

**International Journal of Advances in Applied Sciences (IJAAS)**

# **CERTIFICATE OF ACCEPTANCE**

The manuscript (IJAAS-20962) titled:

**A study of rainfall thresholds for landslides in Badung Regency using  
satellite-derived rainfall grid datasets**

Authored by:

**Putu Aryastana, Listya Dewi, Putu Ika Wahyuni**

was accepted in IJAAS (ISSN 2252-8814) on 2024-01-31

<https://ijaas.iaescore.com>

February 29, 2024



**Prof. Dr. Qing Wang**  
Editor-in-Chief

# Editor/Author Correspondence

Editor Subject: [IJAAS] Editor Decision - Resubmit for review

[DELETE](#)

2023-  
09-15  
03:33  
PM

The following message is being delivered on behalf of International Journal of Advances in Applied Sciences.

-- Paper ID# 20962  
-- Authors must strictly adhere to the guide for authors, MS Word:  
<http://iaescore.com/gfa/ijaas.docx>; LaTeX format: <http://iaescore.com/gfa/ijaas.rar>  
-- Research Paper: min 25 references (primarily to journal papers) and  
Review/study/survey Paper: min 50 references (primarily to journal papers)

Dear Mr. Putu Aryastana,

We have reached an initial decision regarding your paper submission entitled "An Integration of Satellite-derived Rainfall Grid Datasets in Investigating Rainfall Tresholds for Landslide Incidents over Badung Regency" to International Journal of Advances in Applied Sciences, a Scopus indexed journal.

Our decision is: Resubmit for review

1. Authors should have made substantial/intellectual contribution (the new findings with contrast to the existing works). Highlight the main theme of the work with the specific goals of the design and development approach. For preparing your paper strictly adhere to the guide of authors, please read the checklist for preparing your paper for publication at: <https://ijaas.iaescore.com/index.php/IJAAS/about/editorialPolicies#custom-1>. Please try to follow the format as closely as possible.

2. Attention Please! Method section

The experimental/method section is a straightforward description of what you did in your research and how you did it, clear and detailed at every stage. A detailed method section will make your article reproducible by other researchers, allowing them to trust and build on your work.

- A detailed explanation of all methodologies, instruments, materials, procedures, measurements, and other variables used in the investigation.

- A thorough description of the data analysis and decisions for excluding some data and including others.

Please submit your revised paper in MS Word file format (or LATEX source files; ZIP your files if you present your paper in LaTeX). Refer to materials at: <https://bit.ly/35R6JTs> and <https://bit.ly/2DxU9MI> for further guidelines, and submit the revised paper within 8 weeks through our online system at the same ID number (NOT as a new submission) on Tab "Review" as an "Author Version" file for re-review by Reviewers. Then, your revised paper will be judged for acceptance, revision, or rejection based on the editor's and Reviewers comments.

I look forward for hearing from you

Thank you

Best Regards,  
Dr. Qing Wang  
Intelektual Pustaka Media Utama  
[ijaas@iaescore.com](mailto:ijaas@iaescore.com)

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Reviewer A:

As far as your knowledge, have the authors already published a very similar paper?:  
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Please score the paper on a scale of 0 - 10 as per the directions below:

9-10 Excellent - Outstanding

7-8 Good

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0-2 Very Poor

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Comments to the Authors:

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- Please provide the complete affiliation of the authors (Department/Faculty/Institute, city, country).

- Abstract consists of a maximum of 200 words, your abstract has 258 words. Please update it.

- All figures and tables should be mentioned in the paragraph before the figures are displayed. Figures 1, 2, 6 and table 1, 2, 4, 5 are not mentioned in the paragraph before the figures displayed.

- Follow IJAAS style in writing the table

- Complete the author biography, provide all author social media links: ORCID (mandatory), Scopus, Google Scholar, Web of Science (if any). Please follow IJAAS template for details.

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Reviewer B:

As far as your knowledge, have the authors already published a very similar paper?:

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Does the title of the paper accurately reflect the major focus contribution of this paper?:

Yes

If No, Please suggest change of the title as appropriate::

Thresholds NOT Treshholds ???

