Natural Hazards
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Discussions

Interactive comment on "Drought risk in the Bolivian Altiplano associated with El Niño Southern Oscillation using satellite imagery data" *by* Claudia Canedo-Rosso et al.

Anonymous Referee #1

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General comment

The authors integrate remote sensing products (Normalized Difference Vegetation Index, land surface temperature, and precipitation), meteorological observations (near-surface air temperature and precipitation), and crop yield data to assess the impacts of ENSO on quinoa and potato yield in the Bolivian Altiplano. The purpose of the study is to develop a statistical framework that can be employed to reduce drought impacts on agricultural production in a region where surface data are scarce. The study shows that the remote sensing products listed above are sufficiently accurate when compared against ground observations, and that the positive ENSO phase significantly decreases

crop yields. The framework is then employed to identity hotspots that are most vulnerable to droughts. The MS presents a relevant contribution to drought-related risk assessments in a region that is poorly studied. My main concern is related to the bias correction of land surface temperature, as explained in the main comments below. Also, the presentation of the methods section requires some attention. I recommend considering the MS for publication in NHESS after major revision.

Main comments

- The authors assume that land surface temperature (LST) and near-surface air temperature should be equal. This is a misconception as both variables present different processes. LST directly follows from the Stefan-Boltzmann law and therefore depends on outgoing long wave radiation and surface emissivity. Near-surface air temperature, on the other hand, is affected by other processes, such as turbulent heat fluxes. The authors use near-surface air temperature measurements to "bias correct" remotely-sensed LST using an approach by Zhou and Wang (2016). This does not make much sense, as LST and near-surface air temperature should differ. Furthermore, the cited study by Zhou and Wang (2016) actually uses ground measurements of LST rather than near-surface air temperature to bias correct remotely-sensed LST. I propose three alternative approaches to address this issue: the authors could (i) rerun their analysis using LST directly, (ii) find an approach how to spatially interpolate near-surface air temperature, or (iii) use an already existing air temperature data set that has been published elsewhere (e.g. data from the climate research unit).

- I suggest that the authors improve the presentation of the methods section by including the equations employed in their statistical framework (e.g. the Nash-Sutcliffe efficiency (E) coefficient, POD, and FAR).

Detailed comments

P01L14 Please spell out ENSO before using the acronym.

P01L17 You write that "droughts can be better predicted using a combination of satellite imagery and ground-based available data". Better than ground-based available data alone? Please be explicit.

P01L18 You write that "satellite climate data were associated with" NDVI. This is a very vague formulation to outline your approach. Please be more precise.

P01L19 You started out your abstract on the topic of drought and are now jumping to "the crop production variability". Please find a more elegant way to include the topic of crop production variability. I would include this above when you describe the research problem.

P01L19 You are jumping back and forth between methods and results. I think you could improve the readability of your abstract when you first outline your approach and then the results.

P01L21 I would replace "indicate" with "identify".

P02L02 I would include a reference here, e.g. UNDP, 2011: Tras las huellas del cambio climatico en Bolivia: Estado del arte del conocimiento sobre adaptacion al cambio climatico agua y seguridad alimentaria. United Nations Development Program - Bolivia, 144 pp

P03L14 You could include a reference for SAMS here, e.g. Zhou, J., and K. M. Lau, 1998: Does a monsoon climate exist over South America? J. Climate, 11, 1020-1040.

P03L19 Please explain more clearly how exactly the gap filling was done.

C3

P03L25 You mention the resolution three times. Please avoid redundancy.

P04L14 Reformulate. I suggest you write "An E equal to 1 corresponds ..."

P04L08 I suggest you provide the equations for the Nash-Sutcliffe efficiency (E) coefficient, POD, and FAR.

P06L10 This paragraph suggests that land surface temperature (LST) and near-surface air temperature should be equal. Please refer to my general comment above to address this misconception.

P06L28 Delete "and the" or restructure sentence.

P07L16 This sentence is vague. Do you mean NDVI grid cells? Also, NDVI does not "simulate" crop yield. Please rephrase.

P07L20 Please define accumulated degree days.

P07L22 Better than what?

P07L26 Spell out and define GDD here.

P11L28 Please refer to my general comment above.

P11L30 Typo, replace p = 001 with p = 0.01.

P12L03 Please refer to my general comment above.

P15L18 I would move any discussion on insurance policy and drought mitigation to the discussion section.

P16L15 Avoid vague formulations such as "There are numerous cases in many countries". Also, it is not accurate to say that the impacts of ENSO are particularly strong in the mid-latitudes.

C4

Figures

Figure 01 please specify the percentiles, min, max, and outliers of the boxplots in the Figure caption. The same comment applies to Figure 5.

C5