

ΕΜΒΙΟ- ΗΛΕΚΤΡΟΜΑΓΝΗΤΙΣΜΟΣ

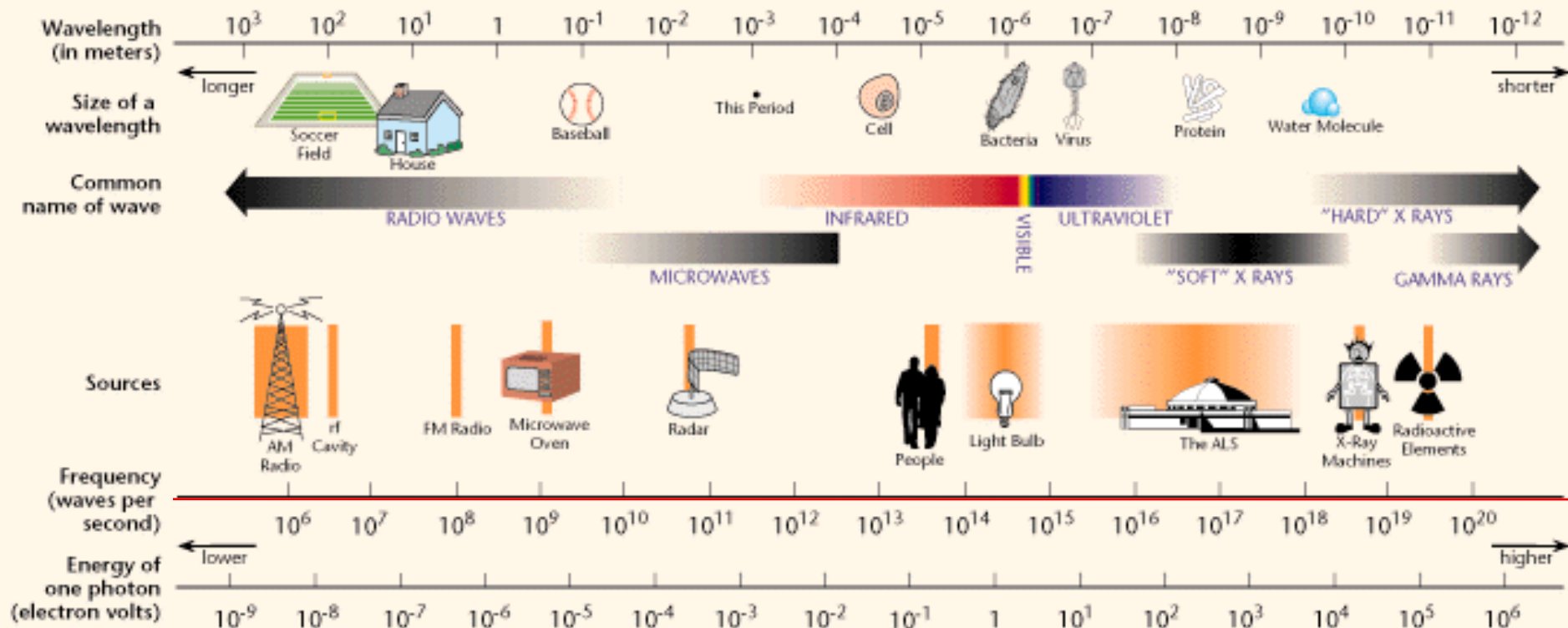
Μάθημα 4^ο

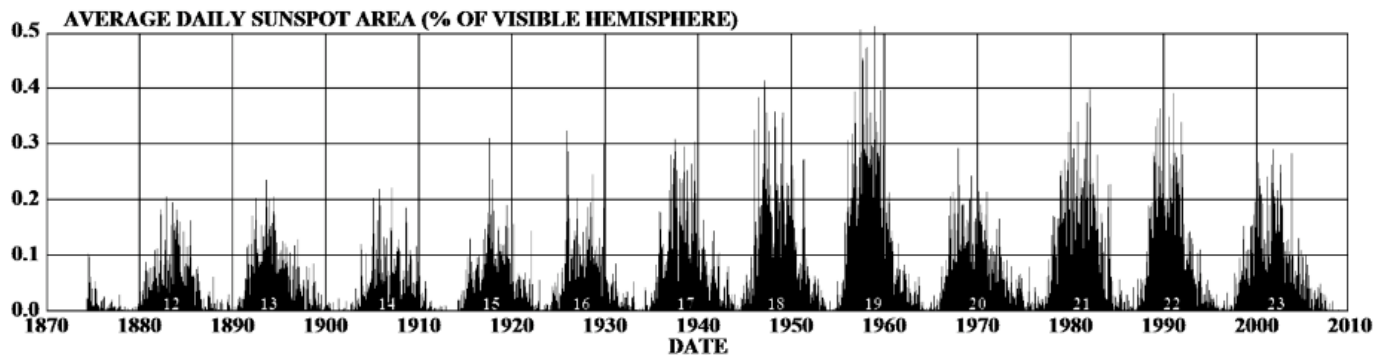
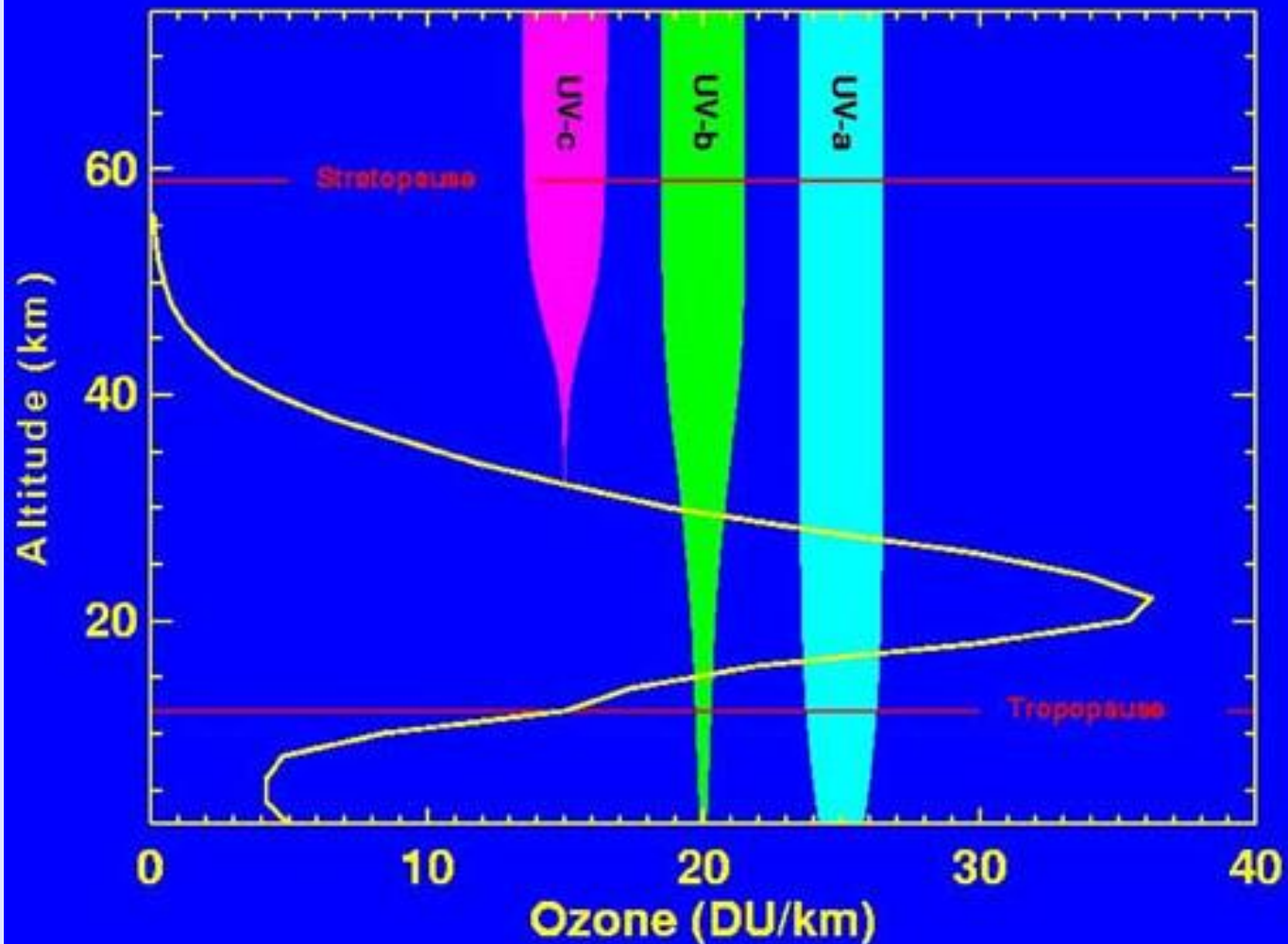
Ηλιακές – γεωμαγνητικές φυσικές δραστηριότητες και επιδράσεις στην βιόσφαιρα





THE ELECTROMAGNETIC SPECTRUM





Does Geomagnetic Activity Influence Human Longevity?

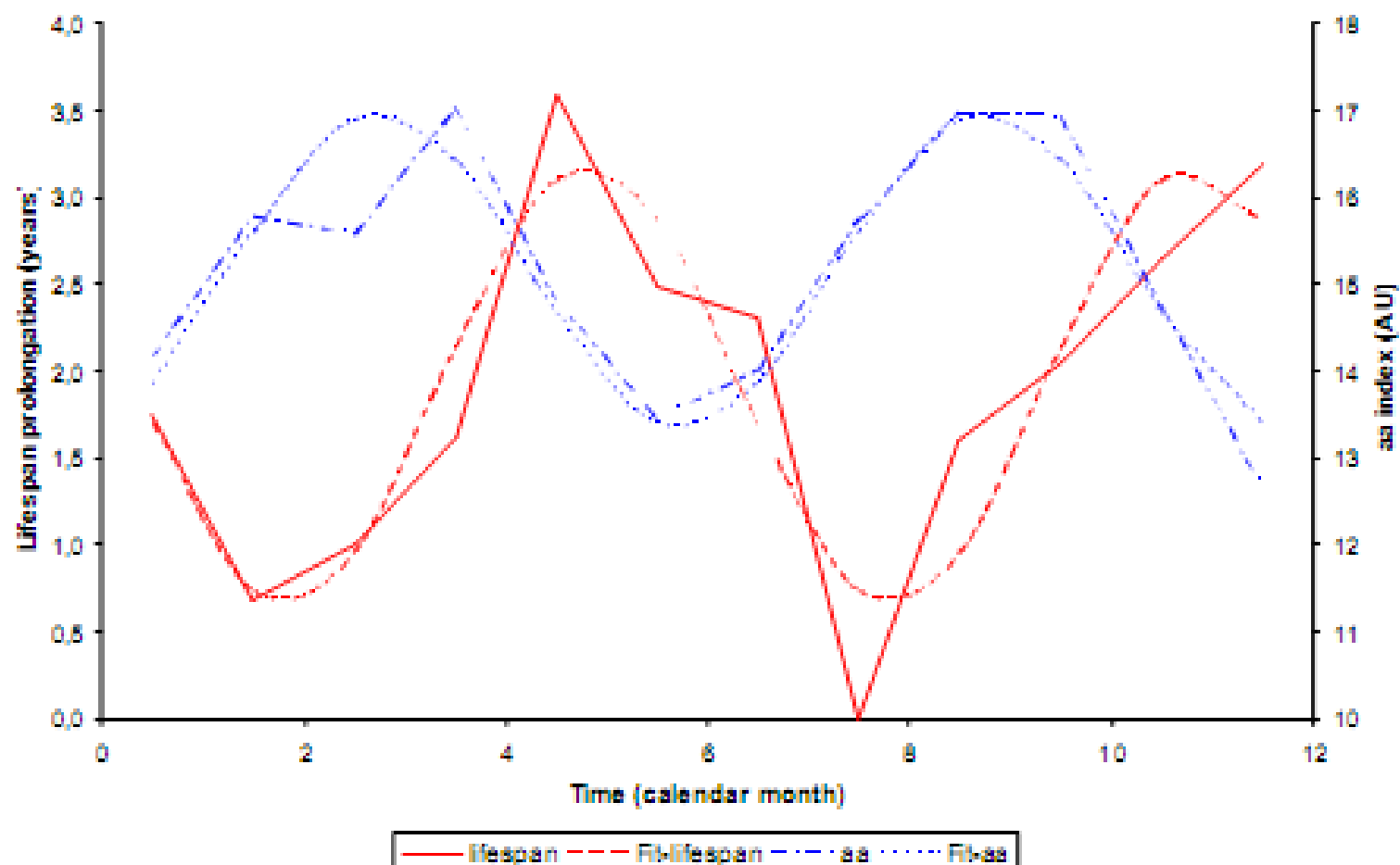


Figure 1. Human longevity studied by Gavrilov and Gavrilova (20) in adult women (30 years and older), in cohorts born in 1800-1880, expressed as a difference for the August value, used as reference, are plotted vs. the month of birth. For comparison, data from the geomagnetic index aa (1868-1880) are plotted after stacking over an idealized 1-year span.