Is the abstract a clear description of the paper?:

No

If No, Please suggest change of the abstract as appropriate::

Integrating field rain data with satellite data improves data accuracy and overcomes rain

data limitations for rain thresholds. Integration can involve field rain data and satellite rain data or different satellite rain datasets. Merging these rainfall data sources provides more spatial coverage than satellite data. To determine how well rain thresholds predict rainfall-triggered landslides, the threshold model must be validated. This study will evaluate satellite rainfall data before and after integration in developing a rainfall threshold model for landslide prediction in Badung Regency. To do so, the study used cumulative rainfall thresholds over 3, 7, 15, and 30 days and two rain satellite products (IMERG and PERSIANN). Median, first, and third quartiles were used to set rainfall thresholds. AUC was calculated to validate rainfall threshold outcomes using receiver operating characteristic (ROC) curves. Analysis showed that integrating satellite rain data into the rainfall threshold model for landslide prediction yields better results than other methods. An AUC value of 0.903 (90.3%) for the 30-day cumulative rainfall threshold supports this claim. This model could be a good landslide early warning system in Badung Regency.

Are the equations, figures and tables in this journal style, clear, relevant, and are the captions adequate?:

Yes

Is the paper written in correct English? Is the paper free from obvious errors, misconceptions, or ambiguity?:

No

If No, please note obvious errors, misconceptions, ambiguity, grammatical errors and suggest corrections::

Please score the paper on a scale of 0 - 10 as per the directions below:

9-10 Excellent - Outstanding

7-8 Good

5-6 Average

3-4 Poor

0-2 Very Poor

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6

Comments to the Authors:

:

#### 1. INTRODUCTION

The occurrence of landslides can be triggered by precipitation in a specific geographic region. Rain-induced landslides are a result of the build-up of hydrostatic pressure within the soil [1]. The occurrence of landslides has extensive ramifications, encompassing the loss of human lives, material destruction, and substantial degradation of the environment. To reduce the number of casualties, it is crucial to implement mitigation strategies, which make it necessary to establish an effective early warning system [2]. One method that can be employed is the incorporation of rain thresholds within the context of the early warning system. The accessibility of components related to rainfall predictions is a crucial factor in this system [3]. A multitude of scholars have undertaken endeavors to establish precise thresholds of rainfall in order to effectively predict slope collapse and landslides. The parameters taken into consideration include average rainfall, duration of the rainfall event, the ratio of rainfall to daily rainfall, previous rainfall in relation to the annual average rainfall, and the ratio of daily rainfall to the maximum previous rainfall [1], [4]–[9]. Rainfall is the predominant factor considered in the examination of rainfall thresholds that initiate landslide occurrences. Therefore, the incorporation of additional rainfall data is imperative in order to complement the existing data obtained from rainfall stations.

The collection and analysis of rainfall data play a crucial role in the identification of changes in climate patterns and the comprehension of the hydrological cycle. However, the collection of rainfall data using rain gauges is subject to limitations and spatial irregularities, which restrict its applicability to a specific geographic area. This phenomenon is especially noteworthy in areas that are distinguished by complex topographical features [10]. An alternative methodology entails utilizing rainfall satellite data to produce information that is not only more precise but also in accordance with actual environmental circumstances [11]. A number of satellite data sets are commonly utilized, including the Tropical Rainfall Measuring Mission (TRMM), Global Satellite Mapping of Precipitation (GSMaP), Global Precipitation Measurement - Integrated Merged Multi-satellite Retrievals (GPM-IMERG), Climate Hazards Group InfraRed Precipitation with Station (CHIRPS), Climate Prediction Center Morphing Method (CMORPH), Precipitation

Estimation from Remotely Sensed Information using Artificial Neural Networks (PERSIANN), and other comparable datasets [12]–[17].

Numerous scholars have conducted prior research to investigate the application of satellite-derived rainfall data in the determination of rainfall thresholds that trigger landslides. Prominent studies have examined the contributions of TRMM [15], [18]–[20], GSMaP [21], [22], IMERG [11], [18], [22]–[24], PERSIANN [12], [22], and CMOPRH [9]. Previous studies have identified variations in the effectiveness of satellite-derived precipitation datasets, which can be attributed to regional factors. In addition, there is a certain degree of error that remains when comparing this data with measurements obtained from rainfall stations located on the ground. In contrast, the aforementioned studies exclusively utilized a singular dataset obtained from satellites in their examination of the precipitation thresholds that trigger landslides. Therefore, an alternative methodology involves the incorporation of multiple satellite images of rainfall, with the objective of reducing the inherent uncertainty in determining the rainfall thresholds that lead to landslides.

