

Interactive comment on “Evaluation of Monte Carlo tools for high energy atmospheric physics” by Casper Rutjes et al.

Anonymous Referee #2

Received and published: 29 August 2016

This paper checks the physics used in several programs used to simulate terrestrial gamma-ray flashes by simulating simple cases (monoenergetic particles beams in air at 1 bar and 0 degrees C) and comparing the results. The relevant physics is thoroughly discussed and the reasons for differences between the simulation results are identified. This is highly useful since several of the codes were developed for other areas of physics and might have explicit or hidden deficiencies for high energy atmospheric physics. Obviously this falls short of a full validation against reality, e.g., some standard cross section used by all of the programs might deviate from the true value.

The results are clearly presented and explained. Issues are identified with several of the programs and advice is provided for future simulation efforts. The paper is a very useful contribution to high energy atmospheric physics modeling.

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Specific Comments:

line 11, page 2: in the large-scale electric field theory, seed electrons might also originate from lightning leaders. See, e.g., section 4.6.2 of Dwyer, Smith and Cummer, Space Science Reviews, 2012.

page 5, line 25. In the discussion of positronium, the lifetimes are for vacuum. Will any positronium be disrupted in 1 bar air before decaying? Which of the programs, if any, handle two versus three photon decay of positronium? This effects the magnitude of the 511 keV line in TGF photon spectra, produced in the atmosphere.

technical corrections:

page 13, line 22: "dot" should be "not"

Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-147, 2016.

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