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Title: AIMERG: a new Asian precipitation dataset (0.1°/half-hourly, 2000-2015) by calibrating GPM IMERG at daily scale using APHRODITE

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General Comments: This manuscript “AIMERG: a new Asian precipitation dataset (0.1° /half-hourly, 2000-2015) by calibrating GPM IMERG at daily scale using APHRODITE”, prepared by Ma et al., (2020), proposed a new daily calibration algorithm on the current stream satellite precipitation product, GPM IMERG, and obtained a new dataset (AIMERG) with better quality compared with the original IMERG over the Asia. Making the AIMERG dataset available is important for the applications in the precipitation-related fields, e.g., hydrology, meteorology, and agriculture. Besides, the calibration algorithm is innovative and meaningful for the next generation of IMERG calibration algorithms.

Authors Response: All the coauthors greatly appreciate you for your final decision with “accepted subject to minor revisions (review by editor)”. Though minor revision is needed, the first author and the co-authors have paid great attentions on each bullet pointed out by you, which greatly improved the quality of this manuscript. Based on the comments from you and the other reviewer, we have made careful modifications on the original manuscript.

Below, the original comments are in **black**, our responses are in **blue**, and our changes in manuscript are in **red**.

Point 1:

Referee Comments: Line 30: Replace ‘finer’ with ‘fine’.

Authors Response: Initially, we wanted to express the satellite-based precipitation product with ‘finer’ spatiotemporal resolutions than those with coarse spatiotemporal resolutions in the current stage. However, to make it clearer as pointed by you, we have replaced ‘finer’ with ‘fine’ throughout the manuscript.

Author's changes in manuscript: we have replaced 'finer' with 'fine' throughout the manuscript, and in line 32.

Point 2:

Referee Comments: Line 32: Replace 'finer' with 'fine' or 'high'.

Authors Response: Initially, we wanted to express the satellite-based precipitation product with 'finer' spatiotemporal resolutions than those with coarse spatiotemporal resolutions in the current stage. However, to make it clearer as pointed by you, we have replaced 'finer' with 'fine' throughout the manuscript.

Author's changes in manuscript: we have replaced 'finer' with 'fine' throughout the manuscript, and in line 34.

Point 3:

Referee Comments: Line 34: Replace 'product' with 'products'.

Authors Response: This is really a grammar mistake, and we have checked and revised all the grammar mistakes like this one.

Author's changes in manuscript: we have replaced 'product' with 'products' in line 36.

Point 4:

Referee Comments: Line 37: Add 'the' between 'in' and 'Tropical'.

Authors Response: This is really a grammar mistake, and we have checked and revised all the grammar mistakes like this one.

Author's changes in manuscript: we have added 'the' between 'in' and 'Tropical' in line 39.

Point 5:

Referee Comments: Line 49: Replace 'Results' with 'results' and 'suggests' with 'suggest'.

Authors Response: These are really grammar mistake, and we have checked and revised all the grammar mistakes like these.

Author's changes in manuscript: we have replaced 'Results' with 'results' and 'suggests' with 'suggest' in line 51.

Point 6:

Referee Comments: Line 73: It's better to delete 'near-real-time' here.

Authors Response: Good idea, and it is really more accurate to delete the expression 'near-real-time' here.

Author's changes in manuscript: We have deleted the expression 'near-real-time' here in line 76.

Point 7:

Referee Comments: Line 77: Delete the sentence 'and other data from potential sensors at $0.1^\circ \times 0.1^\circ$ and half-hourly temporal resolutions'.

Authors Response: Good idea, the expression here is really redundant, and we have deleted it.

Author's changes in manuscript: we deleted the sentence 'and other data from potential sensors at $0.1^\circ \times 0.1^\circ$ and half-hourly temporal resolutions' in lines from 80 to 81.

Point 8:

Referee Comments: Line 77: Replace 'Final' with 'Final run'.

