1. **The separation of "dynamic" and "thermodynamic" contributions in the flow-analogue method is not sufficiently well defined**

This study uses a flow-analogue approach to decompose the T850 temperature anomaly, defining the "dynamic contribution" as the composite of the circulation analogues and the "thermodynamic contribution" as the residual between the observed anomaly and the analogue composite. While this is methodologically defensible, the terminology is somewhat misleading. The residual term does not purely represent background thermodynamic warming; it also captures other processes not fully encoded by the Z500 field, such as differences in vertical motion intensity, subtle variations in moisture transport, and land-surface feedbacks (e.g., soil moisture depletion). The authors acknowledge this caveat in the conclusions, but the abstract and main text repeatedly use the simplified term "thermodynamic amplification," which may lead readers to overestimate the method's ability to physically separate these processes.

Suggestion: In the Methods section, the authors should more clearly state that the residual is a "circulation-constrained approximation". I recommend using more neutral terminology such as "residual thermodynamic component" or "non-circulation component" to avoid over-interpretation.

2. **The definition of a "new class" of heatwaves is not quantitatively specified**

The abstract and conclusions state that the June 2026 event represents a "new class" of early-summer heatwaves, characterized by intensity-dominance, record-shattering temperatures, and relatively compact duration. This is an appealing synthesis, but at present it appears to be a qualitative description based on a single event, rather than a formally defined classification. Without a quantitative criterion, the term "new class" reads more as a rhetorical summary than as a scientifically testable category.

Suggestion: I recommend that the authors propose a more explicit definition for this classification. For example, one could define a metric based on the ratio of intensity to duration (number of heatwave days), or on the relative magnitudes of the dynamic and residual thermodynamic contributions.

3. **A discussion of the PV_y (potential vorticity meridional gradient) mechanism would strengthen the dynamical interpretation of the blocking persistence**

The study convincingly demonstrates that the June 2026 heatwave was driven by a persistent omega-type blocking anticyclone. However, the manuscript does not explore the underlying dynamical mechanisms that enabled this blocking system to remain stationary and amplify over Central Europe for several consecutive days. The authors attribute the event to a "persistent blocking ridge" but do not offer a physical explanation for why this particular blocking events was so exceptionally resilient.

Recent studies have highlighted the crucial role of the meridional gradient of potential vorticity (PV_y) in modulating atmospheric blocking persistence (Luo et al., 2023; Luo et al., 2025). A weakened PV_y can impact the maintenance of quasi-stationary blocking ridges. Given that the June 2026 event was characterized by a remarkably stationary omega-blocking that persisted through the peak phase (25–29 June) and produced record-shattering temperatures, it would be highly instructive to examine whether anomalous PV_y conditions preceded or accompanied this event.

Suggestion: I recommend that the authors extend their dynamical analysis by computing the PV_y

fields over the Euro-Atlantic sector during the June 2026 event, and comparing them against the climatological mean and against historical blocking episodes. Such an analysis would provide a mechanistic explanation for the exceptional persistence of the blocking system. This would substantially strengthen the paper's dynamical interpretation and place the 2026 event within the broader framework of recent advances in blocking dynamics.

Reference:

Luo, D., Luo, B. & Zhang, W. A Perspective on the Evolution of Atmospheric Blocking Theories: From Eddy-Mean flow Interaction to Nonlinear Multiscale Interaction. Adv. Atmos. Sci. 40, 553–569 (2023). https://doi.org/10.1007/s00376-022-2194-z

Luo, D., Zhang, W. & Luo, B. A Nonlinear Multi-Scale Interaction Model for Atmospheric Blocking: A Tool for Exploring the Impact of Changing Climate on Mid-to-High Latitude Weather Extremes. Adv. Atmos. Sci. 42, 2018–2035 (2025). https://doi.org/10.1007/s00376-024-4435-9