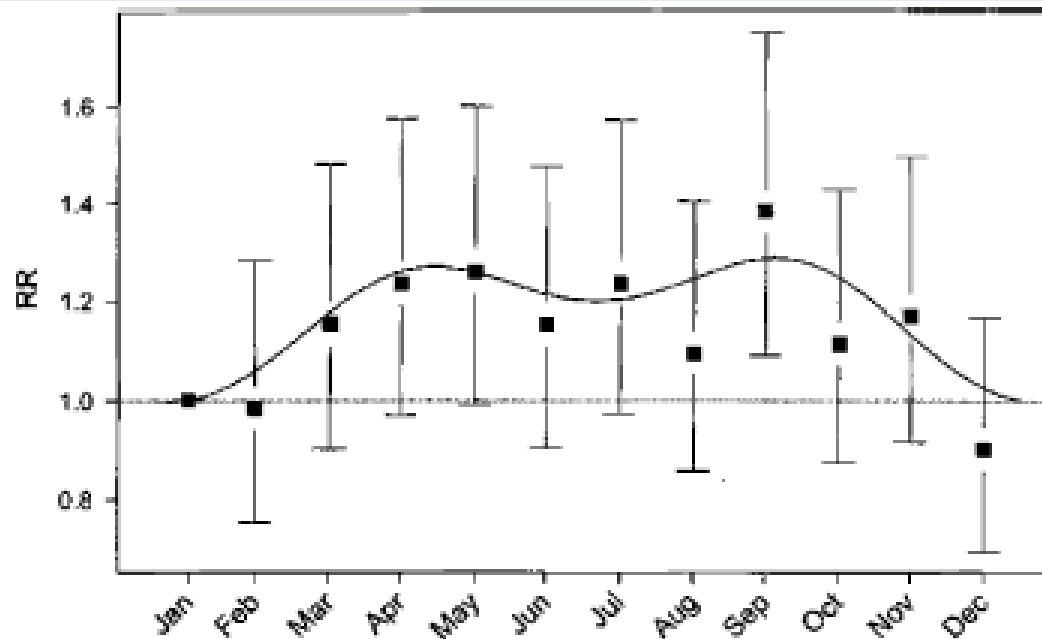


Fig. 4 Relative risk of suicide in northern Finland throughout the year from Partonen et al. (2004)

 Springer

Solar and geomagnetic activity, extremely low frequency magnetic and electric fields and human health at the Earth's surface

S. J. Palmer · M. J. Rycroft · M. Cermack

Mortality from Myocardial Infarction (Minnesota: 1968-1996)
Detrended data

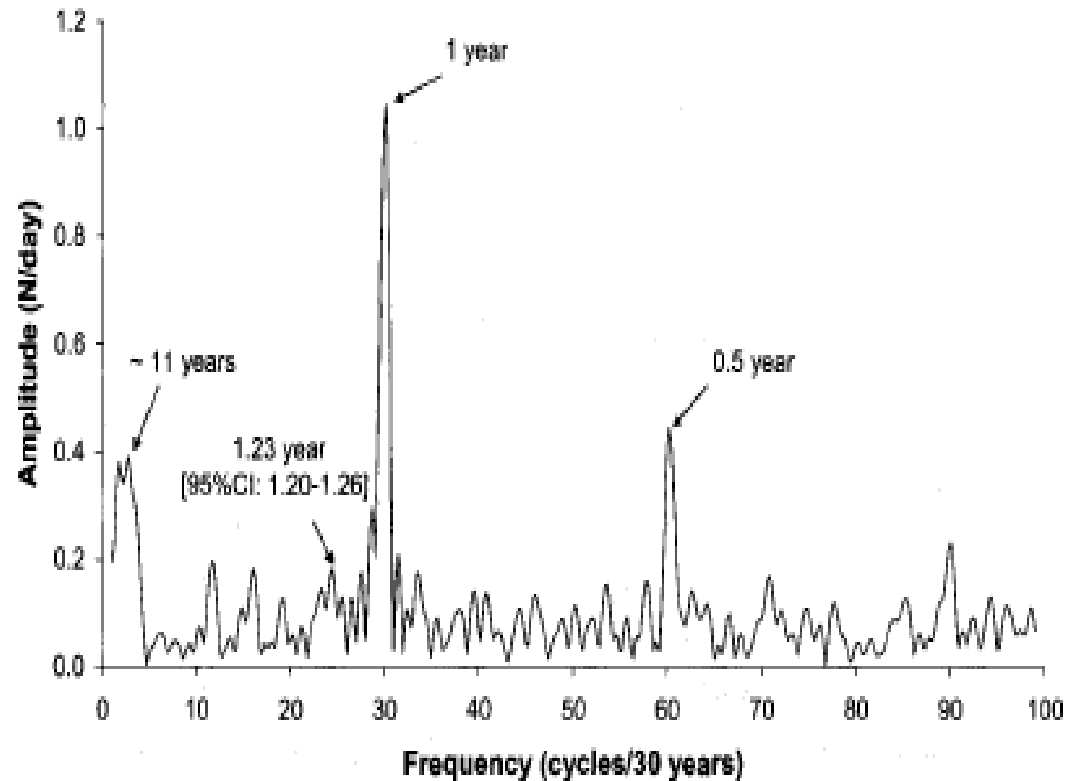
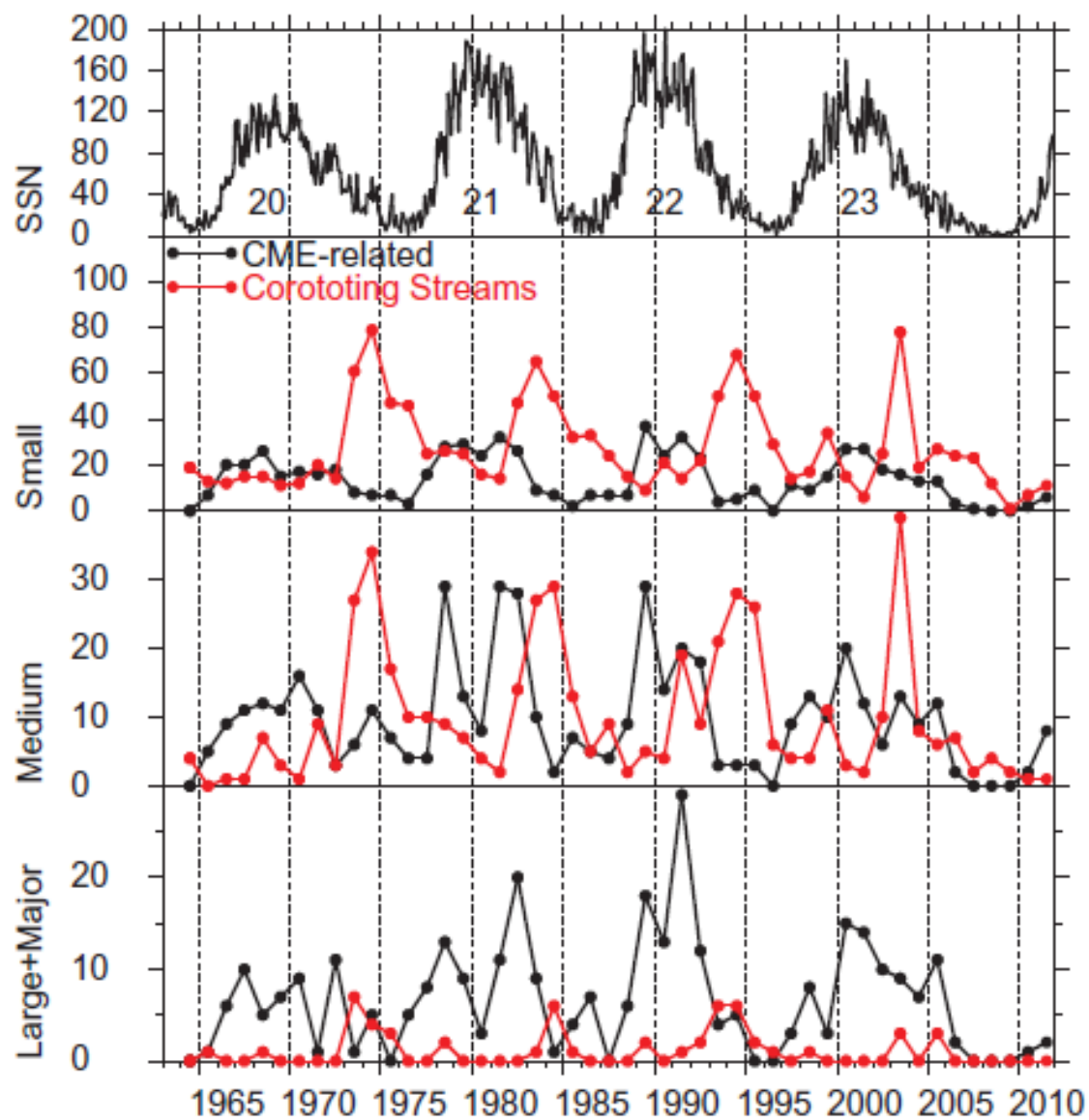


Fig. 18. Clear prominence, in a relatively long time series of myocardial infarctions, of yearly, probably climatic component over any magnetic ~11-year, 0.5-year and transyearly components, the latter with even smaller yet with a non-zero amplitude. © Halberg.

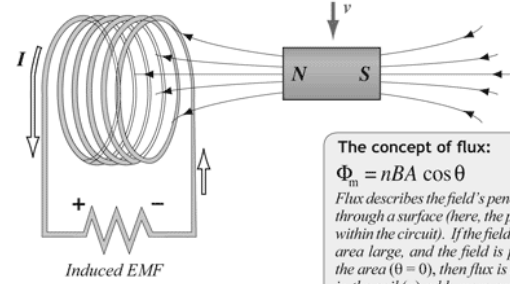




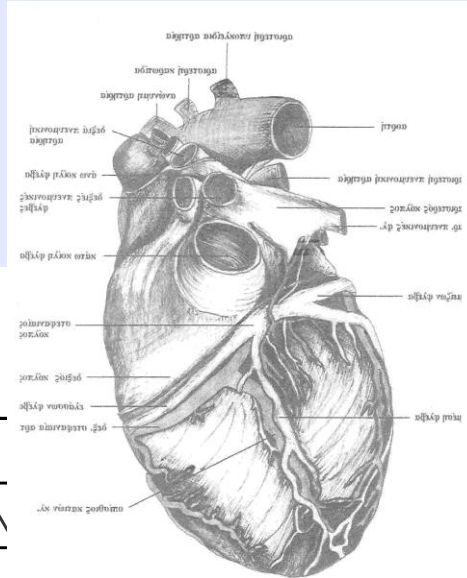
Faraday's Law

$$\mathcal{E} = - \frac{\Delta\Phi_m}{\Delta t}$$

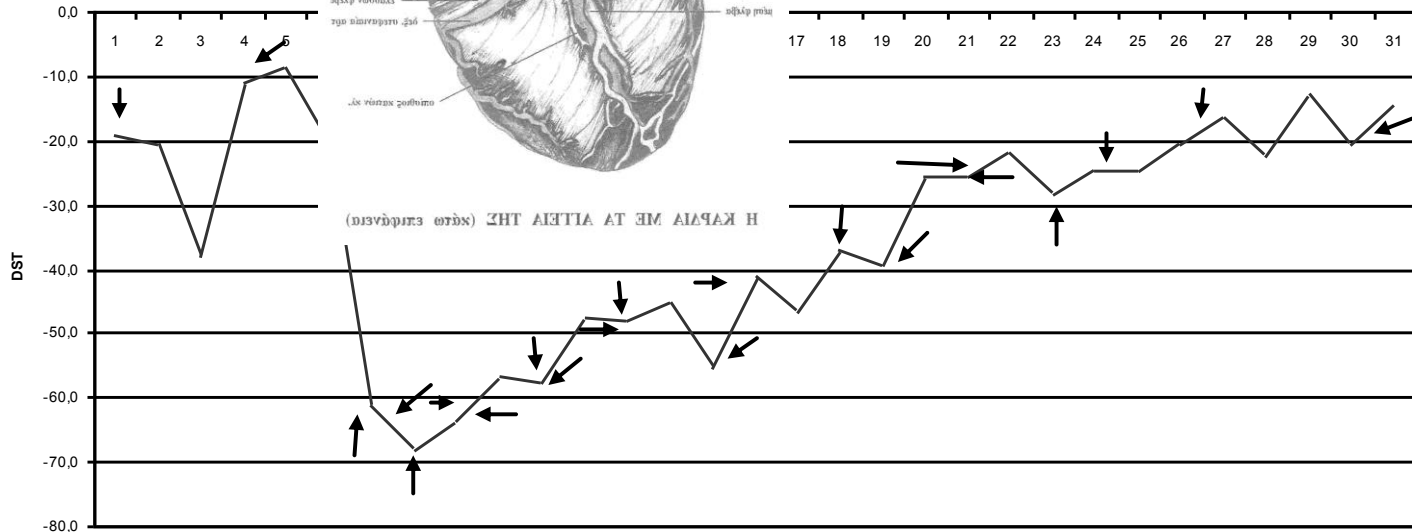
\mathcal{E} = induced emf
 $\frac{\Delta\Phi_m}{\Delta t}$ = rate of change of magnetic flux through the circuit



The concept of flux:
 $\Phi_m = nBA \cos \theta$
 Flux describes the field's penetration (or flow) through a surface (here, the plane of the loops within the circuit). If the field is strong and the area large, and the field is perpendicular to the area ($\theta = 0$), then flux is high. Each turn in the coil (n) adds more area.