Authors Response: Good idea, we have replaced 'Final' with 'Final run'.

Author's changes in manuscript: we have replaced 'Final' with 'Final run' in line 81.

Point 9:

Referee Comments: Line 79: Replace 'incorporated' with 'incorporating'.

Authors Response: This is really a grammar mistake, and we have checked and revised all the grammar mistakes like this one.

Author's changes in manuscript: we have replace 'incorporated' with 'incorporating' in line 82.

Point 10:

Referee Comments: Line 80: It is better to use 'contains large uncertainties' than 'greatly overestimates the precipitation.....', because the Final-run IMERG product is not always overestimating from regions to regions.

Authors Response: Good idea! The suggestion is more accurate, and we have revised it according to your suggestion.

Author's changes in manuscript: we have replaced ‘greatly overestimates the precipitation.....’ with ‘contains large uncertainties, e.g., greatly overestimating the precipitation...’ in lines from 83 to 84.

Point 11:

Referee Comments: Line 84: Replace the sentence ‘following the TMPA approach’ with ‘following the gauge correction method of TMPA’ and Change ‘satellite-based only’ by ‘satellite-only’.

Authors Response: Good idea! The suggestions are more accurate, and we have revised them according to your suggestions.

Author's changes in manuscript: we have replaced the sentence ‘following the TMPA approach’ with ‘following the gauge correction method of TMPA’ and changed ‘satellite-based only’ into ‘satellite-only’ in lines from 87 to 88.

Point 12:

Referee Comments: Line 88: I think GPCC is the right one rather than GPCP.

Authors Response: Good idea! The suggestions are more accurate, and we have revised them according to your suggestions.

Author's changes in manuscript: we have replaced the ‘GPCP’ with ‘GPCC’ in line 90.

Point 13:

Referee Comments: Line 90: The word ‘finer’ is frequently used, but usually it needs an object to be compared, otherwise the comparative form is not suitable.

Authors Response: Initially, we wanted to express the satellite-based precipitation product with ‘finer’ spatiotemporal resolutions than those with coarse spatiotemporal resolutions in the current stage. However, to make it more clearly as pointed by you, we have replaced ‘finer’ with ‘fine’ throughout the manuscript.

Author's changes in manuscript: we have replaced 'finer' with 'fine' throughout the manuscript, and in line 95.

Point 14:

Referee Comments: Line 91: Replace 'product' with 'products'.

Authors Response: This is really a grammar mistake, and we have checked and revised all the grammar mistakes like this one.

Author's changes in manuscript: we have replaced 'product' with 'products' in line 96.

Point 15:

Referee Comments: Line 96: The grammar of the sentence is incorrect.

Authors Response: The sentence here is really not clear. Also according to suggestion by the other reviewer, we have added a new review section on the calibration approaches, therefore, we have deleted this sentence and almost entirely rewritten this paragraph.

Author's changes in manuscript: we have deleted this sentence and almost entirely rewritten this paragraph, in lines from 100 to 121. The content is shown as follows: "Therefore, great efforts have been taken on exploring the calibrations on the satellite-only precipitation estimates using gauge analysis. Historically, GPCP has provided the lion's share of the early efforts in the process of developing calibration algorithms for the satellite-only precipitation estimates in generating Satellite-Gauge products (2.5°/monthly). For instance, to correct the bias of the multi-satellite only estimates (mainly based on PMW and IR data) on a regional scale, the multi-satellite estimate was firstly multiplied by the ratio of the large-scale (with moving window size 5×5) average gauge analysis to the large-scale average of the multi-satellite estimate, and then the satellite-gauge (SG) estimate was finally derived by combining the gauge-adjusted multi-satellite estimate and the gauge analysis with inverse-error-variance weighting (Huffman et al., 1997; Adler et 2003; Adler 2018). Recently, a two-step strategy was proposed to remove the bias inherent in the multi-satellite only precipitation estimates using the probability density function (PDF) matching method and to combine the bias-corrected estimates with the gauge analysis using the optimal interpolation (OI) algorithm (Xie and Xiong, 2011; Shen et al., 2014). And a similar improved PDF algorithm was applied to generate the GSMaP data, which was adjusted at the daily scale by the gauge analysis

