

## **Referee #1 responses:**

### **Overall comment:**

- **RC:** Gil-Guirado et al. present in this manuscript a new and interesting methodology to infer climatic conditions in the past through historical documents. In addition, they compare it with the most commonly used methodologies to infer past climate variability with historical documents, including appealing results. The manuscript is consistent and the results are robust, although I suggest some changes to facilitate its reading and compression before being published. In addition, the manuscript needs a thorough revision of the language. Shortening the sentences and making a section with all the acronyms would benefit the manuscript comprehension too.
- **AC:** Thank you for your flattering and constructive comments. Our aim was to offer new methodological approaches to historical climatology that can be suggestive to extend the knowledge of the historical climate evolution in regions that have been barely studied so far. We appreciate and understand your comments about the language review. Therefore, after taking care of all the suggestions by both reviewers, the full text has been carefully edited by a professional translator.

### **Main comments:**

- **RC:** Right now the methodology is rather confusing. I would suggest clarifying it by doing flow diagrams for each of the proposed methodologies (Page 8). Then, it would be very convenient to make an annex or table with the acronyms. Another important point is to include the whole methodology in the corresponding section. Sections 4.3 and 4.4 contain information on the methodology which should be included, for example, as section 3.4. Climate analysis of drought series.
- **AR:** We mostly agree with these issues. For this reason, some parts of the work, especially the methodology, have been re-written to improve their clarity. In detail, section 3 (methodology) has been modified in order to include clarifications about the implementation of each method. In addition, we have included new flow diagrams for each of the proposed methodology as additional panels in figures 3, 4 and 5, respectively (see attached figures). Finally, we have included the methodological information contained in sections 4.3 and 4.4 as an additional subsection in the methodology section (3.4). Finally, and following the referee's recommendations, we have included an Annex (See Annex 2) where we compile all the acronyms used throughout the manuscript.