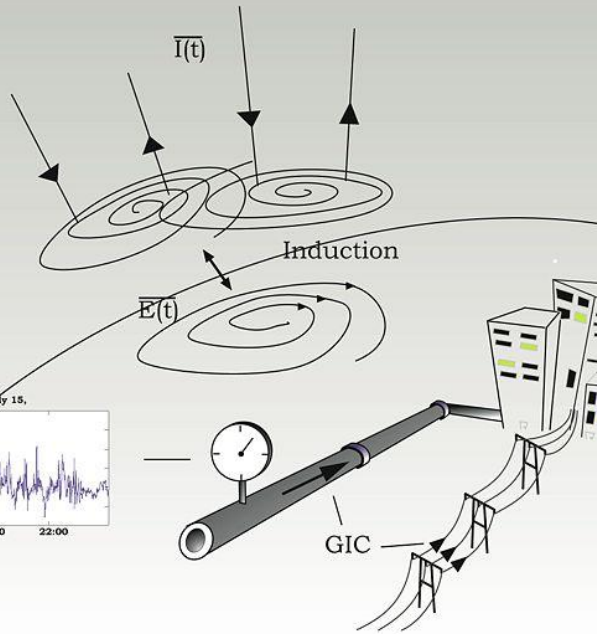
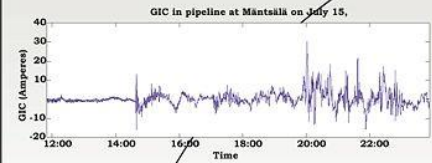


4



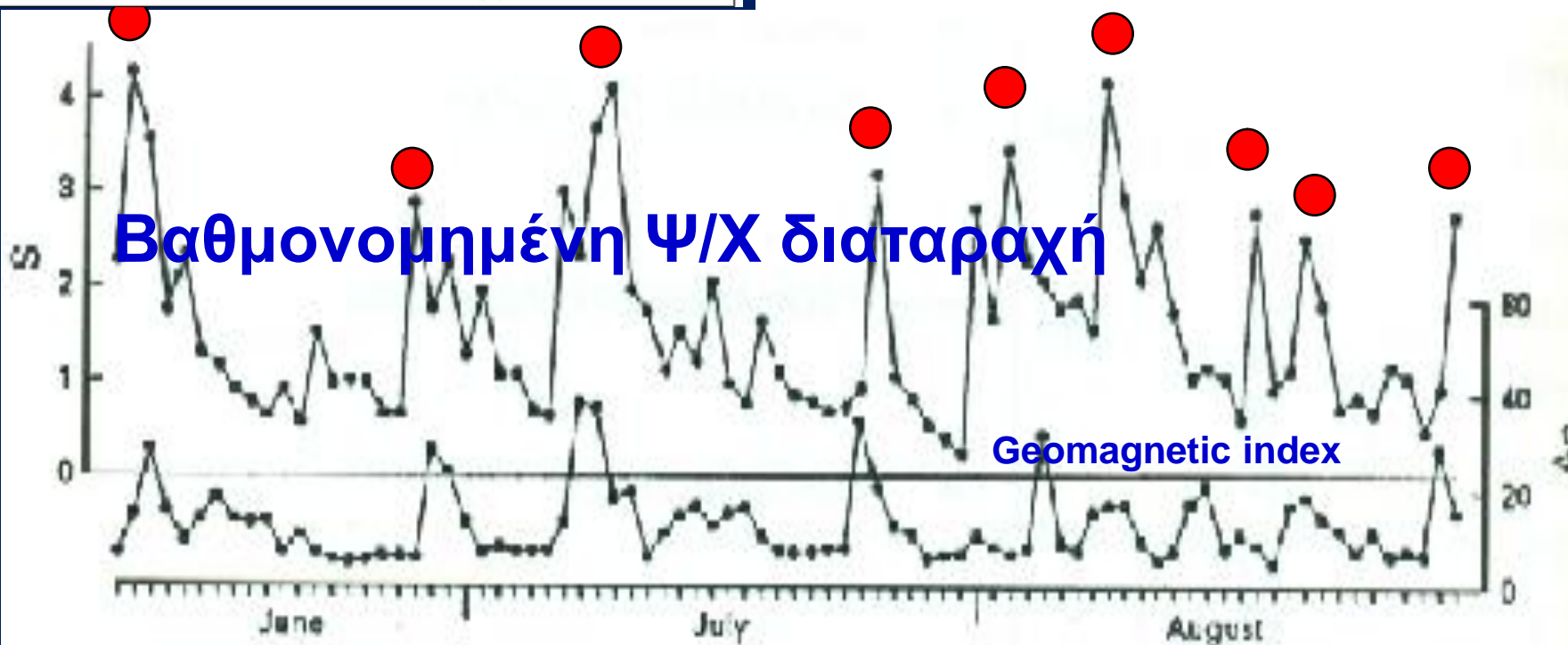
schizophrenia, bipolar disorders, multiple sclerosis (*Torrey et al. 1997*).

Parkinson's disease, mental-behavioral illnesses and probably human lifespan (*Cornelissen et al. 2002*).



Induced EMF

the area ($\theta = 0$), then flux is high. Each turn in the coil (n) adds more area.



Βαθμονομημένη Ψ/Χ διαταραχή

κεραυνών
λόδα ήταν
000
νοί στις
ου 2006

καταιγίδας
τεσσάρων-πέντε
ωρών

Προχθές
παρατηρήθηκε μεγάλος
αριθμός αστραπών,
οι οποίες ξεπερνούσαν
τις **20** ανά ώρα και
ανά **10** χιλιόμετρα
εξόδους (σε ευθεία)




27 June: Night of lightning

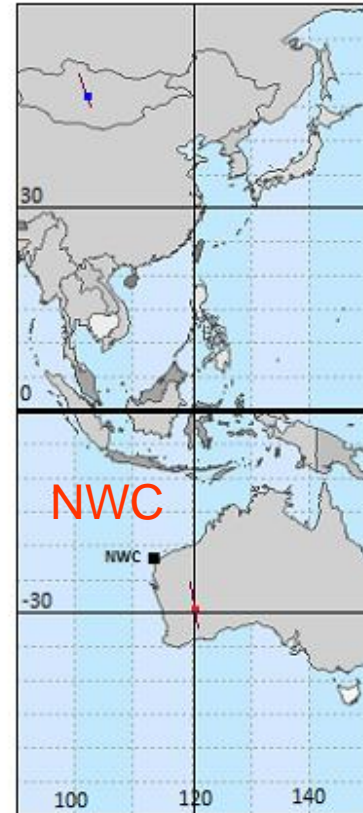
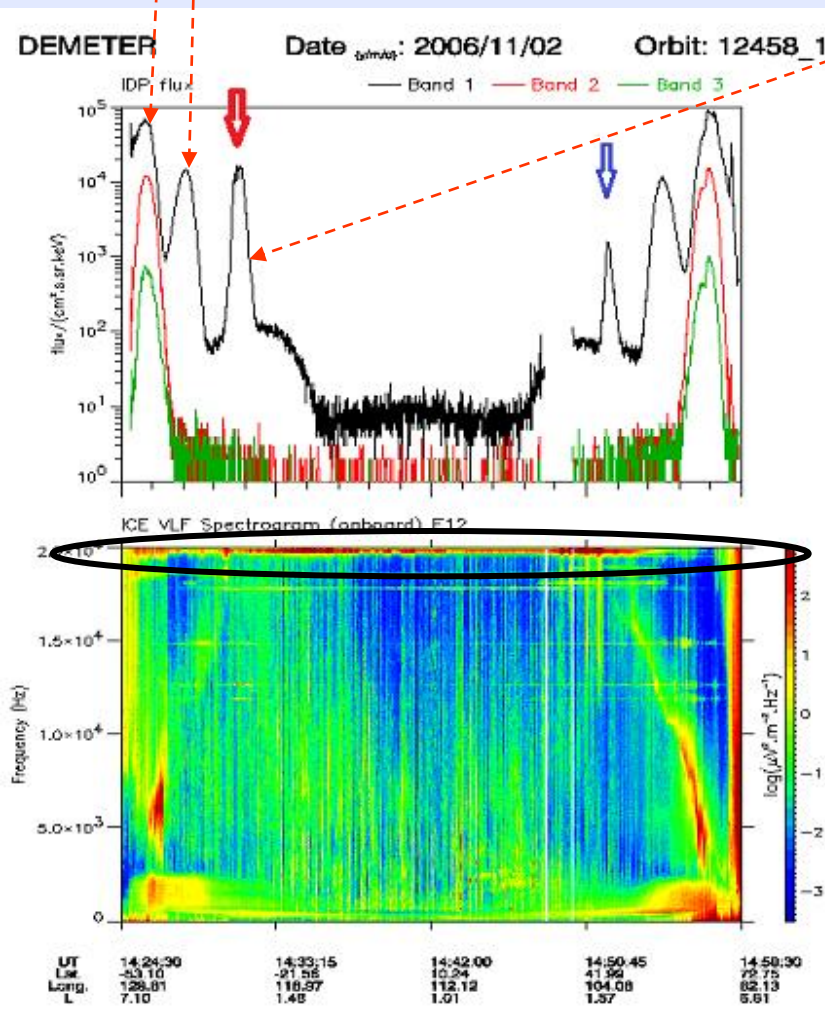
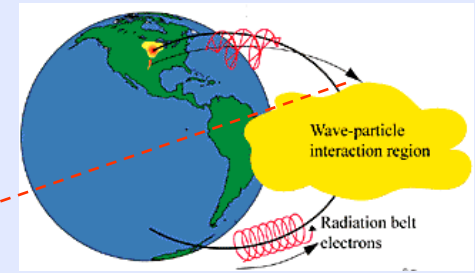
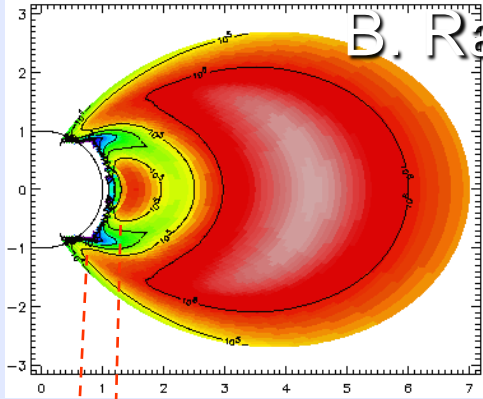


κάνουμε όταν βρεθούμε στη μέση μιας καταιγίδας με κεραυνοίς

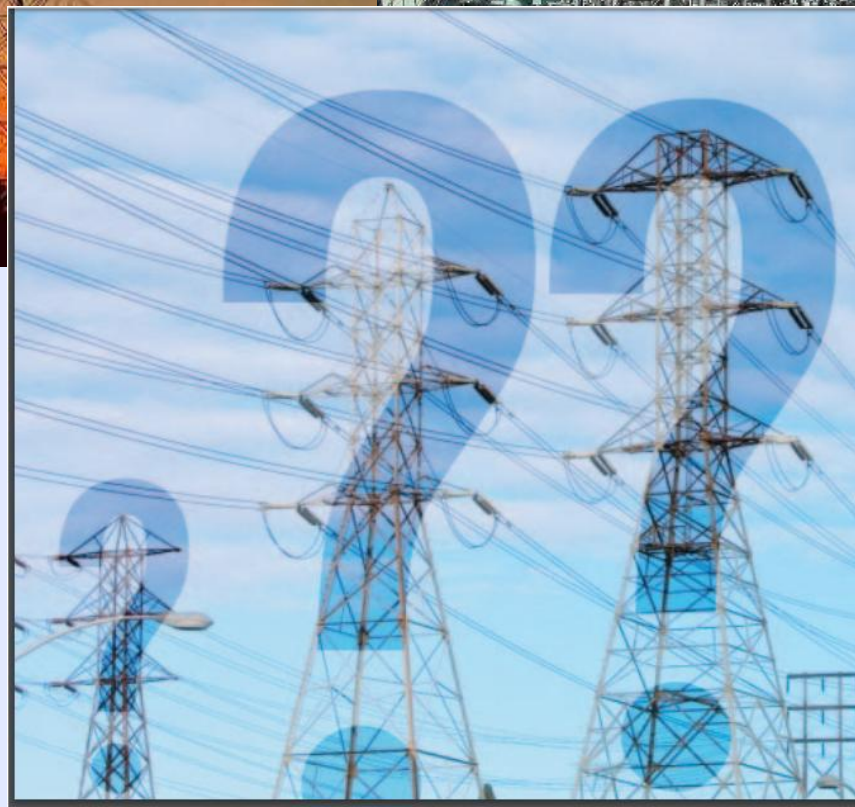
Σε εξωτερικό χώρο

|  Στο σπίτι

B. Radiation belt electron precipitation



Transmitters:
 narrow band
 VLF wave
 Activity around
 the radiating
 frequency





12, 2010



ΑΪΤΗ. Σύμφωνα με νέο απολογισμό της κυβέρνησης στο Πορτ-ο-Πρενς, ο σεισμός προκάλεσε **το θάνατο 300.000** ανθρώπων.

Οι υλικές καταστροφές από τον σεισμό ήταν μεγάλης έκτασης. Ανάμεσα στα δεκάδες κτήρια που κατέρρευσαν συγκαταλέγονται και το πεντάωρο αρχηγείο των Ηνωμένων Εθνών, τα γραφεία της Παγκόσμιας Τράπεζας, το Προεδρικό

ΚΑΤΑΣΤΡΟΦΕΣ ΑΠΟ ΣΕΙΣΜΟΥΣ



12 May

Japan, M9.0
MARCH 11, 2011



May 5th, 2008, China

Απόπειρα ποσοτικοποίησης: Συσχέτιση ποσότητας παραγωγής γάλακτος σε βουστάσιο πριν από σεισμό

95%CI

(Yamauchi et al., *Animals*, 2017.)

