Eastern Nazarene College
Discover your purpose

Dr. Pierre-Richard Cornely

Physics & Engineering

Title: Recent Developments in Earthquake Monitoring & Prediction

Abstract: In the last few decades, research on earthquake prediction has resulted in the recognition that there may exist many earthquake precursors in the lithosphere, atmosphere and ionosphere. The ionosphere is naturally perturbed by solar and geomagnetic disturbances and it is difficult to extract the variations connected with earthquakes particularly for the equatorial and high latitude ionosphere. Several researchers have contending theories on the mechanisms associated with pre-earthquake signals. The basic premise is that a thin layer of particles created before earthquakes due to ions originating from the earth's crust travel to the earth's surface and begin radiating from the earth's surface due to strong electric fields Namgaladze et al., [2009]. The ions can then travel from above earth's surface to the ionosphere where they can create ionospheric disturbances. When solar and geomagnetic disturbances can be ruled out, the effects of pre-seismic activities in the ionosphere can be assessed using fluctuations in the ionospheric electron density in the vicinity of fault lines. The Parameterized Ionospheric Model (PIM) is a fast global ionospheric model which produces electron density profiles (EDPs) between 90 and 25000 km altitude, which corresponds to critical altitudes of the ionosphere Daniell et al., [1995]. Since PIM only simulates a statistical mean ionosphere, sudden variations in ionospheric electron density will not be represented in the models, which make PIM ideal for background electron density predictions. Latest discoveries and research in the field of seismic predictions Friedemann et al. [2013], Bleier et al., [2010] confirm what has been reported by Cornely et al., [2013]. In this presentation, we discuss the basic work done by Cornely et al. [2013] and placed it within the context of the new developments in the field.

[1995] Parameterized ionospheric model: A global ionospheric parameterization based on first principles models, Radio Science, Volume 30, Number 5, Pages 1499-1510, September-October 1995
[2009] Namgaladze et al., Three-dimensional structure of the seismo-electromagnetic ionospheric electron density disturbances, Proceedings of the MSTU, Vol. 15, No. 3, 2012 pp.595-603
[2013] Bleier et al., Correlation of pre-earthquake electromagnetic signals with laboratory and field rock experiments, Nat. Hazards Earth Syst. Sci., 10, 1965–1975, 2010
www.nat-hazards-earth-syst-sci.net/10/1965/2010/doi:10.5194/nhess-10-1965-2010
[2013] Cornely et al., Anomalies in the Ionosphere around the Southern Faults of Haiti near the 2010 Earthquake, Natural Hazards General Contributions, NH13A-1589, 2013
[2013] Friedemann et al., Earthquake Forewarning, a Multidisciplinary Challenge from the Ground up to Space Acta Geophysica vol. 61, no. 4, Aug. 2013, pp. 775-807, DOI: 10.2478/s11600-013-0130-4