(0.5°/daily) from the climate prediction center (CPC) (Mega et al., 2014). While GPM IMERG adjusted the multi-satellite precipitation estimates (0.1°/half hourly) at the monthly scale using the ratios between the original monthly multi-satellite only and the monthly SG data, in the combination with the original monthly multi-satellite only and GPCC (1.0°), in the month (Huffman et al., 2019). There is still much room for exploring the improved algorithms for calibrating the multi-satellite-only precipitation estimates at finer spatiotemporal scales, e. g. 0.25°/daily, which is also one of the next vital focuses by the GPM (Huffman et al., 2019).”

Point 16:

Referee Comments: Line 99: Maybe it is ‘GPCC’ rather than ‘GPCP’ here.

Authors Response: Good idea! The suggestions are more accurate, and we have revised them according to your suggestions.

Author's changes in manuscript: we have replaced the ‘GPCP’ with ‘GPCC’ in line 123.

Point 17:

Referee Comments: Line 101: ‘over the land’ is repeated.

Authors Response: Good idea, and we have deleted the second term ‘over the land’.

Author's changes in manuscript: we have deleted the second term ‘over the land’ in lines from 125 to 126.

Point 18:

Referee Comments: Line 116: Replace ‘era’ with ‘eras’.

Authors Response: Good idea. Your suggestion is more accurate.

Author's changes in manuscript: we have replaced ‘era’ with ‘eras’ in the line 140.

Point 19:

Referee Comments: Line 124: It is ‘IMERG’ rather than ‘GPM’ here.

Authors Response: Good idea. Your suggestion is more accurate.

Author's changes in manuscript: we have replaced ‘GPM’ with ‘IMERG’ in the line 148.

Point 20:

Referee Comments: Line 129: The description of the sentence ‘.....which the TRMM era IMERG.....’ is unclear.

Authors Response: It is really confusing for the readers to understand it. And we have rewritten this sentence.

Author's changes in manuscript: ‘....., based on which the TRMM era IMERG has been completed at the end of September, 2019,’ has been changed into ‘....., based on which IMERG has been retrospect to the TRMM era at the end of September, 2019’ in the lines from 153 to 155.

Point 21:

Referee Comments: Line 131: The description here is inconsistent with the introduction part.

Authors Response: To make it clearer, we have added one sentence to introduce the aim of this point at the end of this paragraph, and also we used the consistent descriptions on using the GPCC data to calibrate the multi-satellite-only precipitation estimates to generate the Final run IMERG in the Introduction section.

Author's changes in manuscript: we have add one sentence “, which is relative spares, especially over the Asia” at the end of this paragraph in line 160. Additionally, to keep consistent throughout the manuscript, we have changed ‘GPCP’ to ‘GPCC’ in the Introduction section, in lines 90, and 123, respectively.

Point 22:

Referee Comments: Line 133: The word ‘poster’ is misused here.

Authors Response: Good idea, ‘poster’ is replaced by ‘posted’.

Author's changes in manuscript: we have replaced ‘poster’ with ‘posted’ in line 159.

Point 23:

Referee Comments: Line 136: Replace ‘the release APHRODITE product’ with ‘the release of the APHRODITE product’.

Authors Response: Good idea. Your suggestion is more accurate.

Author's changes in manuscript: we have replaced 'the release APHRODITE product' with 'the release of the APHRODITE product' in line 162.

Point 24:

Referee Comments: Line 138: The literature cited here may not be suitable to support this sentence, but it is not a big problem.

Authors Response: Actually, the citation is the reference in supporting for the APHRODITE data. To make the citations more robust here, we have added another two recent research on the applications of the APHRODITE (Menegoz et al., 2013; Sunilkumar et al., 2019).