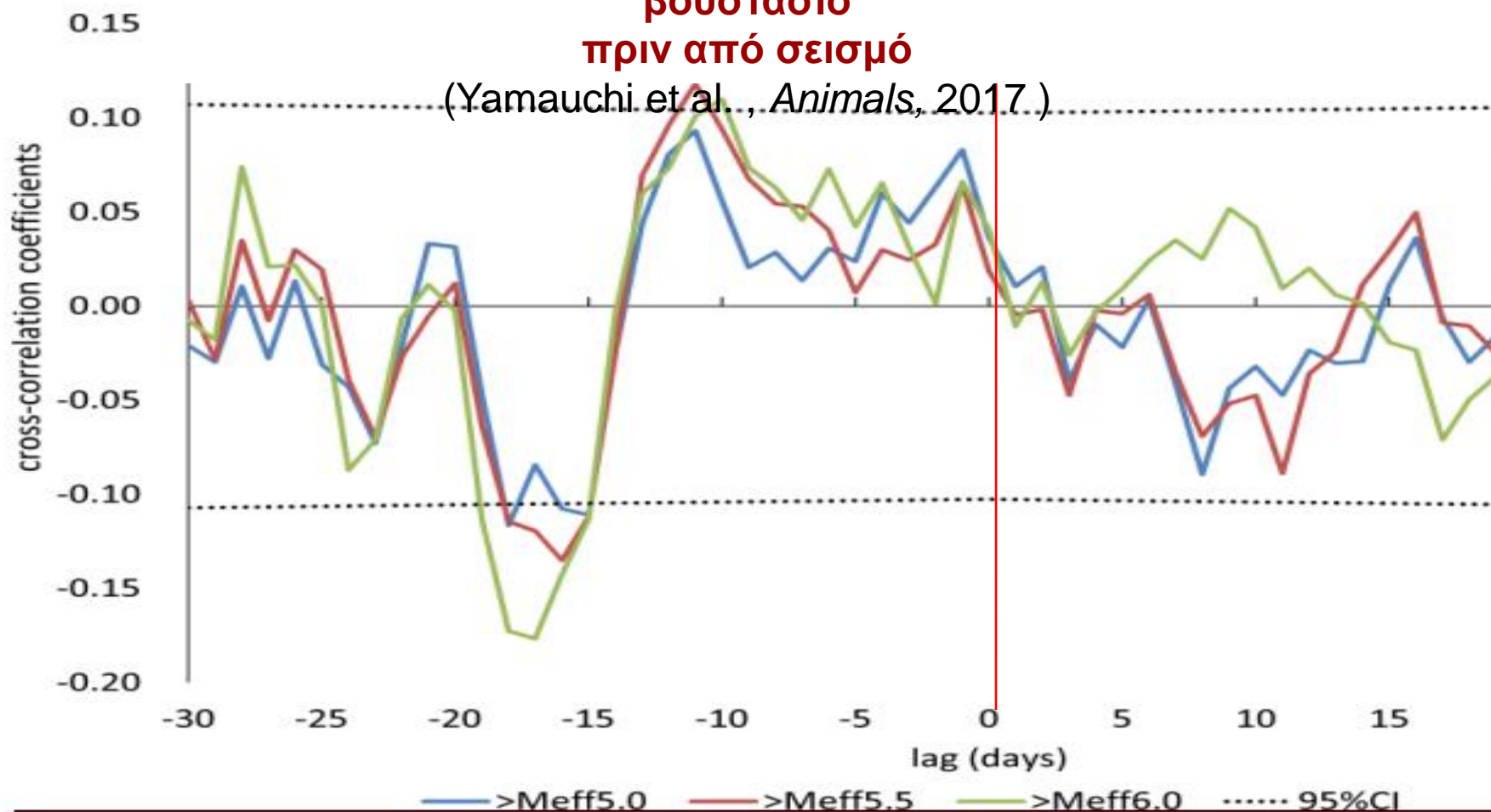


Figure 6. The results of cross-correlation analyses between milk yield exceeding each M_{eff} ; CI = confidence interval.

On 10 March 2015, a Japanese [National Police Agency](#) report confirmed:

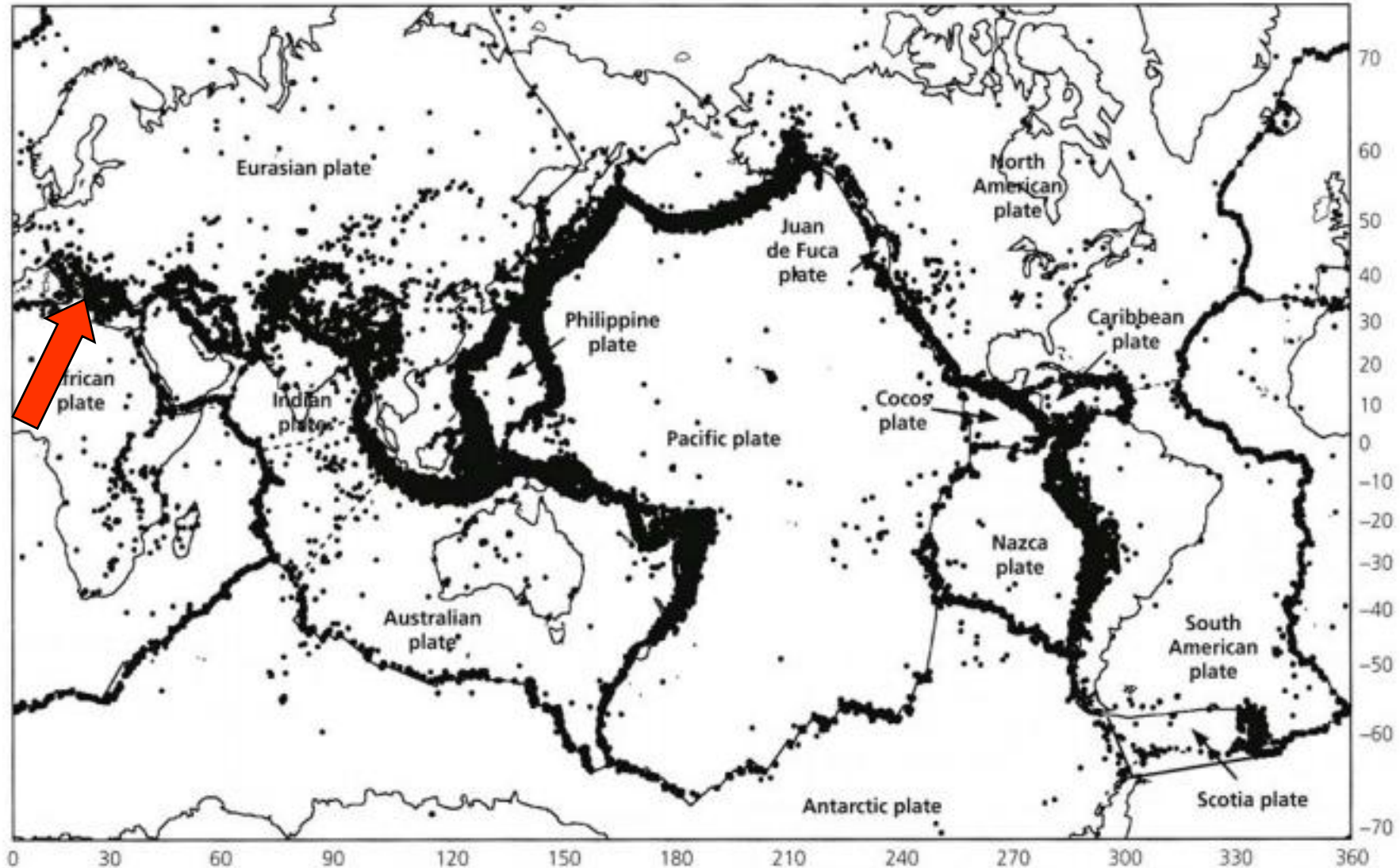
15,894 deaths,
6,152 injured, and
2,562 people missing as well as
228,863 people living away from their home in either temporary housing or due to permanent relocation .

A 10 February 2014 agency report listed

127,290 buildings totally collapsed,
272,788 buildings "half collapsed", and another
747,989 buildings partially damaged.
4.4 million households in northeastern Japan were left without electricity
1.5 million without water.^[44]

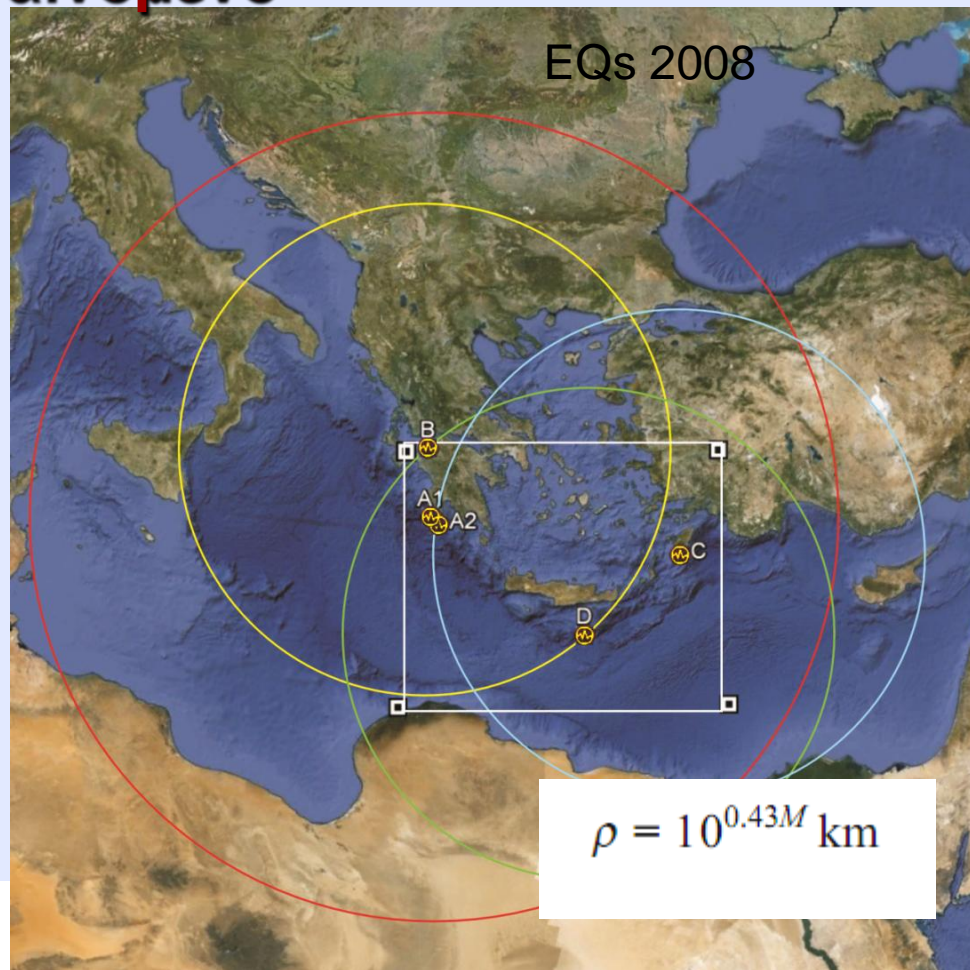
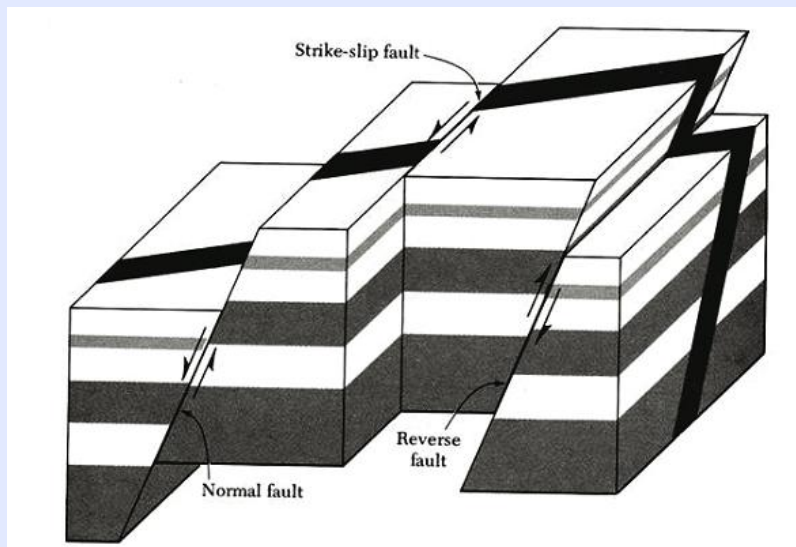
ΔΡΑΣΤΗΡΙΟΤΗΤΑ ΣΕΙΣΜΩΝ

Παρατηρείται έντονα στα όρια των τεκτονικών πλακών



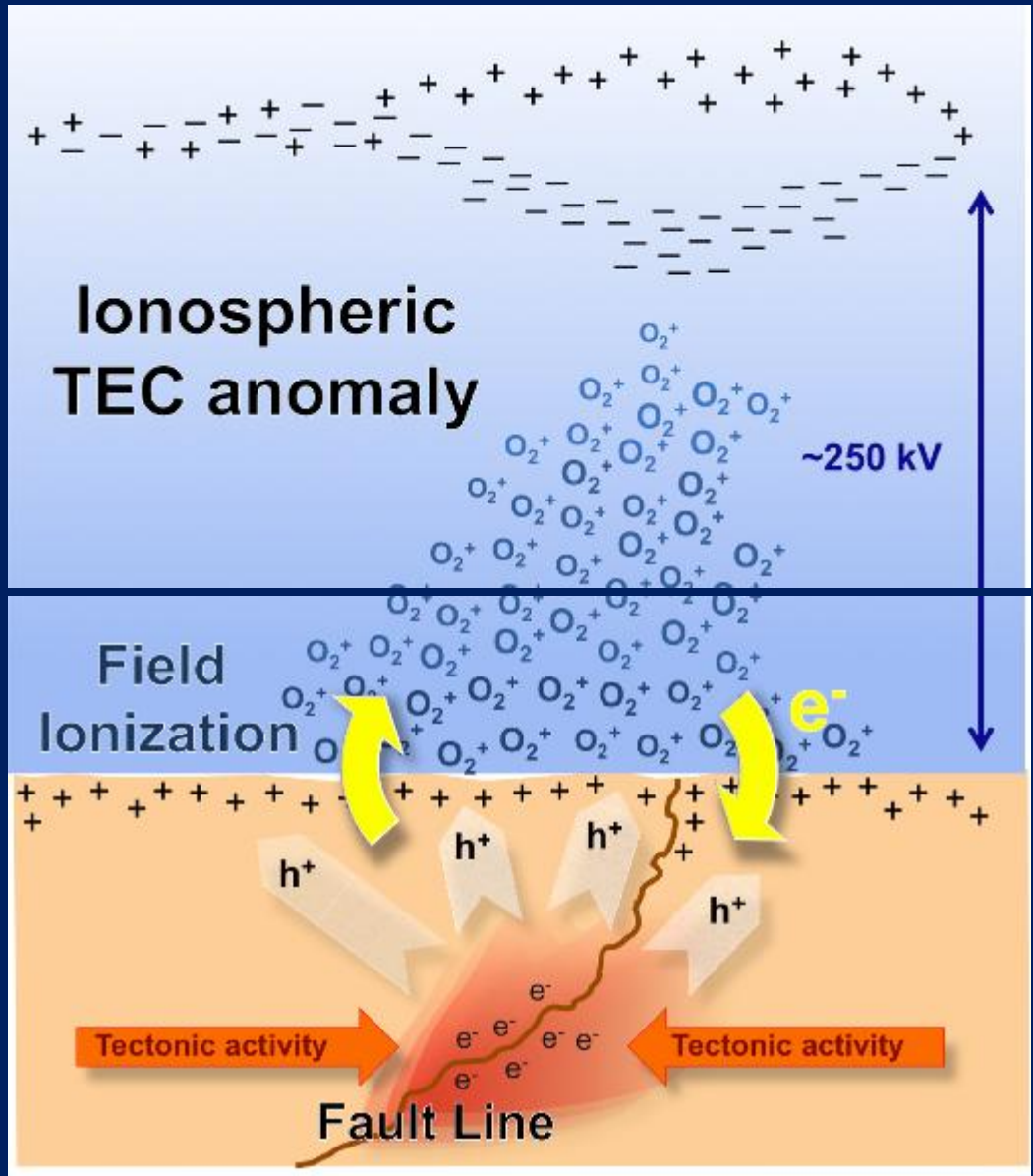
Η σεισμική δραστηριότητα ήταν κυρίως γνωστό ως ένα μηχανικό φαινόμενο

