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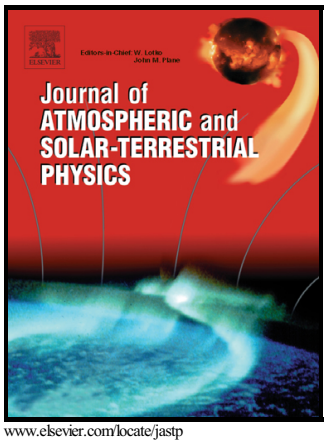

www.elsevier.com/locate/jastp

PII: S1364-6826(15)00027-9
DOI: http://dx.doi.org/10.1016/j.jastp.2015.02.002
Reference: ATP4157

To appear in: *Journal of Atmospheric and Solar-Terrestrial Physics*

Received date: 13 August 2013
Revised date: 4 February 2015
Accepted date: 5 February 2015

Cite this article as: Marcos A. Peñaloza-Murillo and Jay M. Pasachoff, Air-cooling mathematical analysis as inferred from the air-temperature observation during the 1st total occultation of the Sun of the 21st century at Lusaka, Zambia, *Journal of Atmospheric and Solar-Terrestrial Physics,* http://dx.doi.org/10.1016/j.jastp.2015.02.002

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Abstract

We analyze mathematically air temperature measurements made near the ground by the Williams College expedition to observe the first total occultation of the Sun [TOS (commonly known as a total solar eclipse)] of the 21st century in Lusaka, Zambia, in the afternoon of June 21, 2001. To do so, we have revisited some earlier and contemporary methods to test their usefulness for this analysis. Two of these methods, based on a radiative scheme for solar radiation modeling and that has been originally applied to a morning occultation, have successfully been combined to obtain the delay function for an afternoon occultation, via derivation of the so-called instantaneous temperature profiles. For this purpose, we have followed the suggestion given by the third of these previously applied methods to calculate this function, although by itself it failed to do so at least for this occultation. The analysis has taken into account the limb-darkening, occultation and obscuration functions. The delay function obtained describes quite fairly the lag between the solar radiation variation and the delayed air temperature measured. Also, in this investigation, a statistical study has been carried out to get information on the convection activity produced during this event. For that purpose, the fluctuations generated by