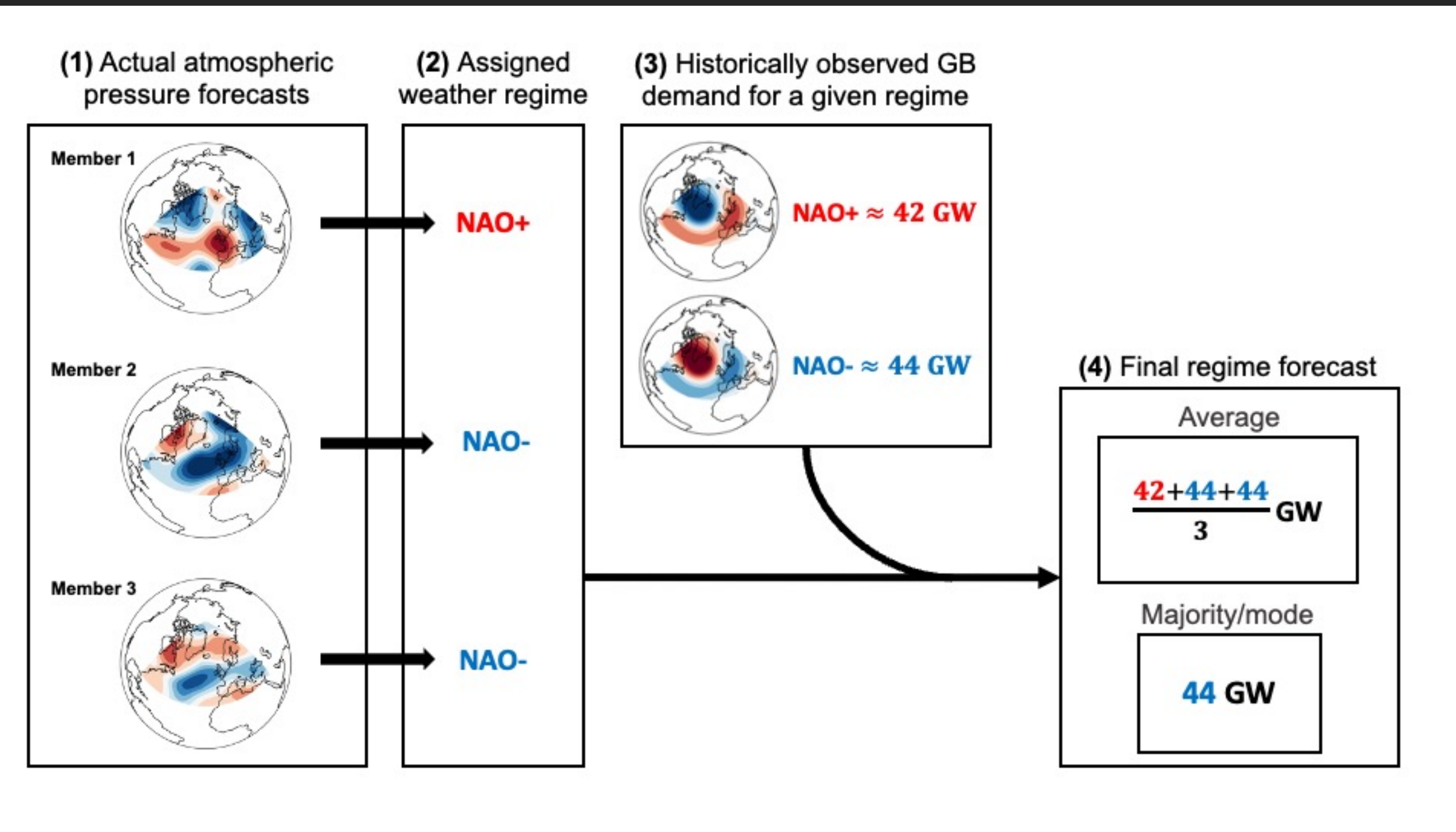
RESULTS

The 30-pattern framework is more informative but less predictable. The 2-pattern framework is less informative but more predictable. Swap from former to latter after 12 forecast days. Theory applies more generally to any case.

Strommen, K., H. M. Christensen, and H. C. Bloomfield. 2025. "Balancing Informativity and Predictability in Circulation Type Forecasts: A Case Study of Energy Demand in Great Britain." *Meteorological Applications* 32, no. 4: e70078. <https://doi.org/10.1002/met.70078>.