The amalgamation of ground-based and weather satellite data can be employed to improve the accuracy of early rainfall detection, thereby reducing the potential consequences of landslides. The enhancement of data accuracy and resolution of limitations associated with rainfall data for the purpose of determining rainfall thresholds can be achieved through the implementation of an integrated approach that combines field rainfall data and satellite information. The integration of rainfall data results in a spatial coverage that is more evenly distributed in comparison to the exclusive reliance on individual satellite datasets [10]. The integration of two separate satellite rainfall datasets for the purpose of determining rainfall thresholds that trigger landslides is currently subject to significant limitations. Previous studies have explored the integration of satellite-derived rainfall data, with a prominent example being the merging of SM2RAIN and IMERG datasets. The fusion underwent analysis in order to develop a rainfall threshold model within the Indian context. The integration of different satellite data products allows for the utilization of the unique advantages offered by each product, while also addressing the limitations associated with SM2RAIN's tendency to underestimate rainfall or IMERG's tendency to overestimate it, especially in cases of low-intensity rainfall events [24]. The results indicated that, among the products evaluated in India, the IMERG dataset performed the best on an hourly basis, while the SM2RAIN dataset had a comparatively low error rate. Overall, the analysis of rainfall patterns using the combined SM2RAIN and IMERG datasets yielded more accurate results compared to the data obtained from traditional rainfall stations. Previous research has identified certain constraints in the utilization of daily precipitation data for the purpose of establishing thresholds that trigger landslides. Therefore, this study employs a methodology that incorporates hourly rainfall data. The successful implementation of a landslide early warning system relies on the effective application of rainfall thresholds that are derived from the integration of hourly data [25].

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# EDITOR-IN-CHIEF COMMENTS:

1. The introduction should contextualize your study and give any specialized information the general measurement or control reader may require to understand what follows. It must describe the importance of relevant earlier work and the challenges your work solves. It should also list your work's comparators. The introduction should define the article's contribution(s) and show how it's shown in the rest of the manuscript. A typical introduction should be as brief as possible and would contain the following:
  - a. An outline of the problem.
  - b. A review of the relevant literature, noting briefly the major contributors and indicating:
    - What the main contributors did?
    - What the main contributors found?
  - c. A statement of unsolved problems and/or areas requiring improvement; particularly the one(s) considered in your manuscript.
  - d. In regard to the above, describe what you will perform that has not been done before (what are your new contributions?).
  - e. An outline of how the following sections show what you did and how its relevance will be demonstrated.
2. This paper contains no critical discussion, comparison, or interpretation. What are the ramifications of your findings? What will come in handy in the future?

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# ASSOCIATE EDITORS COMMENTS:

1. The method section is a detailed step-by-step description of the experimental procedure that includes all of the information needed to replicate the work described in the paper. The Method must include a description of both novel and standard experimental approaches, as well as whatever minimal justification is required to persuade the reader that the methods are correct.

A well-written Method section:

1. Is the "how-to" section of your paper, containing all of the pertinent details for producing your results.
2. Persuades the reader that your approach is correct by providing justification for selecting your methodology, which may include analysis or theoretical justification.
3. Gives readers the details, algorithms, and techniques necessary to confirm and/or replicate your findings

The Methods section's purpose is to describe how the questions and knowledge gaps raised in the Introduction will be addressed in the Results section.

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International Journal of Advances in Applied Sciences  
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Author Subject: Submission of revised paper for re-review by Reviewers

[DELETE](#)

2023-11-01 01:48 AM The following message is being delivered on behalf of International Journal of Advances in Applied Sciences.

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Dear Dr. Qing Wang,

I hope this email finds you well. I am writing to inform you that I have completed the revisions for my manuscript entitled "An integration of satellite-derived rainfall grid datasets in investigating rainfall thresholds for landslide incidents over Badung Regency". I would like to express my sincere gratitude for giving me the opportunity to improve the manuscript and for your valuable feedback.

I have carefully reviewed and incorporated the suggested changes, and I am pleased to inform you that the revised portions have been highlighted in green for your convenience. These modifications were made in line with your guidance and the constructive comments provided by the reviewers.

I believe that the revisions have significantly strengthened the quality and clarity of the manuscript. I am confident that the updated version of the manuscript will contribute positively to the field of landslide disaster mitigation.

I kindly request that you review the revised manuscript at your earliest convenience. If there are any further changes or recommendations, please do not hesitate to let me know. I am committed to ensuring that this research meets the high standards of your journal.

Once again, I want to extend my appreciation for your time, guidance, and support throughout this process. I look forward to your feedback and hope that the revised manuscript aligns with your expectations.

Thank you for your continued support and consideration.

Sincerely,  
Putu Aryastana, Ph.D.  
Department of Civil Engineering, Warmadewa University  
[aryastanaputu@yahoo.com](mailto:aryastanaputu@yahoo.com)

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International Journal of Advances in Applied Sciences  
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Editor Subject: [IJAAS] Editor Decision: ACCEPT with minor revisions (a Scopus indexed journal) [DELETE](#)

2023-12-14 12:43 PM The following message is being delivered on behalf of International Journal of Advances in Applied Sciences.