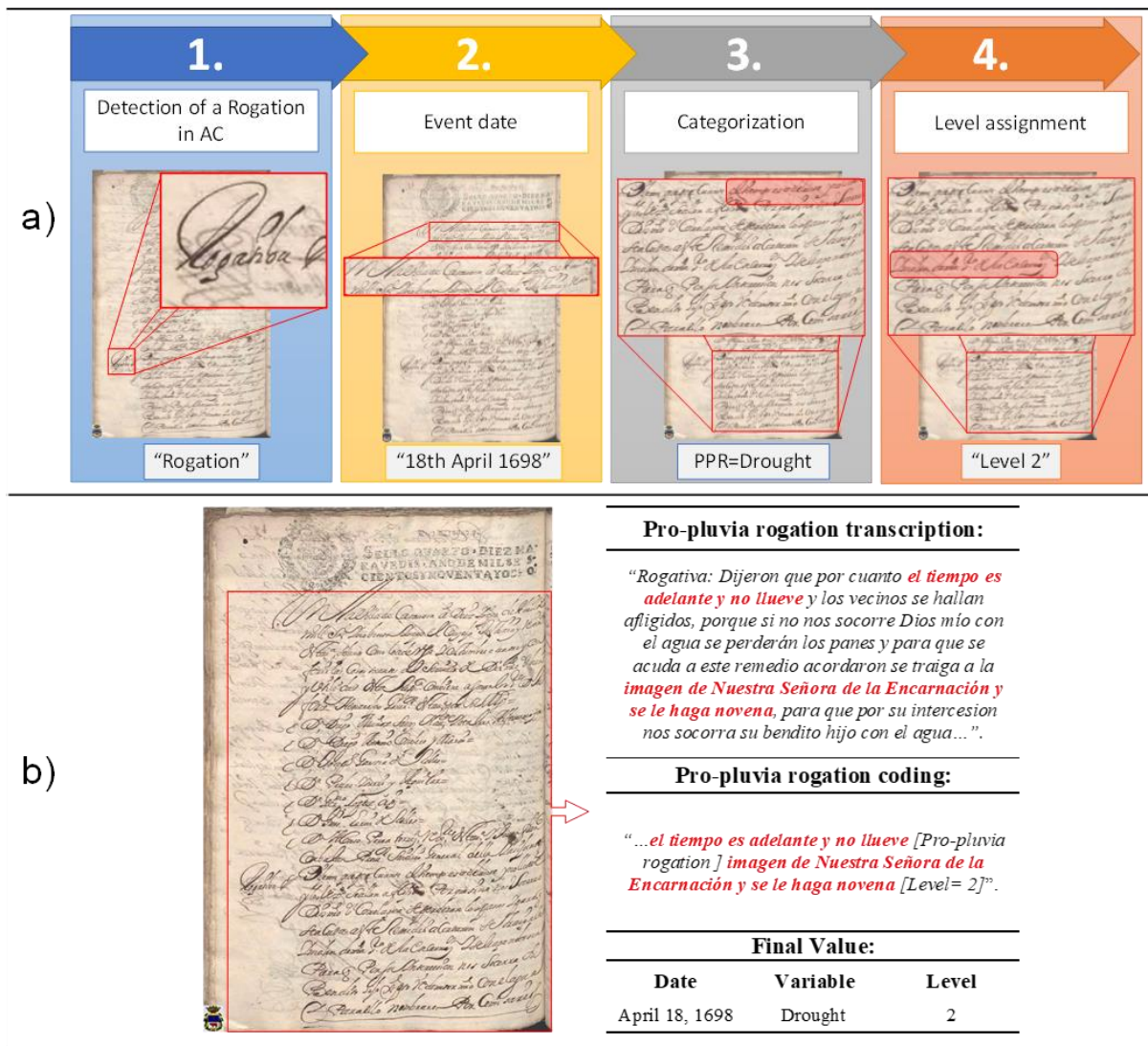
### **Minor comments:**

- **RC:** Some minor comments; Line 29/1. Define and cite WMO. Line 6/2. Please rephrase. Line 25/2. You might want to replace further by improve. Line 9/9. have promoted. Line 15/14. La? Table 1 (Page14). To improve the visibility, I would suggest to plot it in columns following the color code of the next figures. Lines 1-5/22. What are the potential climatic implications of such cycles? e.g. Solar irradiation? Line 18. period IN the.. Line 8/23. Results section again? I guess it should be discussion instead. Please be attentive to all details before submitting a manuscript.
- **AR:** Thank you very much for highlighting these important details and providing advice about the convenience of including some necessary clarifications. All these issues have been taken into account. Regarding the potential of cycles of around 30 years detected in droughts, although the reason remains unclear, some authors (Moreira et al., 2012)