ΤΕΚΤΟΝΙΚΗ ΠΛΑΚΑ

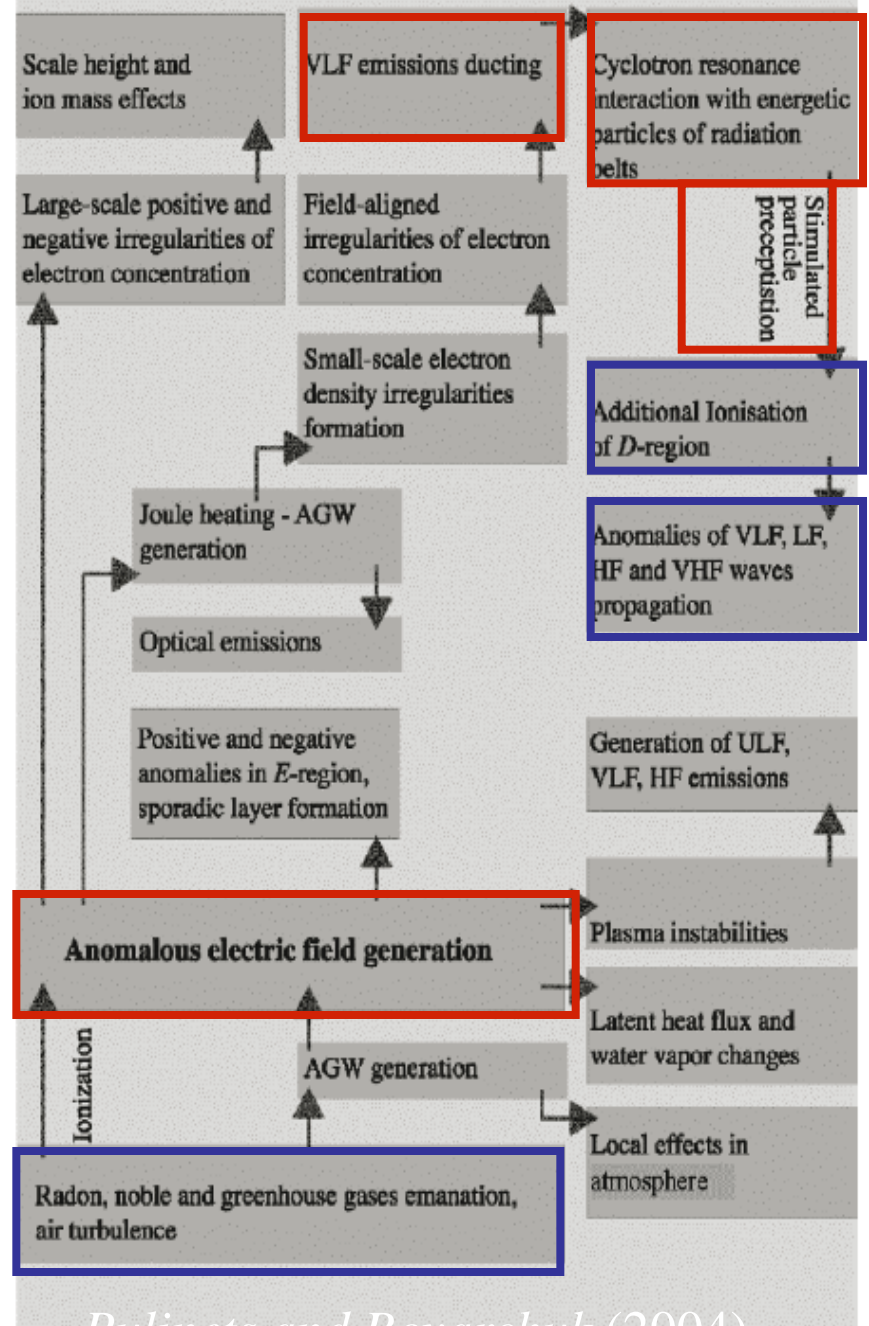
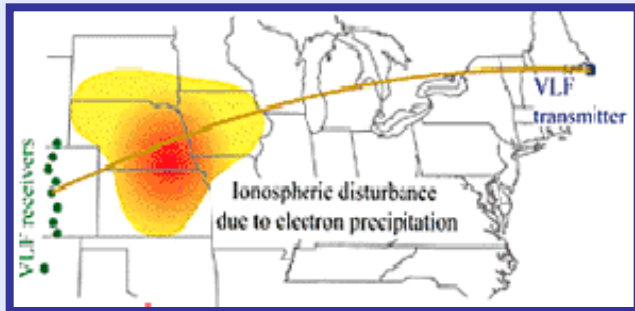
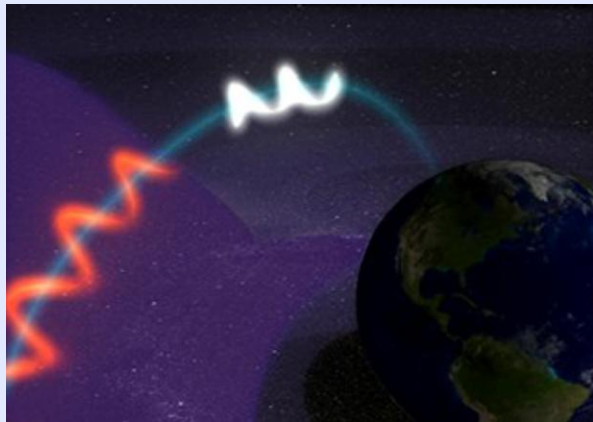
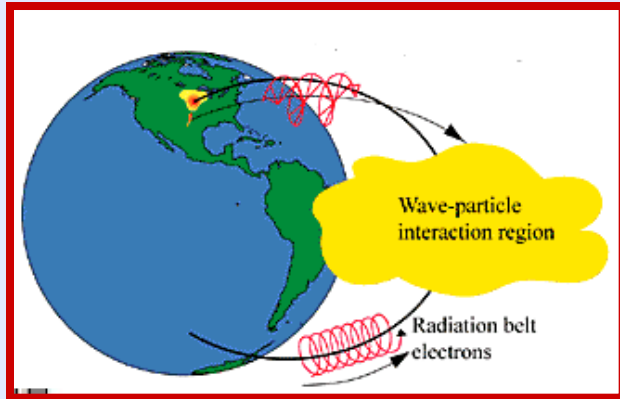


Earthquake Preparation Zone

The conception of the earthquake preparation zone was developed by different authors (Dobrovolsky et al. 1979; Keilis-Borok and Kossobokov 1990; Bowman et al. 1998). In general words, this is an area, where the local deformations connected with the source of the future earthquake are observed.



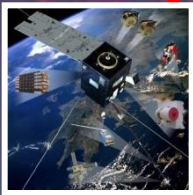
Some conclusions



UHF	3 GHz
VHF	300 MHz
HF	30 MHz
MF	3 MHz
LF	300 kHz
VLF	30 kHz
VF	3 kHz
ELF	300 Hz
ULF	30 Hz
	0 Hz

3

GOES and Terra satellites sense infrared light from positive charges recombining with electrons in the atmosphere.



DEMETER, COSMOS 1809, and QuakeSat satellites sense ELF magnetic disturbances.

SIGNS OF QUAKES TO COME: Rocks cracking before earthquakes cause positive charge to flow up toward the surface. The flow of charge leads to electromagnetic disturbances that can be detected at the surface and even from space.

The ionosphere drops prior to an earthquake.

Air-conductivity sensor detects charges that can cause lights in the sky.

Lights

Charges accumulate on rock outcroppings.

2

Radar measures the height of the ionosphere.

Magnetometers detect ULF and ELF changes in the magnetic field.

GPS satellite

Electrons in the ionosphere after the relative phase of GPS signals.

VLF, HF, and UHF radio signals become scattered as the ionosphere drops.

ΗΜ Ακτινοβολία:

1. Υπόγεια ELF-ULF, 2.

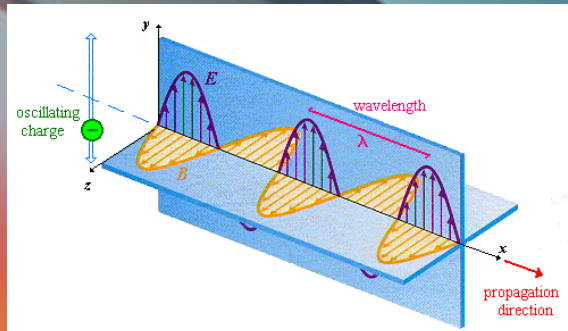
Ατμοσφαιρική TIR,

3.

Μαγνητοσφαιρική VLF

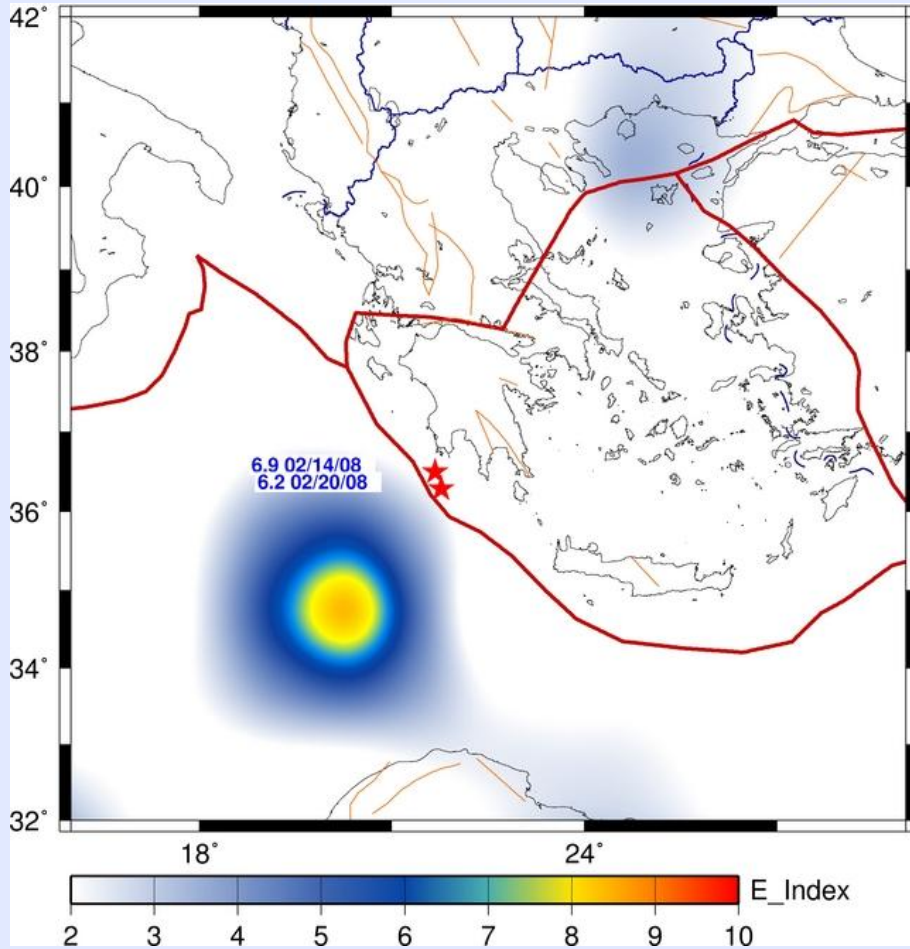
1

Stress on rock preceding earthquake causes flow of charge.