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-- Paper ID# 20962

Dear Mr. Putu Aryastana,

We have reached a decision regarding your submission entitled "An Integration of Satellite-derived Rainfall Grid Datasets in Investigating Rainfall Thresholds for Landslide Incidents over Badung Regency" to International Journal of Advances in Applied Sciences (IJAAS), p-ISSN 2252-8814, e-ISSN 2722-2594. This journal is recognized ("SINTA 1" accredited) by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia (Decree No. 79/E/KPT/2023). FYI, the IJAAS is also indexed in Scopus beginning with items published in 2019 (<https://www.scopus.com/sourceid/21101156891>).

Our decision is to ACCEPT with minor revisions  
The goal of your revised paper is to describe novel technical results.  
A high quality paper MUST has:

- (1) a clear statement of the problem the paper is addressing --> explain in "Introduction" section
- (2) the proposed solution(s)/method(s)/approach(es)/framework(s)/algorithm(s) ....
- (3) results achieved. It describes clearly what has been done before on the problem, and what is new.

In preparing your revised paper, you should pay attention to:

1. Please ensure that all references have been cited in your text. Each citation should be written in the order of appearance in the text in square brackets. The references must be presented in numbering and CITATION ORDER is SEQUENTIAL [1], [2], [3], [4], ..... (IEEE style). For example, the first citation [1], the second citation [2], and the third and fourth citations [3,4]. When citing multiple sources at once, the preferred method is to list each number separately, in its own brackets, using a comma or dash between numbers, as such: [1], [3], [5] or [4-8]. It is not necessary to mention an author's name, pages used, or date of publication in the in-text citation. Instead, refer to the source with a number in a square bracket, e.g. [9], that will then correspond to the full citation in your reference list. Examples of in-text citations:  
This theory was first put forward in 1970 [9]."  
Newton [10] has argued that...  
Several recent studies [7], [9], [11-15] have suggested that....  
...end of the line for my research [16].

2 An Introduction should contain the following three (3) parts:

- Background: Authors have to make clear what the context is. Ideally, authors should give an idea of the state-of-the art of the field the report is about.
- The Problem: If there was no problem, there would be no reason for writing a manuscript, and definitely no reason for reading it. So, please tell readers why they should proceed reading. Experience shows that for this part a few lines are often sufficient.
- The Proposed Solution: Now and only now! - authors may outline the contribution of the manuscript. Here authors have to make sure readers point out what are the novel aspects of authors work. Authors should place the paper in proper context by citing relevant papers. At least, 5 references (recently journal articles) are used in this section.

3. Results and discussion section: The presentation of results should be simple and straightforward in style. You should improve your analyzing and also present the comparison between performance of your approach and other researches. Results given in figures should not be repeated in tables. This section report the most important findings, including results of statistical analyses as appropriate. It is very important to prove that your manuscript has a significant value and not trivial.

Please revise your manuscript according to the editor and reviewers' comments and then submit your revised paper within 6 weeks.

I look forward for hearing from you

Thank you

Best Regards,  
Dr. Qing Wang  
Intelektual Pustaka Media Utama  
ijaas@iaescore.com

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----- EDITOR COMMENTS: Pay attention to the following instructions  
carefully! -----  
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1). Please ensure to adhere strictly to the journal presentation and formatting guidelines !! <http://iaescore.com/gfa/ijaas.docx> and pay attention to the checklist for preparing your FINAL paper for publication:  
<http://ijaas.iaescore.com/index.php/IJAAS/about/editorialPolicies#custom-1>

2). It is mandatory to present final paper in the sections structure: 1. INTRODUCTION - 2. The Proposed Method/Algorithm/Procedure specifically designed (optional) - 3. METHOD - 4. RESULTS AND DISCUSSION – 5. CONCLUSION "IMRADC style". See <http://iaescore.com/gfa/ijaas.docx>

3). Add biographies of authors as our template (include links to the authors' profiles, do not delete any icons in the template). It is mandatory!! See <http://iaescore.com/gfa/ijaas.docx>  
--> Provide links for all authors to the 4 icons (Scholar, Scopus, Publons and ORCID)

4). Prepare all tables as our template (NOT as figure)

5). Use different PATTERNS for presenting different results in your figures/graphics (instead of different colors). It is mandatory!! Re-check all your figures. See <http://iaescore.com/gfa/ijaas.docx>

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Reviewer A:

As far as your knowledge, have the authors already published a very similar paper?:  
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If yes, kindly please cite below::

