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Corrigendum: Solar geoengineering modeling and applications for mitigating global warming: assessing key parameters and the urban heat island influence

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KEYWORDS

solar geoengineering, UHI global warming estimates, UHI footprint, heat pollution, land-cover/land-use, drought relief, reservoir evaporation, Paris Accord suggested goals

A corrigendum on
Solar geoengineering modeling and applications for mitigating global warming: assessing key parameters and the urban heat island influence

by Feinberg, A. (2022). *Front. Clim.* 4:870071. doi: 10.3389/fclim.2022.870071

In the published article, there were errors in **Results**, *Space Mirror Model Estimate*. The errors are due to the term $S_o/4$ that was used instead of S_o.

A correction has been made to *Space Mirror Model Estimate*, Paragraph 1. This sentence previously stated: "Using Eq. 11, one can let $X_C = 100\%$ (and $H_T = 1$). Sun-shading can effectively translate to changing a target on earth reflectivity to ~100% from its prior average of 30% so that $\alpha'_T - \alpha_T = 0.7$, and then Eq. 11 is".

The corrected sentence appears below:

"Using Eq. 11, one can let $X_C = 100\%$ (and $H_T = 1$). Sun-shading can effectively translate to changing a target on earth reflectivity to ~100% from its prior average of 30% so that $\alpha'_T - \alpha_T = 0.7$. For space mirror, the irradiance occurs 24 h a day and the earth's curvature is not a factor, this increases $S_o/4$ to S_o, and then Eq. 11 is written."

A correction has been made to *Space Mirror Model Estimate*, Paragraph 1, Equation 12. The equation previously stated:

$$\text{“}\Delta P_T = -340\frac{A_T}{A_E}\,[0.7]\;(1) = -1.47 W\,m^{-2}\text{”}$$

The corrected equation appears below:

$$\text{“}\Delta P_T = -1361\frac{A_T}{A_E}\,[0.7]\;(1) = -1.47 W\,m^{-2}\text{”}$$

A correction has been made to *Space Mirror Model Estimate*, Paragraph 1, Equation 13. The equation previously stated:

$$\text{“}\frac{A_T}{A_E} = 0.62\%\text{”}$$

The corrected equation appears below:

$$\text{“}\frac{A_T}{A_E} = 0.154\%\text{”}$$

A correction has been made to *Space Mirror Model Estimate*, Paragraph 2. This sentence previously stated: “This indicates that if we fully block the sun from 0.62% of the earth,”.

The corrected sentence appears below:

“This indicates that if we fully block the sun from 0.154% of the earth,”.

A correction has been made to *Space Mirror Model Estimate*, Paragraph 4. This sentence previously stated: “One notes the resulting shaded earth area in Eq. 13 equates to 510 × 106 km^2 (0.0062) = 3.2 × 106 km^2, yielding a radius of about 1,009 km. Sánchez and McInnes (2015) illustrate an area in their Figure 6, roughly with a shading radius on earth between 6,000 and 8,000 km.”

The corrected sentence appears below:

“One notes the resulting shaded earth or disc required area in Eq. 13 equates to 510 × 10^6 km^2 (0.00154) = 0.787 × 10^6 km^2, yielding a radius of about 500.5 km.”

A correction has been made to *Space Mirror Model Estimate*, Paragraph 4. This sentence previously stated: “For almost similar goals, the improvement found in this paper is about a factor of 6–8 in the required earth-shaded radius.”

The corrected sentence appears below:

“For almost similar goals, the improvement found in this paper is about a factor of 8.4 in the required disc reduced area.”

A correction has been made to *Space Mirror Model Estimate*, Paragraph 7. This sentence previously stated: “Nevertheless, weight issues are obviously problematic. For example, by comparison to the international space station that weighs about 420 ton (Garcia, 2021), reduced area estimates found here are better than Sanchez et al.’s estimates but still lead to weights that are 1350 times higher than the space station.”

The corrected sentence appears below:

“Nevertheless, weight issues are obviously problematic. For example, by comparison to the international space station that weighs about 420 ton (Garcia, 2021), reduced area estimates found here are better than Sanchez et al.’s estimates but still lead to weights that are much higher than the space station.”

In the published article, there was an error in **Results**, *Space Mirror Model Estimate*. An explanation was unclear.

A correction has been made to *Space Mirror Model Estimate*, Paragraph 4. This sentence previously stated: “This is mainly because, in this paper, the goal is a little smaller, a maximum reflectivity of 100% is used [Sánchez and McInnes (2015) goal was roughly a little lower than 100%], and secondary effects of GHG re-radiation $(1 + f) = 1.62$ and feedback $A_F = 2.15$ (section Solar Geoengineering Reverse Forcing Method; Table 1; Eq. 1) are incorporated in Eq. 14.”

The corrected sentence appears below:

“This is mainly because, in this paper, the goal is a little smaller, a maximum reflectivity of 100% is used (Sanchez et al. goal was roughly a little lower than 100%), and secondary effects of GHG re-radiation $(1 + f) = 1.62$ and feedback $A_F = 2.15$ (section Solar Geoengineering Reverse Forcing Method; Table 1; Eq. 1) are incorporated in Eq. 14. As well, Sánchez and McInnes (2015) used their Equation 1 in their assessment. This is not comparable to Eq. 12 used in this paper’s assessment.”

In the published article, there was an error in **Results**, *Space Mirror Model Estimate*. The error is due to a geometry ratio estimate between the space disc radius and the shaded radius which can be refined.

A correction has been made to *Space Mirror Model Estimate*, Paragraph 6. This sentence previously stated: “We note that the shaded radius from the disk projected on earth is reduced in this paper by a factor of 6–8 on earth. Therefore, the space disk radius will also be reduced (from intersecting similar triangles, see Figure 6 in Sánchez and McInnes, 2015) by a factor of 6–8 leading to a disk area reduction that goes as r^2 (a 36 to 64 disk area reduction) reducing the area by an average of 50 to 1.3 × 105 km^2 (0.57 million tons).”

The corrected sentence appears below:

“We note that the space disk radius is reduced by a factor of 3 compared to Figure 6 in Sánchez and McInnes, 2015. Further disc reductions will likely be found in the author’s planned future work on solar geoengineering to stop annual global warming.”

The author apologizes for these errors and states that this does not change the scientific conclusions of the article in any way. The original article has been updated.

Publisher’s note

References

Garcia, M. (2021). *International Space Station Facts and Figures*. Available online at: https://www.nasa.gov/feature/facts-and-figures (accessed January 4, 2022).

Sánchez, J.-P., and McInnes, C. R. (2015). Optimal sunshade configurations for space-based geoengineering near the Sun-Earth L1 point. *PLoS ONE* 10, e0136648. doi: 10.1371/journal.pone.0136648