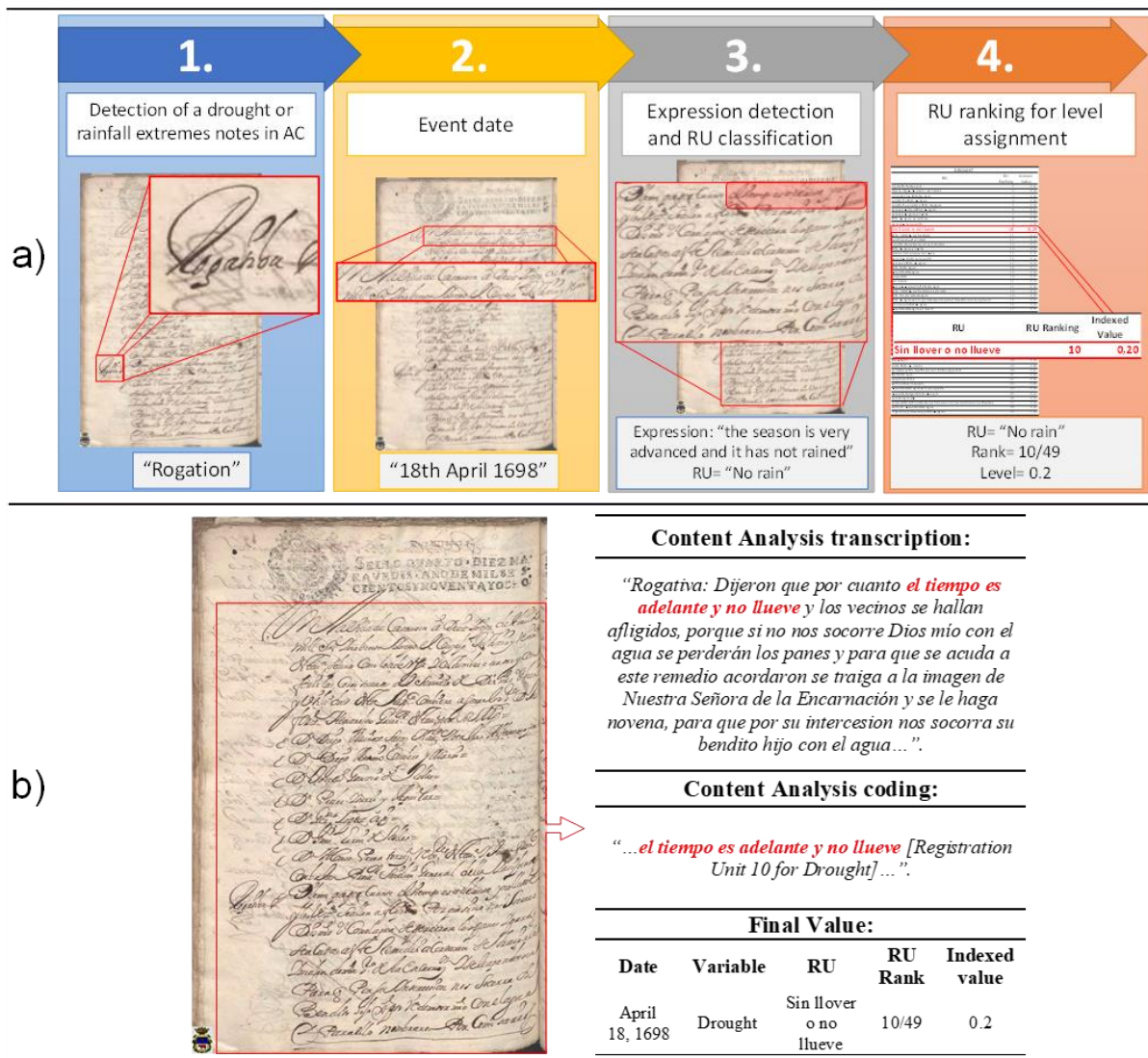
have detected a similar periodicity of droughts in Portugal. In addition, as you suggest, Chen et al., (2006) relate this hydrological variability with the Sunspot Number variability. We have added a short comment in the new version of the manuscript about this particular point.

Here is a more detailed description of the changes carried out:

- *Line 29/1. Define and cite WMO.* This is now defined
- *Line 6/2: This text* has been rewritten
- *Line 25/2* Done
- *Line 9/9:* Corrected
- *Line 15/14:* Corrected
- *Table 1 (Page14).* To improve the visibility, I would suggest to plot it in columns following the color code of the next figures. Following this advice, we have used the same color code of figure 6 to the same variables of table 1.
- *Lines 1-5/22. What are the potential climatic implications of such cycles? e.g. Solar irradiation?.* We have added some discussion about the detection of these cycles in Portugal, as well as the possible relationship between these cycles and solar variability.
- *Line 18/22.* Corrected
- *Line 8/23.* Corrected and section renamed