(a) Forecast skill at predicting the North Atlantic Oscillation regime across winter season.



(b) Schematic for using weather forecasts to inform GB demand.

...but you need to balance informativity and predictability to make best use of them!

(a) Positive NAO phase

(b) Negative NAO phase

Many different ways to create an energy demand forecast using "circulation types".

Which should you pick? How to combine?

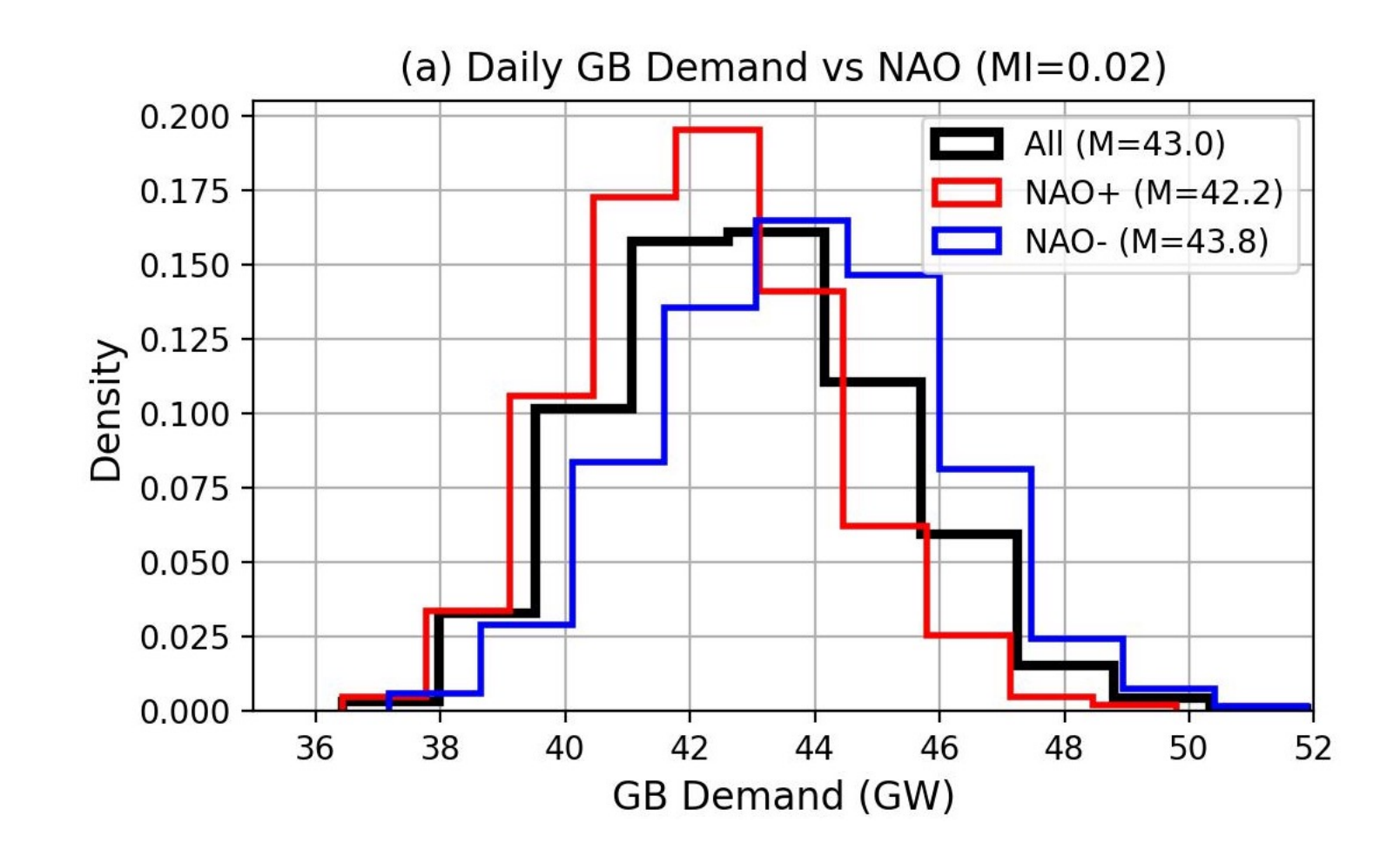
OUR SOLUTION

- 1) Estimate forecast skill.
- 2) Use mutual information content to estimate informativity.
- 3) Plot the "total value" curves and select whichever framework is on top.

