Study Nuclear Winter with a radiative-convective climate model

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July 29, 2023

Abstract

1 Introduction

2 Methods

The definition of wavenumber $\nu = \frac{1}{\lambda}$ is used in this work, where λ is the wavelenght.

2.1 Longwave radiation

At wavelengths $\lambda \geq 4\,\mu m$, solar radiation has lower intensities than radiation emitted by Earth's surface and atmosphere at the same wavelengths. Moreover, it presents negligible scattering in atmosphere with respect to absorption. For these reasons longwave radiation is considered to be emitted only by Earth's surface and atmosphere.[1, p. 468]

2.2 Shortwave radiation

At wavelengths $\lambda < 4\,\mu m$, solar radiation has much greater intensity than radiation emitted from Earth's surface and atmosphere. Both scattering and absorption by gases, aerosols and clouds of atmosphere dissipates solar radiation.[1, p. 469]

Specific intensity of solar radiation can be expressed by a differential equation whose resolution is complex even applying approximations and numerical methods.[1, p. 469]

A lower complexity parametrisation is adopted instead, where the atmosphere is divided in a given number of layers and radiation is absorbed, scattered and reflected between each layes. Multiple reflections can occur from each layer but only one is considered in this model because successive reflections from amospheric layers have negligible intensities compared to the first one.[1, p. 470]

2.3 Numerical approach

3 Results

3.1 Stability analysis

4 Discussion

A Source code

In this section the C++ code used to obtain the results presented in this work is shown and commented.

A.1 Classes

References

[1] V. Ramanathan and J. A. Coakley Jr., "Climate modeling through radiative-convective models," *Reviews of Geophysics*, vol. 16, no. 4, pp. 465–489, 1978. DOI: https://doi.org/10.1029/RG016i004p00465. eprint: https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/RG016i004p00465. [Online]. Available: https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/RG016i004p00465.