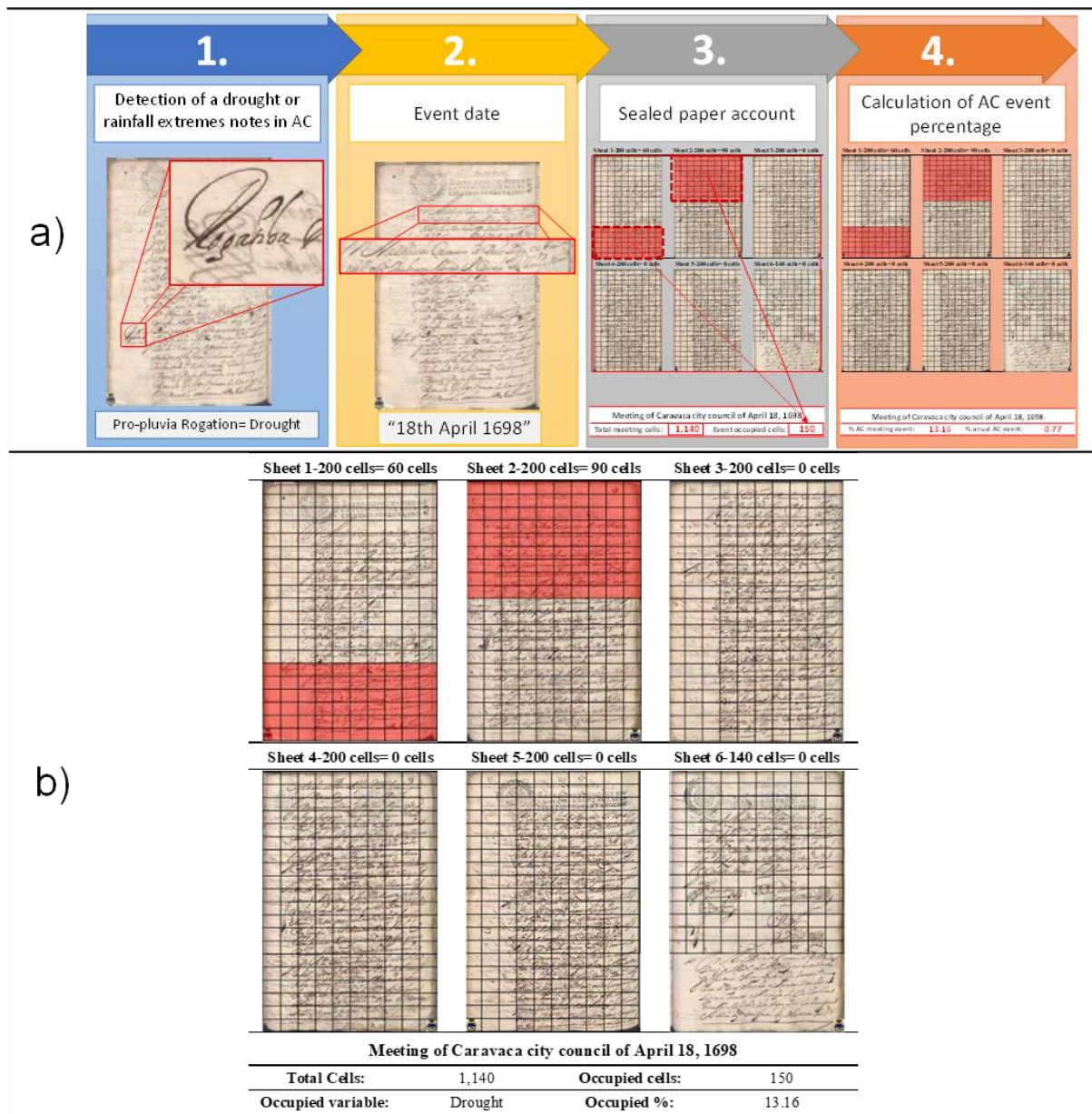


**Figure 1:** RO method by step (Panel a) and encoding example of the RO method (Panel b). This particular example refers to a Pro-Pluvia RO on 18th April 1698, so the reconstructed variable is drought. Source: the Carmesi Project



**Figure 2:** Content Analysis method by step (Panel a) and an example of the encoding of the Content Analysis (CA) method (Panel b). The coded source is the same as in Figure 2 to emphasise how the three different approaches are applied in practice. This particular example refers to a PPR on 18 April 1698, so the reconstructed variable is drought. Source: the Carmesi Project.





**Figure 3:** COST method by step (Panel a) and an example the COST method encoding (Panel b). The coded source is the same as in Figure 2 and 3 to emphasise how the three different approaches are applied in practice. This particular example refers to a PPR on 18 April 1698, so the reconstructed variable is drought. Source: the Carmesi Project.

## **ANNEX 2 (acronyms used throughout the manuscript):**

**COST:** Cost Opportunity for Small Towns

**RO:** Rogations Method

**CA:** Content Analysis

**WMO:** World Meteorological Organization

**HC:** Historical Climatology

**CC:** Capital City

**EP:** Episcopal sees

**MCA:** Municipal Chapter Acts

**CCO:** City Council

**RU:** Registration Units

**PPR:** pro-pluvia rogations

**PSR:** pro-serenitate rogations