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Sprite thunder: automated sprite detection with infrasound recordings

M. Ignaccolo (1), T. Farges (2), E. Blanc (2), M. Fullekrug (1)

(1) Department of Electronic and Eletrical Engineering, University of Bath, Bath, United Kingdom, (2) Commisiarat a l'Energie Atomique, DASE/LDG, Bruyeres le Chatel, France

Recent work by T. Farges et al.[1] shows how sprites generate an infrasound signature. This signature is a chirp in the frequency range 1-10 Hz, which has been observed for 70% of the sprite events, as confirmed with optical observations from the "Observatoire du Pic du Midi" in the Pyrenees (southern France). This promising high detection efficiency makes infrasound recordings highly relevant for sprite detection. In this work, we compare the traditional tools of Fourier analysis with the wavelet analysis [2] and a complex system approach [3] to investigate the properties of the sprite induced chirp, and try to determine the false alarm rate. We then discuss how the results can be used to successfully detect sprites with infrasound recordings.

[1] "Identification of Infrasound produced by sprites during the Sprite 2003 campaign", T. Farges, E. Blanc, A. Le Pichon, T. Neubert and T. H. Allin, Geophys. Res. Lett., 32, L01813, doi:10.1029/2004GL021212

[2] "A Wavelet Tour of Signal Processing", S. Mallat, 2nd Edition 1999, Academic Press

[3] "Facing non-stationarity conditions with a new indicator of Entropy increase: the CASSANDRA algorithm", P.Allegrini, P. Grigolini, L. Palatella, G.Raffaelli and M. Virgilio. in: Novak M.N. (ed.): Emergent Nature. World Scientific, Singapore(2002)