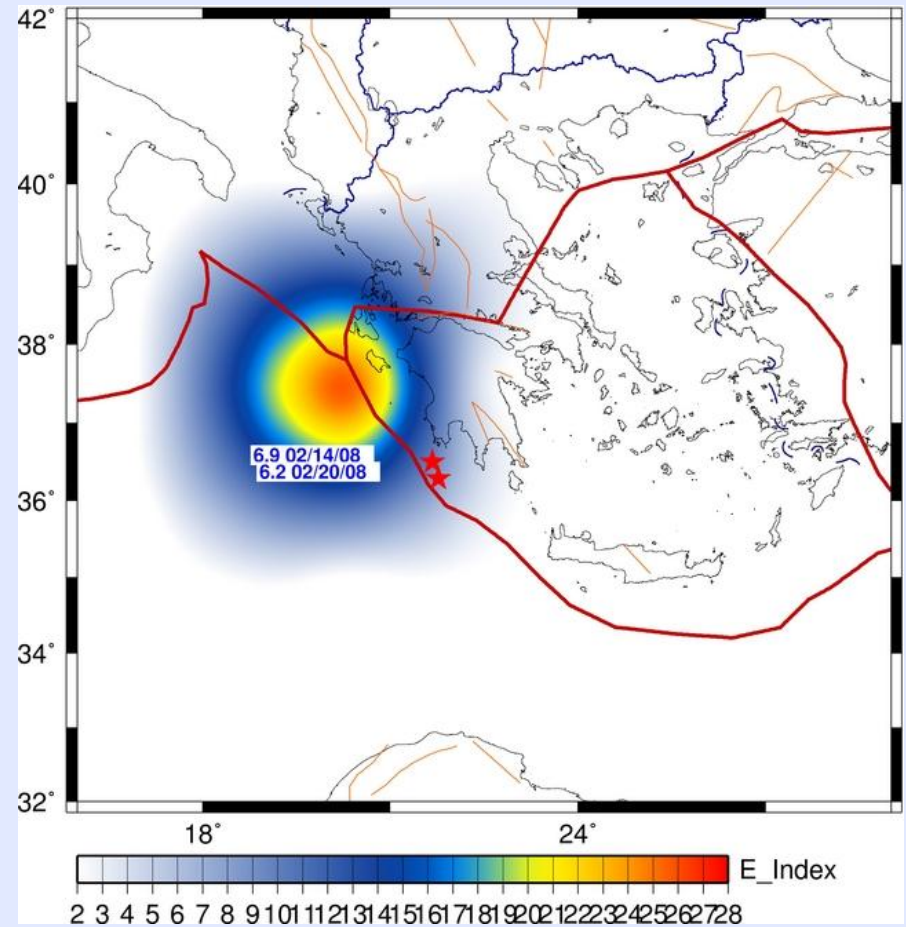


2008	02	14	100922.72	36.50	21.67	29	6.9	MwGCMT
2008	02	14	120855.79	36.35	21.86	28	6.5	MwGCMT
2008	02	20	182706	36.29	21.77	9	6.2	MwGCMT

02.07.2008 (-7)



02.20.2008(-1)

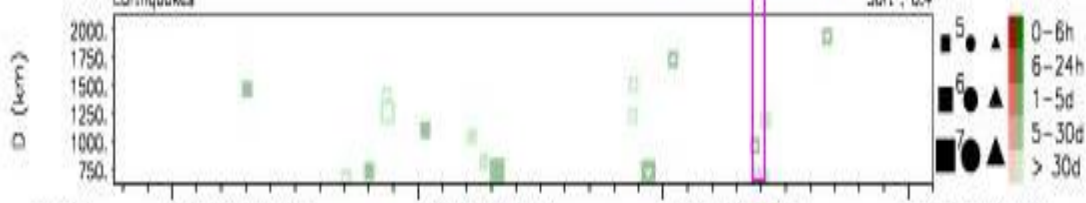
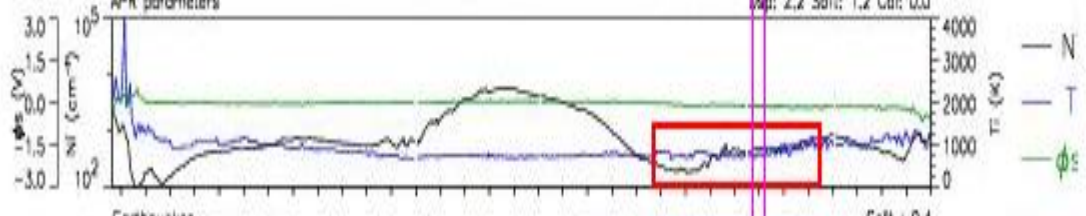
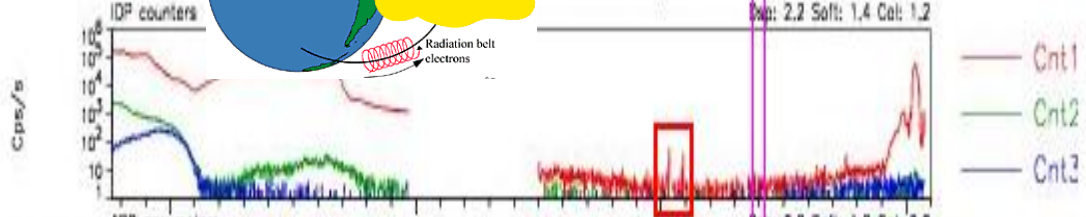
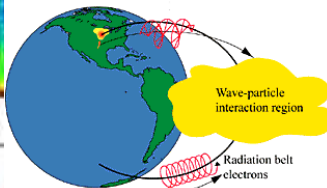
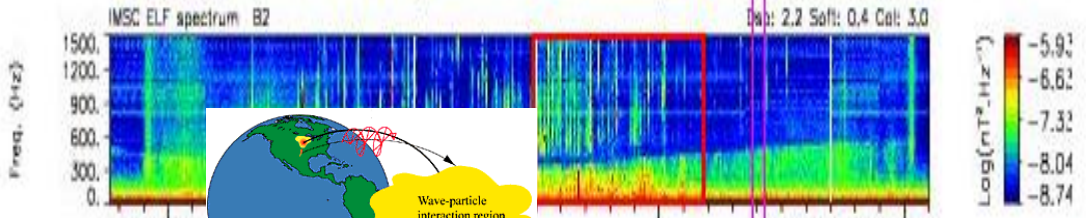
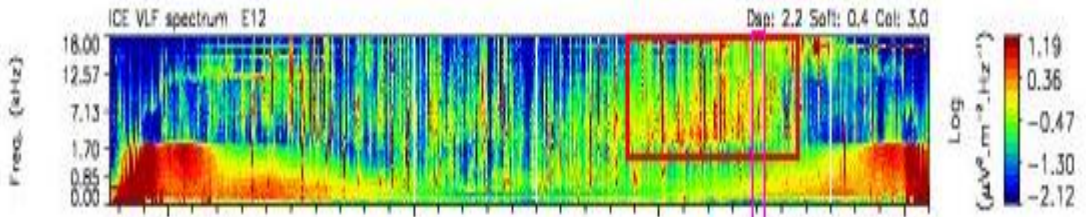


Θερμική Υπέρυθρη Ακτινοβολία (TIR)

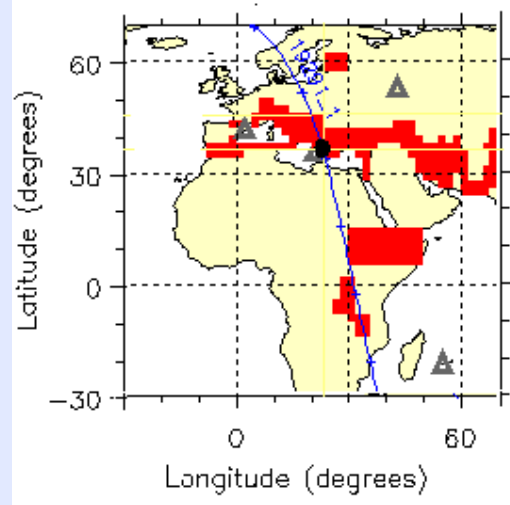
Date (ymd): 2008/02/10

Orbit: 19291_1

DEMETER



UT/LT	19:49:00/22:46	19:59:00/22:16	20:09:00/21:54	20:19:00/21:14
Lat.	-49.68	-13.54	22.82	58.89
Long.	44.25	34.17	26.35	13.79

