

Possible Preseismic Anomalies in the Ground Wave of LF (216 KHz and 270 KHz) Radio Broadcastings Revealed in Italy During 1997–1998

PIER FRANCESCO BIAGI¹, LAURA CASTELLANA¹,
TOMMASO MAGGIPINTO¹, ROBERTO PICCOLO¹,
ANITA ERMINI²

¹*Department of Physics, University of Bari, Italy*

²*Department of Engineering of Enterprise, University of Roma Tor Vergata, Italy*

On February 1996, a receiver able to measure the electric field strength of LF radio broadcastings, with a sampling frequency of ten minutes, was put into operation in a site (AS) located in central Italy. One of the broadcasting stations selected is MCO (France, $f=216$ kHz), 518 km far from the receiver; another one is CZE (Czech Republic, $f=270$ kHz), 818 km far from the receiver. The data of these stations collected by the AS receiver since February 1996 up to September 2004 were examined and, at first, the night time data and the day time data (in winter and summer) were separated. Then, the wavelet analysis on the night and day time data was applied. As it concerns the MCO radio signal, the main result was the appearance of a very clear anomaly during summer (July-August) 1998, at day time and at night time. On August 15, 1998 a seismic sequence started with 17 earthquakes ($M=2.2-4.6$) on the Reatini mountains, a seismogenic zone located 30 km far from the AS receiver exactly along the path MCO-AS. As it concerns the CZE radio signal, the main result was the appearance of a very clear anomaly during August-September 1997, at summer day time. On September 26 the Umbria-Marche (central Italy) seismic sequence started with two earthquakes with magnitude $M=5.6$ and $M=5.9$. The location of these epicentres was about 100 km far from the AS receiver but in the area of the CZE-AS path. The only way to justify the quoted anomalies seems to be the occurrence of an increase of the ground wave propagation mode of the radio signals. As it concerns the 1998 anomaly, such an increase could have been produced by an increase of the ground conductivity and of the troposphere refractive index in the zone of the Reatini mountains seismic sequence during its preparatory phase. As it concerns the 1997 anomaly, we assume the formation of a troposphere reflecting layer or of a troposphere duct in the zone of the Umbria-Marche earthquakes, during their preparatory phase, able to produce an area of constructive interference for the CZE radio signal nearby the AS receiver.