Does the title of the paper accurately reflect the major focus contribution of this paper?:  
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Are the equations, figures and tables in this journal style, clear, relevant, and are the captions adequate?:  
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Is the paper written in correct English? Is the paper free from obvious errors, misconceptions, or ambiguity?:  
Yes

If No, please note obvious errors, misconceptions, ambiguity, grammatical errors and suggest corrections::

Please score the paper on a scale of 0 - 10 as per the directions below:

9-10 Excellent - Outstanding  
7-8 Good  
5-6 Average  
3-4 Poor  
0-2 Very Poor

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Comments to the Authors:

:

- Avoid links in the body of the text, rather use them as references
- Please mention Figures 5, 6, 7, 8 (a)-(d) in the body text before figure displayed

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Reviewer B:

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Does the title of the paper accurately reflect the major focus contribution of this paper?:

Yes

If No, Please suggest change of the title as appropriate::

Is the abstract a clear description of the paper?:

Yes

If No, Please suggest change of the abstract as appropriate::

Are the equations, figures and tables in this journal style, clear, relevant, and are the captions adequate?:

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Is the paper written in correct English? Is the paper free from obvious errors, misconceptions, or ambiguity?:

Yes

If No, please note obvious errors, misconceptions, ambiguity, grammatical errors and suggest corrections::

Please score the paper on a scale of 0 - 10 as per the directions below:

9-10 Excellent - Outstanding

7-8 Good

5-6 Average

3-4 Poor

0-2 Very Poor

:

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Comments to the Authors:

:

TITLE

A study of rainfall thresholds for landslides in Badung Regency using satellite-derived rainfall grid datasets.

ABSTRACT

Integrating field rainfall data with satellite data improves data accuracy and overcomes rainfall data limitations for rain thresholds. Integration can involve field rainfall data, satellite rainfall data, or a different satellite dataset. Merging these rainfall data sources

provides more spatial coverage of satellite data. To determine how well rainfall thresholds predict rainfall-triggered landslides, the threshold model must be validated. This study will evaluate satellite rainfall data before and after integration in developing a rainfall threshold model for landslide prediction in Badung regency. To do so, the study used a cumulative rainfall threshold over 3, 7, 15, and 30 days and two rainfall satellite products (IMERG and PERSIANN). Median, first, and third quartiles were used to set thresholds. The area under curve (AUC) was calculated to validate rainfall threshold outcomes using receiver operating characteristic (ROC) curves. Analysis showed that integrating satellite rainfall data into the rainfall threshold model for landslide prediction yields better results than other methods. An AUC value of 0.903 (90.3%) for the 30-day cumulative rainfall thresholds supports this claim. This model could be a good input for a landslide early warning system in Badung Regency.

## INTRODUCTION

Precipitation in a particular geographic area may be the cause of landslides. Rain-induced landslides are a result of the buildup of hydrostatic pressure within the soil [1]. The occurrence of landslides has extensive ramifications, encompassing the loss of human lives, material destruction, and substantial degradation of the environment. To reduce the number of casualties, it is crucial to implement mitigation strategies, which make it necessary to establish an effective early warning system [2]. One method that can be employed is the incorporation of rain thresholds within the context of the early warning system. The accessibility of components related to rainfall predictions is a crucial factor in this system [3]. A multitude of scholars have undertaken endeavors to establish precise thresholds of rainfall in order to effectively predict slope collapse and landslides. The parameters taken into consideration include average rainfall, duration of the rainfall event, the ratio of rainfall to daily rainfall, previous rainfall in relation to the annual average rainfall, and the ratio of daily rainfall to the maximum previous rainfall [1], [4]–[9]. Rainfall is the predominant factor considered in the examination of rainfall thresholds that initiate landslide occurrences. Therefore, the incorporation of additional rainfall data is imperative in order to complement the existing data obtained from rainfall stations.

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## CONCLUSION

Based on the analysis of the outcomes of the threshold model, a significant conclusion arises. Out of the three methods used, the first approach (using Q1) shows excellent performance in all statistical measures (TPR, TNR, and ACC). In addition, when the two satellite datasets are combined, the resulting AUC value for a 30-day cumulative rainfall period is 0.903. The threshold mentioned here is a dependable indicator of landslide occurrences, distinguished by a minimal rate of mistakes. Therefore, it is recommended to incorporate this model into the structure of a landslide early warning system for implementation in Badung Regency. Moreover, in future research endeavors, broadening the scope to encompass additional geographical regions could augment the generalizability of these findings and further substantiate the efficacy of the proposed model.