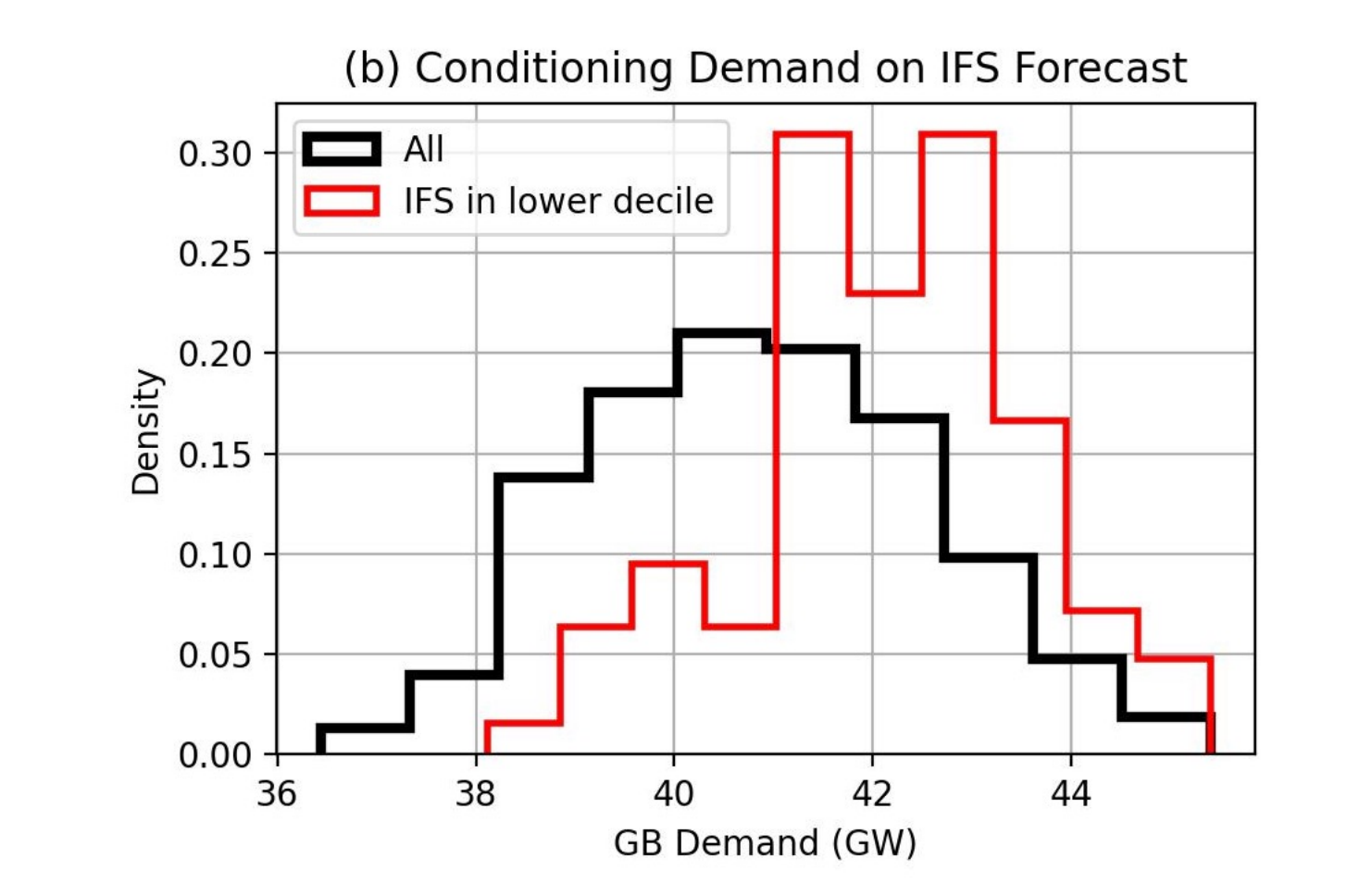
Estimating informativity of a circulation-type forecast

A circulation-type framework is informative for your application if knowledge of which type is occurring makes your climatological PDF narrower.

You can estimate this quantitatively using *mutual information content*.



Mutual information can therefore be used to evaluate different choices of forecast.



For forecasts a few weeks out, the gridpoint forecast is superior to circulation type forecasts.

For forecasts months ahead circulation-types are better.