

Review of EGUsphere-2024-2798

This is an excellent article outlining the arguments for a European field campaign called “Thunderstorm Intensification from Mountains to Plains” (TIM). The paper outlines the high damage potential of severe storms in Europe, summarises the key research topics for TIM to address, and outlines a possible field campaign with focus regions and a synergistic set of instrumentation and research goals. The article is exceptionally well written and compelling. I have only minor comments that should be addressed before the article will be ready to accept. First, references are missing in a few places that I have listed below. Second, while severe storms are affected by climate change and that is a key reason that TIM should go ahead, the language used when writing about the effects of climate change on severe storms needs to be precise about the uncertainties in our current knowledge that exist around certain changes.

Specific comments

1. Line 26-27: “are projected to experience the strongest increases in severe weather occurrence as a result of global warming” – I assume this statement relates to projected increases in severe storm environments, which is correct, but since there are possible disconnects between environments and severe weather occurrence (which may also depend on hazard type), care needs to be taken. If the authors mean environments, I would suggest changing this sentence to “increases in atmospheric conditions prone to severe weather occurrence”. Also, I think Battaglioli 2023 did not show projection information but rather past trends.
2. Line 107: “but also the terrain shape and dimensions, and the surface use such as cities or cropland” - the authors should include some references to previous work about these factors.
3. Lines 110-113: “Moisture is often relatively low directly over mountain ridges, leading to less CAPE compared to the surrounding slopes and valleys. Local increase in water vapor content can be found along convergence lines, near lakes, or other regions where moist air can be transported or accumulated, which would lead to larger CAPE, all else being equal.” These statements require references.
4. Line 120: “Nevertheless, studies have suggested” - it is unclear which studies have suggested these findings.

5. Line 175: “as well as outflow from existing storms” – any previous work on this in particular?
6. Line 178: “The reliable role of these processes in CI has been shown to increase predictability of convective precipitation over mountains compared to flat terrain” – it is unclear to me what is meant here. Is it that the use of variables related to these processes increases predictability?
7. Line 192: “has been proposed” – by who?
8. Line 253: Flash floods should be listed as secondary impacts (since they depend on terrain) and the words “flash floods” in this list could be replaced with “extreme rainfall”.
9. Line 262: “Hail is the dominating source of SCS damage” – I agree, although the ranking could be regionally dependent and this statement needs a reference.
10. Line 269: The authors should include a reference or two to the numerous wind-driven hail studies that show it is more damaging than non-wind-driven hail.
11. Line 360: “as well as in severe weather reports” – important to include a reference to the study showing this conclusion.
12. Lines 362-364: “In its Sixth Assessment Report the Intergovernmental Panel on Climate Change (IPCC) states that climate models consistently and with high confidence project environmental changes that would likely lead to an increase in the frequency and intensity of severe thunderstorms, also involving tornadoes, hail, and winds (Calvin et al., 2023, Chapter 11)” – while IPCC gives high confidence to CAPE increases in tropics and subtropics, other projections are given with lower confidence (e.g. there is “significant uncertainty” around projected changes in hail, lightning, and tornadoes.) See e.g. Table 11.2. Given the different trends possible for different hazards (e.g. because hail is affected by melting which can lead to decreases in surface hail frequency with increased temperature) and given that increases in CAPE do not necessarily always translate into frequency increases (given offsetting effects), the statement made here by the authors should be rephrased to show the level of uncertainty that exists (I note the next paragraph does a good job of mentioning these factors, but the statement still requires slight revision for accuracy).
13. Line 394: Have advances *always* been linked to new technology? Would “often” be more accurate?
14. Line 464: A reference for Z_{DR} columns for hail detection is required here.

Technical corrections

1. Line 87: “quite long distances” is rather vague and an indication of what it means could be given.
2. Line 152: grammatically, “encounter” should be “encountering” here.

3. Line 196: “fails” should be “fails to occur”.
4. The authors have used “exemplary” where I think “example” or “possible” is meant (“an exemplary setup” for example means a gold-standard setup, whereas “an example setup” may be what the authors mean).
5. Line 531: a word (data?) is missing here.