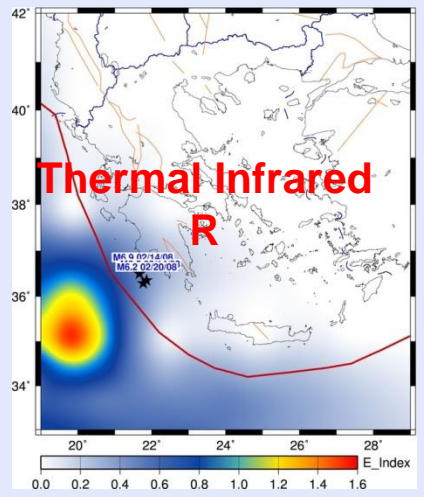


VLF

ELF

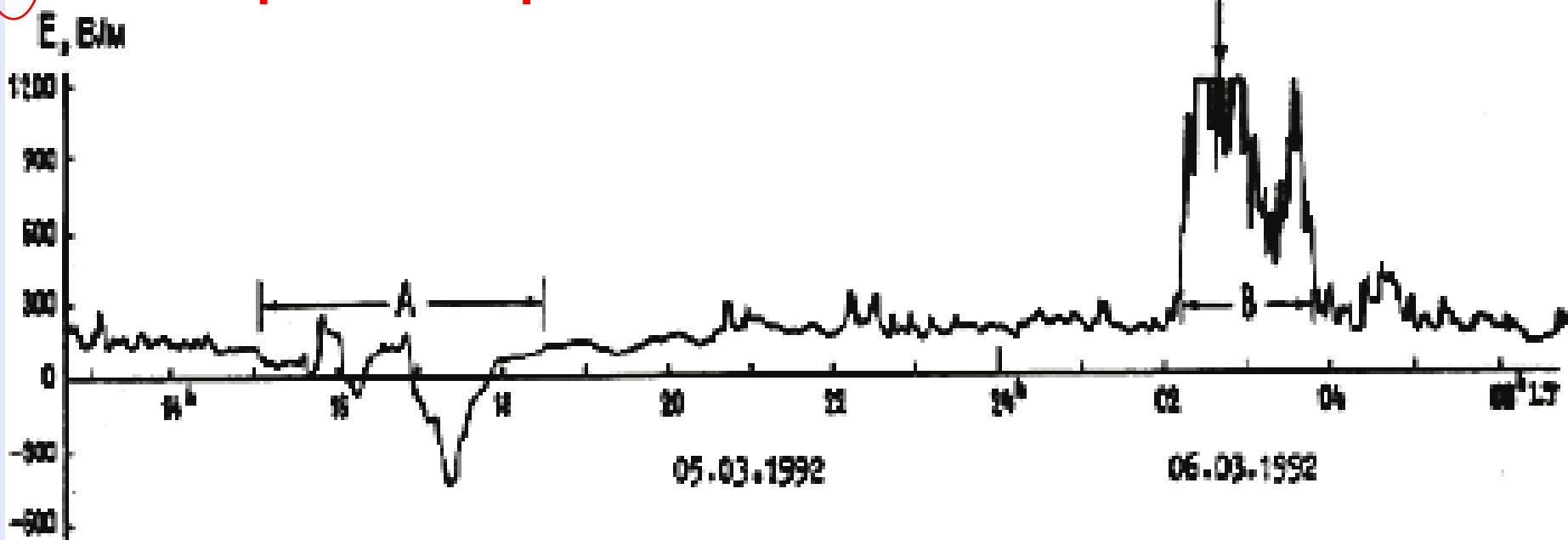
Radiation belt electron precipitation

plasma



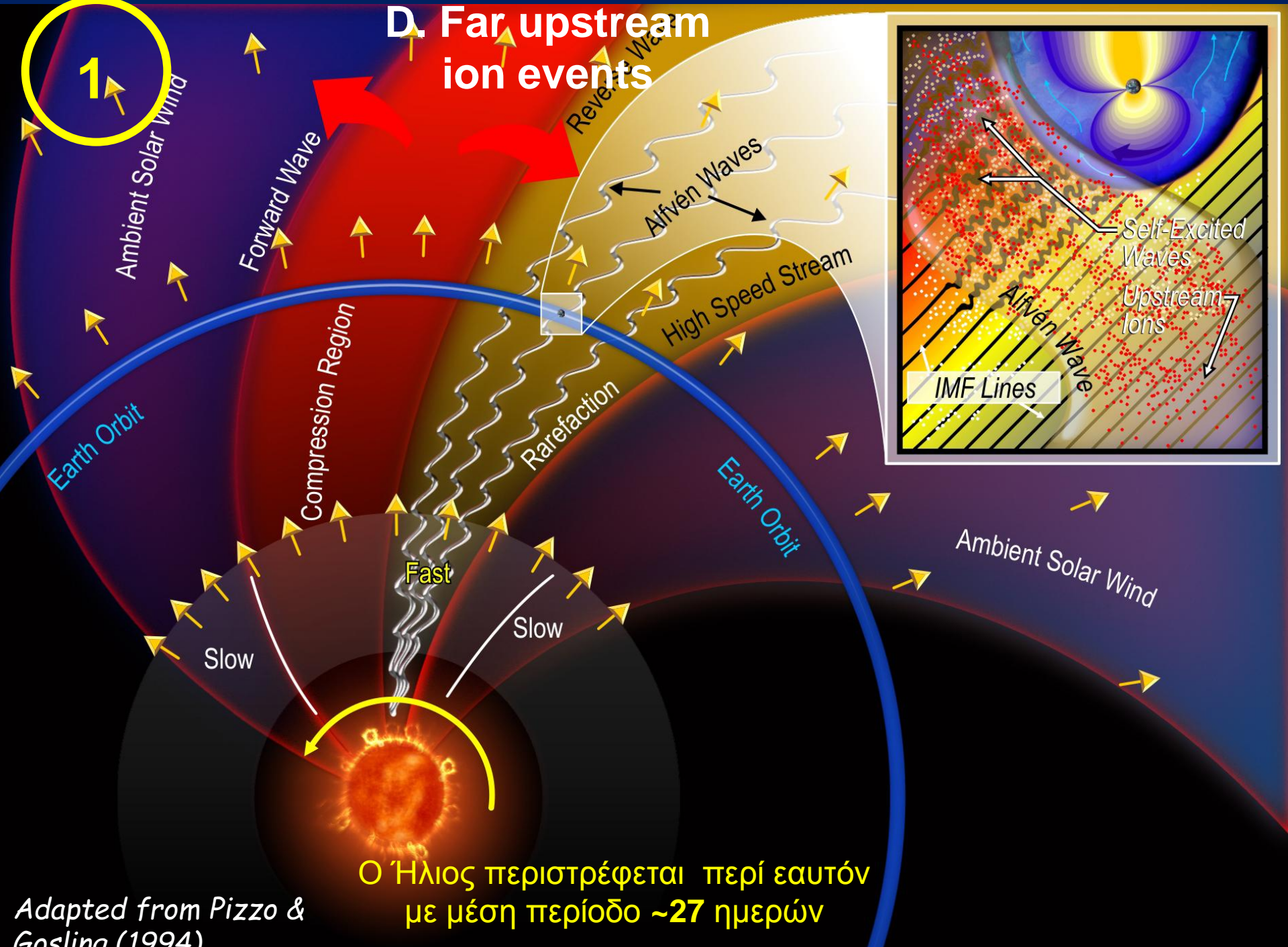
Σεισμό - Ηλεκτρικό Πεδίο

$M = 6,1; \Delta = 130 \text{ km}$



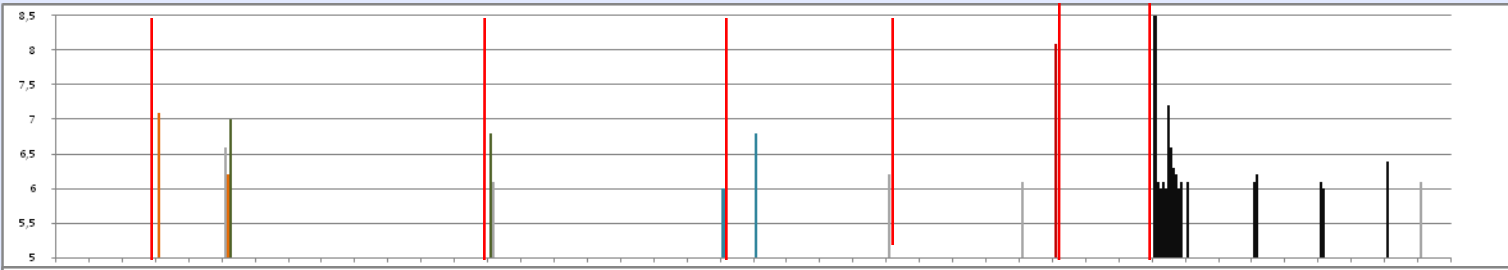
Vershinin et al. 1999

D. Far upstream ion events

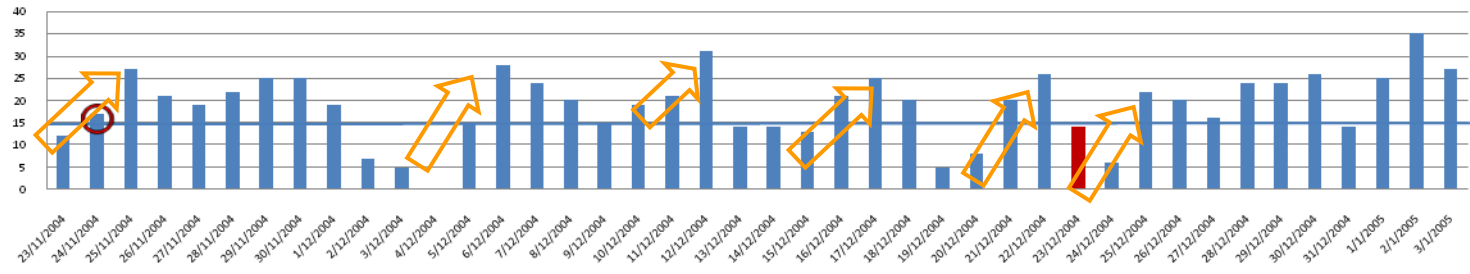


Ο Ήλιος περιστρέφεται περί εαυτόν
με μέση περίοδο ~27 ημερών

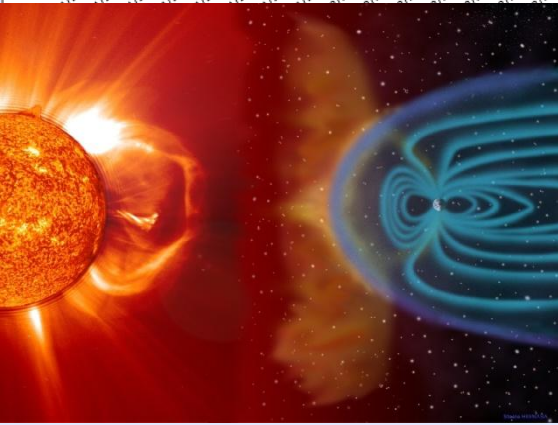
Adapted from Pizzo & Gosling (1994)



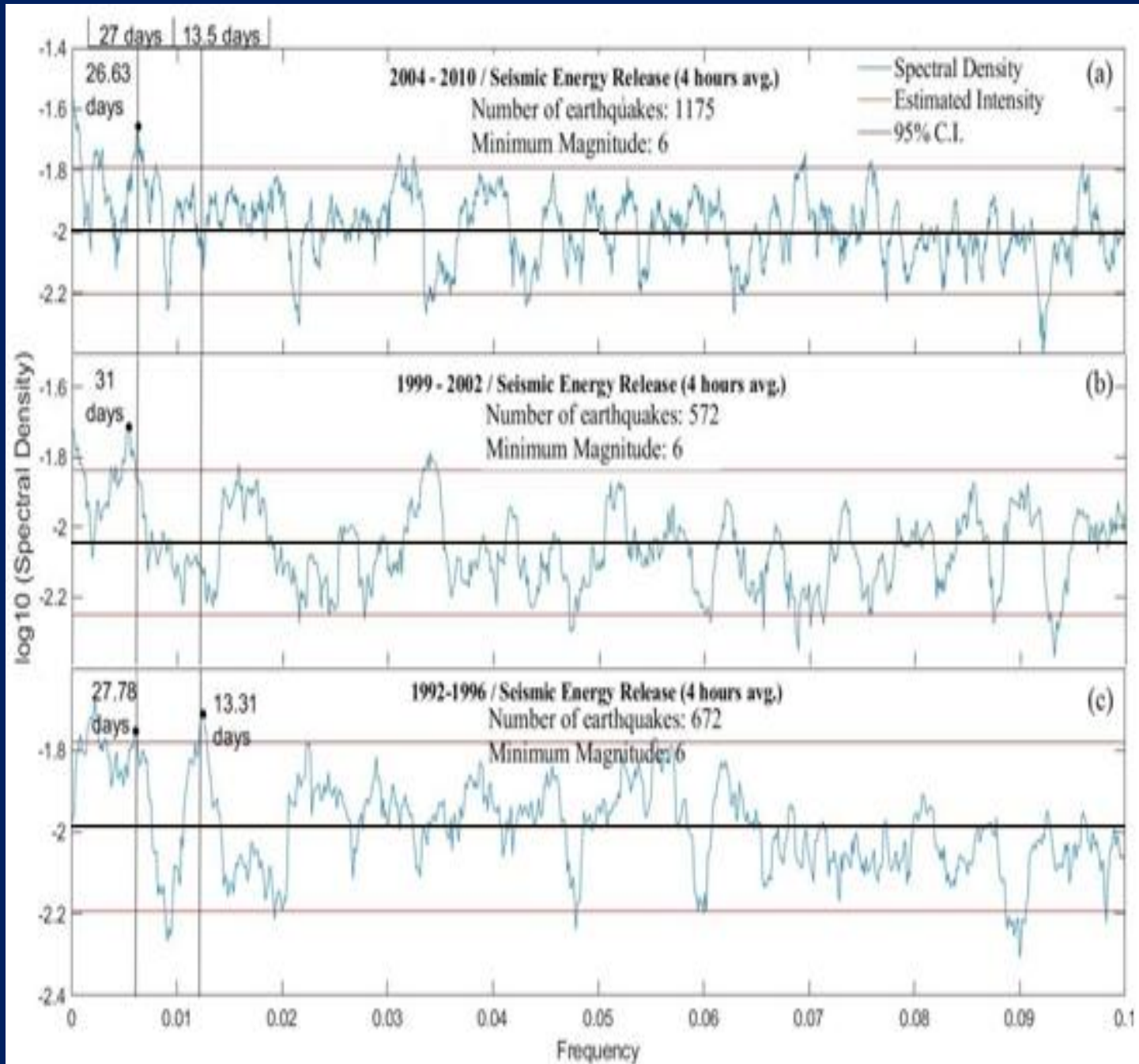
Kp



swV



Περιοδόγραμμα σε χρονοσειρές παγκόσμιας σεισμικής δραστηριότητας



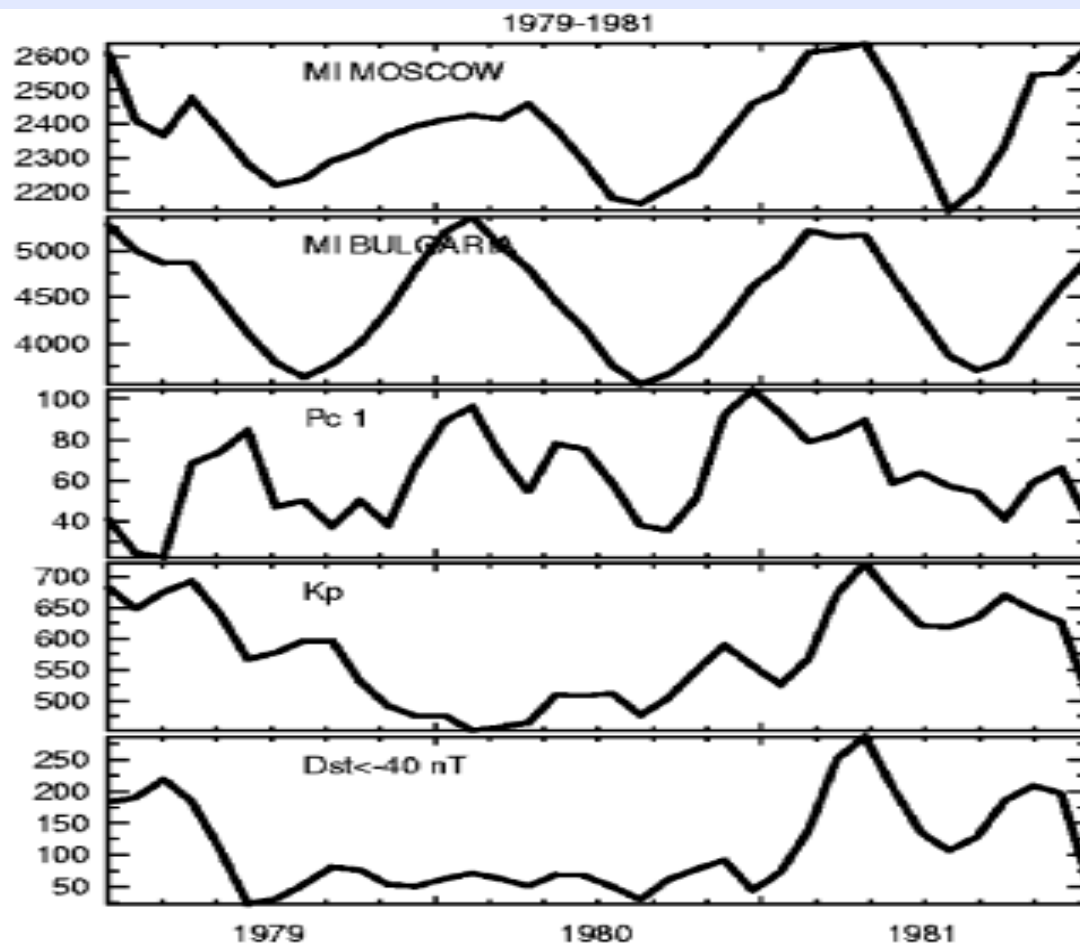


Fig. 1. The monthly myocardial infarctions (MI) ambulance data for Moscow over 3 years (1979–1981) and the MI death in Bulgaria in comparison with the monthly Pc1 activity (monthly numbers of 15-min intervals with Pc1 as it was suggested by Matveyeva et al., 2001), the monthly sum of Kp-index and hours with Dst < -40 nT. All curves have been smoothed off.