Author's changes in manuscript: we have added another two recent related application studies on APHRODITE (Menegoz et al., 2013; Sunilkumar et al., 2019), and the citation '(Yatagai et al., 2012)' has been changed into '(Yatagai et al., 2012; Menegoz et al., 2013; Sunilkumar et al., 2019)' in line 164.

Point 25:

Referee Comments: Line 139: Delete 'best' here.

Authors Response: According to the reference by Duncan and Bigg (2012), they found that the APHRODITE was an optimal dataset for analyzing historical precipitation variability and change as it replicated 'ground truth' observations very well. Therefore, we have changed the 'best tool' into 'optimal dataset'

Author's changes in manuscript: we have changed the 'best tool' into 'optimal dataset' in line 166.

Point 26:

Referee Comments: Line 148: The correct citation here should be 'Shen et al., 2014' and the interpolation method is QI instead of IDW.

Authors Response: Good idea. Your suggestions are more accurate, and we have revised them according to your suggestions.

Author's changes in manuscript: the citation '(Shen et al., 2010)' has been changed into '(Shen et al., 2014)' and 'inverse distance weighting (IDW)' has been replaced as 'optimal interpolation (OI)' in lines 175.

Point 27:

Referee Comments: Line 158: Replace 'network' with 'networks'.

Authors Response: Good idea. Your suggestion is more accurate.

Author's changes in manuscript: we have replaced 'network' with 'networks' in the line 187.

Point 28:

Referee Comments: Line 181: Delete 'investigations' here.

Authors Response: Good idea. Your suggestion is more accurate.

Author's changes in manuscript: we have deleted 'investigations' and changed 'evaluation' into 'evaluations' in the line 206.

Point 29:

Referee Comments: Line 189: What do 'those' mean?

Authors Response: It is really confusing for the readers here. To make it clearer, we have revised it.

Author's changes in manuscript: we have changed 'those (0.1°/ daily)' into 'IMERG data at the daily scale (0.1°)' in the lines from 214 to 215.

Point 30:

Referee Comments: Line 212: To my understand, the seventh step of the algorithm is not needed, since the fourth step already contains that.

Authors Response: Definitely, the seventh step has been conducted by the fourth step. Here we just pointed out we have taken this situation into our considerations in the calibration procedure. To make it clearer, we have added a nonrestrictive clause at the end of this sentence.

Author's changes in manuscript: we have added additional sentence at the end of the sentence ‘..... to meet the ground truth observations’ as “ . And this consideration has been already conducted in the fourth step” in the lines from 244 to 245.

Point 31:

Referee Comments: Line 219: The manuscript has no clear explanation on how to match the 0.1° and 0.25°, which is suggested to be explained.

Authors Response: It was really neglected. We have added one sentence at the end of the fourth step on how to match the IMERG (0.1°) and APHRODITE (0.25°).

Author's changes in manuscript: we have added one sentence at the end of the fourth step on how to match the IMERG (0.1°) and APHRODITE (0.25°) as ‘ . In this step, to match the IMERG (0.1°) and APHRODITE (0.25°), the numbers and weights of the APHRODITE grids corresponding to each IMERG pixel are determined, according to the relative spatial locations and coverage relationships between the each pixel of IMERG (0.1°) and the corresponding pixels of APHRODITE (0.25°)’ in the lines 231 to 234.

Point 32:

Referee Comments: Line 244 and 292: Some verbs incorrectly use the plural form in the manuscript. For example, ‘are’ should be changed by ‘is’ on line 244 and ‘were’ should be changed by ‘was’ on line 292.

Authors Response: Good suggestions! We have checked and revised such grammar errors throughout the manuscript this time.

Author's changes in manuscript: we have replaced ‘are’ by ‘is’ in line 277, and changed ‘were’ into ‘is’ in line 343. Additionally, we have checked and revised such grammar errors throughout the manuscript this time.