

## ***Interactive comment on “Making rainfall (fractal!) features fun: scientific activities for teaching young children” by A. Gires et al.***

### **Anonymous Referee #2**

Received and published: 19 March 2016

The authors present several different classroom-based activities around the core theme of rainfall. These activities include making flour and oil disdrometers, developing a rainfall times-series, and writing a children's book. These activities are part of the development of “a whole activity kit” on rainfall. Age groups engaged include 5-6 and 8-12 year olds. The activities described are interesting and appear to make complex topics accessible and fun for students as young as 5-6 years old.

The framework informing the design of the activities is strongly underpinned by the current literature and the authors use a mix of different methods to explore the topic of rainfall with students. The authors provide a review of relevant literature, which I feel is of great use to members of scientific community who engage in classroom-based outreach and education. Overall, this article provides a nice summary of detailed, scientist-led outreach and provides great examples for engaging students in the scien-

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tific process, through fun, real-life examples of the scope and rigor of research science.

#### Major Comments:

- One limitation of this work is the lack of qualitative or quantitative evaluation. This limits our understanding of the success and reach of these activities. Given the goals stated at the start of this manuscript, even qualitative evaluation would have helped to assess whether these goals were met. - Along the lines of evaluation, can the authors please provide in the text, (a) specific examples of how the teachers with whom they collaborated improved their activities (e.g. what language did they change for clarity etc.; lines 1-7, page 17) and; (b) examples of how and what feedback was collected from the students in the development of the book (line 8, page 16)

This information can guide readers in understanding how feedback was collected and the results of this work as well as demonstrate better one of the central arguments at the end of the study which states that, “The development of these activities highlighted the importance of a genuine collaboration between scientists and school teachers, which turns out to be necessary for a successful implementation” (Lines 1-3, page 17). If this is the case, please include a section about this collaboration (how connections were made and how did you build the dialogue, how was feedback solicited, examples of suggestions made by the educators) at the beginning of the article. It would also help to include specific information/examples about this feedback/collaboration for each of the activities presented in the manuscript.

Minor comments: - The article requires a thorough review of grammar and punctuation, including the use of the colon. - For clarity and ease of reading, the title can be simplified or clarified. I suggest removing (fractal!) from the first part of title as it only represents one small portion of the science of rainfall covered in the activities presented here and makes it hard to read. - I would specify an age range for your targeted activities in your abstract (page 2, line 3) and title (as above); young is vague and has different meanings in different countries - Page 2, line 6: I suggest changing fields to

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science - First 10 lines in abstract and introduction are identical. . . - Page 2, line 9: I suggest removing the colon and specifically listing the activities that will be presented in the text e.g. (a) designing and using a disdrometer; (b) developing a time-series of local rainfall. . . and (c) collaboratively writing a children's book about rainfall. . . - Page 2 line 20: You mention parents here but this is not discussed in the text; remove or include more information in the text. - Page 2, line 26: what is Veolia? - Page 3, line 1: Please remove the colon and use sentences. - Page 3, line 9: use of 'young age' again; please define and be consistent. - Page 3, line 21: The ages mentioned in the text differs from that targeted with your activities. A majority of the activities presented here were targeted at 5-6 and 8-9 year olds but the ages cited in your literature review are much older (11-14 years old). Please elaborate on your choice of age range given that it differs from the literature, specifically if your stated goal was to interest more students in science. - Page 4, line 1: I would avoid using a Chinese proverb here. - Page 4, line 2: Not sure you need 19 references here. Also, please check the ordering of references required by the journal (e.g. chronological, alphabetical), and update this list accordingly. - Page 4, lines 11-12: Please provide references for this broad statement. If this is the assumption of the authors, please state that clearly. - Page 4, line 14: You start the sentence with "The Authors" but the cite numerous papers; please clarify the cited research from the opinion of the authors. - Page 5, line 9: Please state where geographically this, and all of the other activities, were tested. - Page 5, line 16: add a space between the 'R, the' - Page 5, line 17: reference? - Page 5, line 24: How does this activity differ from Mason and Viñas, 2013? Please describe. - Page 6, line 3: I really like this activity and how concepts were built for the students; I want to try this in the classroom! - Page 7, line 7: So it has to be raining to conduct this activity? Have you tested ways to 'make' rain (e.g. spray bottles)? - Pages 7-8, line 20: For the four points explored here, what materials are used to discuss or teach these elements? Up to this point, students are exploring the rainfall, not its formation. Can you describe the tools and resources used for this part of the activity? - Page 8, line 5: Do students measure the sizes? - Page 8, line 12: Remove () and add a comma - Page 8, line

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13: Remove information about the plot and add it to the figure caption. - Pages 9-10, starting line 24: I suggest removing this 'footnote' reference - Page 10 (all)- 11 (lines 1-10): This information about the mathematics of the model is too detailed for this type of paper; I suggest removing it completely or moving it to an appendix. The information presented should be specific to the concepts explored with the students. Demonstrate the specifics when discussing the activity. - Page 11, line 11: I really like this activity, too. Fantastic! - Page 11, line 18: Change 'at school' to 'to school' - Page 11, line 23: holiday? - Page 12, lines 25-26: What is alive and dead in this context? First use, please explain. - Page 13, line 21: How do you know it "went well". What does that mean and how did you arrive at that conclusion? See major comments above. Here is a place where you can clearly state, what worked, what didn't and how you know. - Page 14, section 3.3: This seems out of context and is hard to understand. Some of this information is new and seems out of context. Did you explore these concepts in the classroom? If so, explain. If not, I suggest updating the text or section, as it does not demonstrate the students 'going further'. Is this a shortcoming of the activity? If so, that is really interesting and should be discussed in simple terms. Maybe each 'Going Further' section should be changed to focus on lessons learned or something similar? - Page 14, major comment: It seems that the fractal activity didn't work as anticipated; this is glossed over in the text. If this is the 'key' activity (as the title currently suggests), we need more information about what did and didn't work in this activity. The authors can go further here to describe what didn't work. This would be far more useful information than section 3.1. Given that the topic is complex, specific examples, in clear language, about how exactly this content was approached would be really useful (and good for the broader community). One key challenge is 'distilling' the science – what would the authors do differently? How did the expert educators help frame the content? - Page 14, line 20: Sceaux, France? - Page 14-15, starting line 26: Simplify text to limit punctuation. - Page 15: An interactive session implies two-way dialogue; please describe the design of the sessions- exactly how were they interactive. A bit more information would be useful if people wish to use a similar approach. - Page

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15, line 16: Remove “This scientist writes the book”. - Page 15, line 25: As above, I would list the questions so they are clear. e.g. The story was structured around three main questions, (a) xx; (b) xx ; (c) xx. . . - Page 16, line 1: complements? - Page 16, point iii: What specific feedback did the children supply? What questions did you ask. Please describe. - Page 16: About the book development: who read the book, how was it distributed, what evaluation or metrics exist? What languages is it available in? - Page 16-17: Do you have any information about whether your goals were reached (e.g. student or teacher feedback?) - Page 17, line 13: You mention ‘fruitful discussions’ with the schools and teachers. Can you weave in specifics about these discussions into the text for each activity (as above with major comments)? - Pages 22-29: Check language and grammar in all figure captions. - Page 22: Keep caption formatting consistent; change (c) to read: (c) Student drawing of their observations. - Page 23: Change wording for clarity; e.g. testing disdrometers. . . - Page 24: Change to ‘rainy conditions’ and ‘bringing the disdrometer outside to test it in the rain’; ‘drawing by the children. . .’

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2015-496, 2016.