N.G. Kleimenova et al. /

Journal of Atmospheric and Solar-Terrestrial Physics 69 (2007) 1759–1764



Electromagnetic effects – From cell biology to medicine

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*Technische Universität Dresden, Medizinische Fakultät Carl Gustav Carus,
Institut für Anatomie, Fetscherstraße 74, 01307 Dresden, Germany*

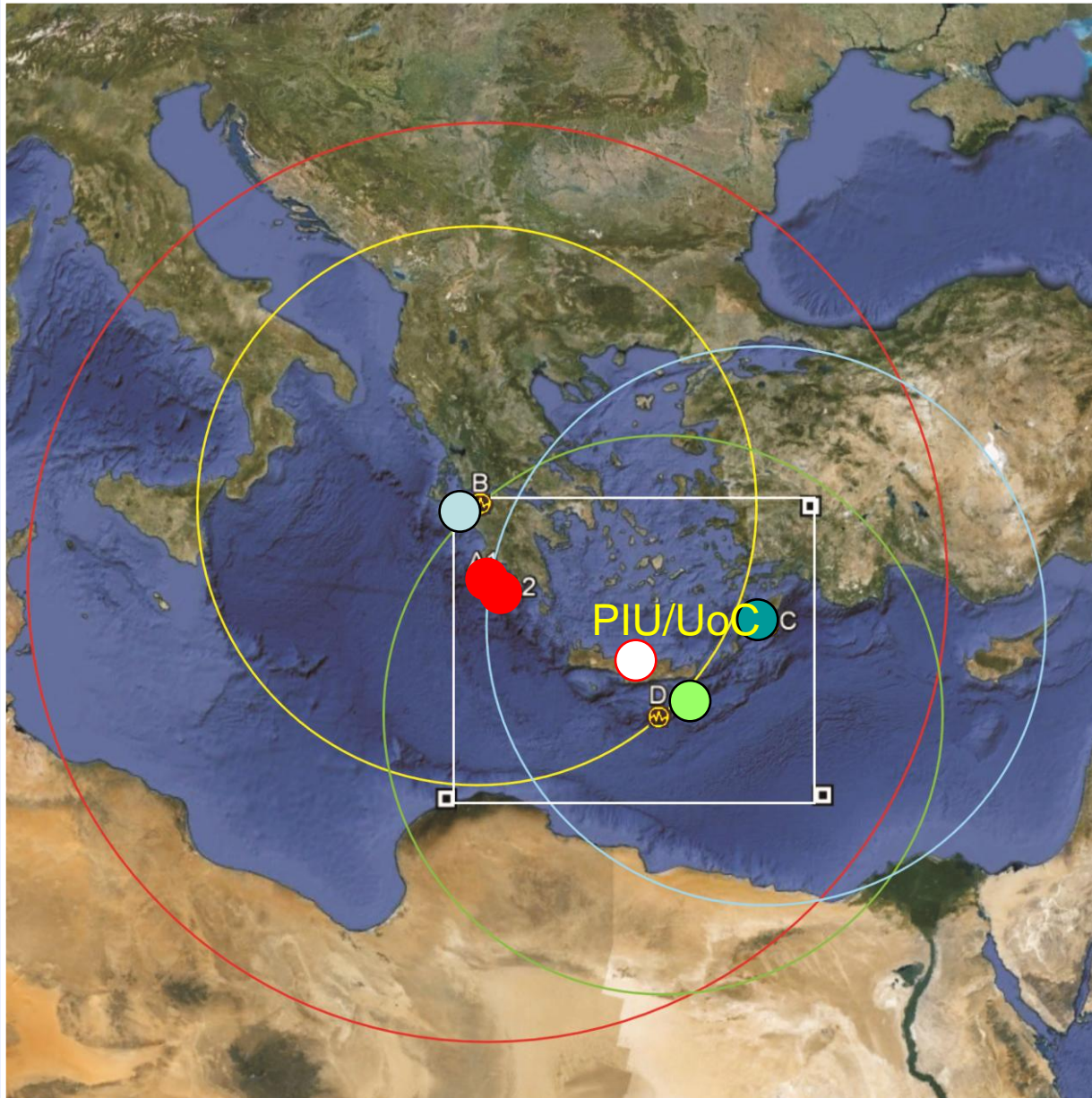
Received 23 June 2008; accepted 25 July 2008

Abstract

In this review we compile and discuss the published plethora of cell biological effects which are ascribed to electric fields (EF), magnetic fields (MF) and electromagnetic fields (EMF). In recent years, a change in paradigm took place concerning the endogenously produced static EF of cells and tissues. Here, modern molecular biology could link the action of ion transporters and ion channels to the “electric” action of cells and tissues. Also, sensing of these

All systems in an organism from the molecular to the organ level are more or less in motion. Thus, in living tissue we mostly find alternating fields as well as combination of EF and MF normally in the range of extremely low-frequency EMF. Because a bewildering array of model systems and clinical devices exists in the EMF field we concentrate on cell biological findings and look for basic principles in the EF, MF and EMF action.

Statistical Comparison of seismic activity in a geographical area window including the island of Crete to the admissions to the Psychiatric Inpatient Unit of the University of Crete (IPU/UoC)



Time interval
2008-2010 (2012)

EQ		Date	M
A1	●	2008/02/14	6.9
A2	●	2008/02/14	6.5
B	○	2008/06/08	6.4
C	●	2008/07/15	6.4
D	●	2009/07/01	6.4

EOS

EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION

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VOLUME 90 NUMBER 46 17 NOVEMBER 2009

A Storm of Strong Earthquakes in Greece During 2008

An unusual cluster of four $M_w > 6.2$ earthquakes ruptured the Hellenic Arc and Trench (HA-T) from 6 January to 15 July 2008 with a variety of focal depths and mechanisms (Figure 1 and Table 1). Common earthquake clusters incorporate a sequence of dependent events: a main shock, numerous aftershocks, and sometimes foreshocks preceding the main shock. Cluster members occur on the same fault or on a set of nearby faults. The four HA-T earthquakes, however, do not conform with this pattern because the faults are spatially isolated.

HA-T is a highly active seismotectonic system within the entire western Eurasia, but the occurrence of the 2008 cluster was still far beyond chance. Clusters of isolated earthquakes have been described in Greece since the 1950s, and more recently they were attributed to remote earthquake triggering [Papadopoulos, 1998, 2002]. Such triggering has traditionally been described through the popular Coulomb Failure Stress model, which explains aftershock occurrence or interaction between nearby strong earthquakes. This model predicts static stress

over a short time. The 2008 cluster seems to belong to that type of earthquake activity. It was initiated with a 6 January 2008 strike-slip earthquake of intermediate focal depth occurring at the descending slab in western HA-T. The largest earthquake in the cluster followed on 14 February and was an interplate low-angle thrust event, which, along with the two strong aftershocks (one on the same day and one 6 days later), again ruptured the western HA-T. The sequence continued on 8 June with a shallow, strike-slip event in the northwestern Peloponnese region. The time cluster concluded in eastern HA-T on 15 July with an interplate, oblique-slip earthquake.

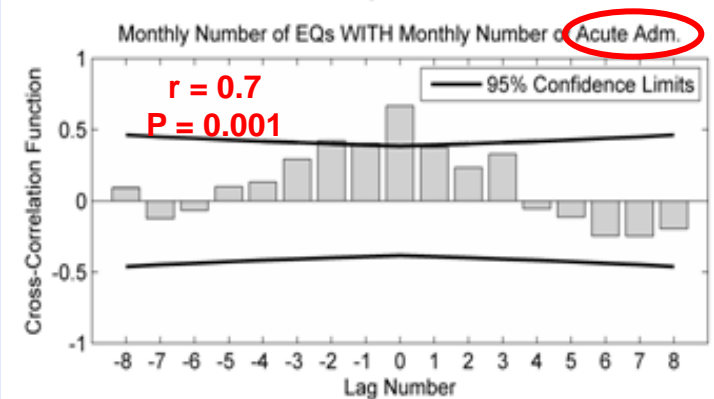
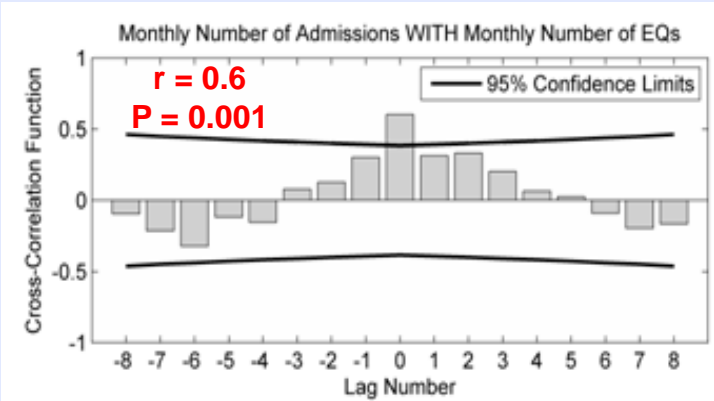
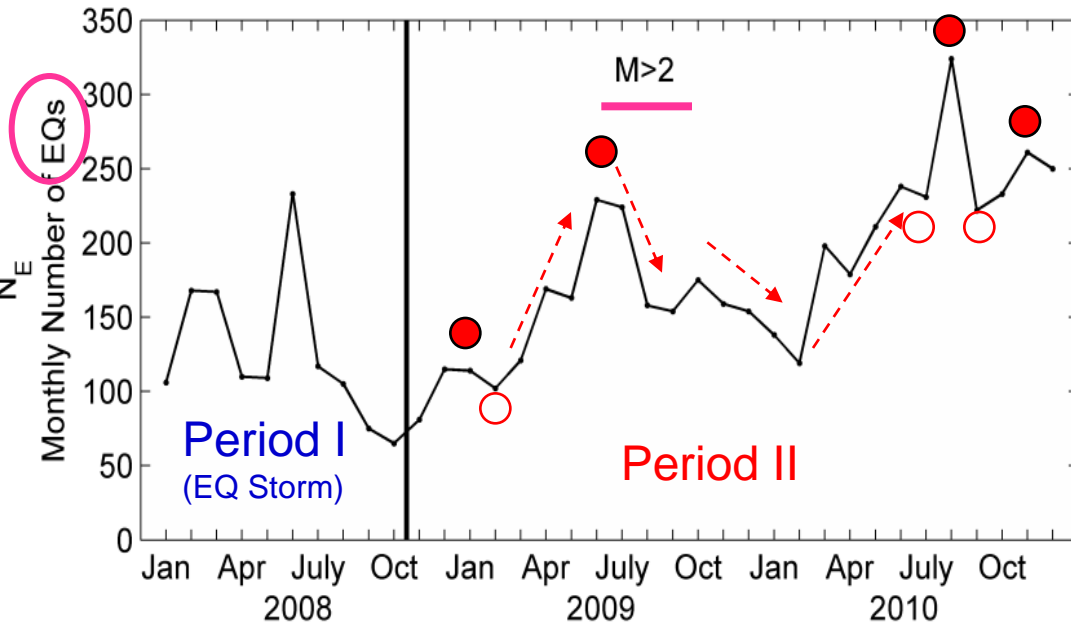
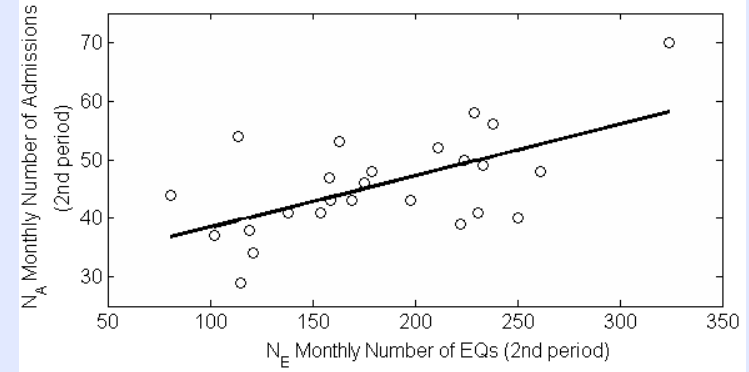
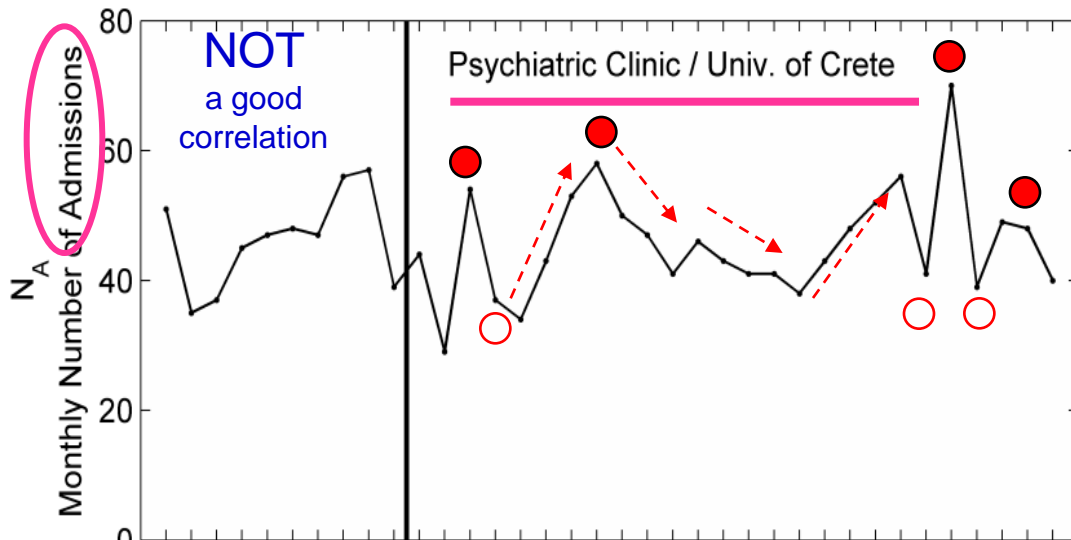
Instrumental seismicity indicates that the rate of strong ($M_w \geq 6.2$) HA-T earthquakes is about 1 event every 2.5 years. However, the occurrence of four main shocks in 6.5 months implies this frequency has now increased by a factor of 18. The rate increases by a factor of 27 if the two strong aftershocks following the largest main shock are also considered. The probability to observe by chance four main shocks in such



Fig. 1. Seismotectonic elements of the Hellenic Arc and Trench (HA-T) system. Dates, magnitudes, and focal mechanisms (beachball diagrams) of the earthquakes listed in Table 1 are shown (taken from the Harvard earthquake list, <http://www.globalcmt.org/CMTsearch.html>). Arrows represent the direction of plate motion, and triangles indicate volcanoes. The dashed line in the volcanic arc indicates the position of the earthquake epicenters at depth of 150 kilometers where magma is generated along the descending Mediterranean lithospheric plate. The box in the inset shows the location of the study area.

$P - I \neq P - II$

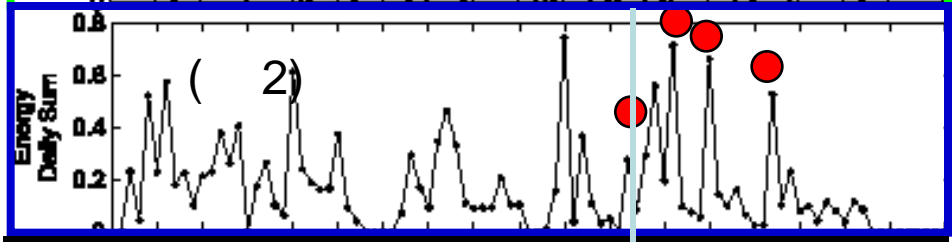
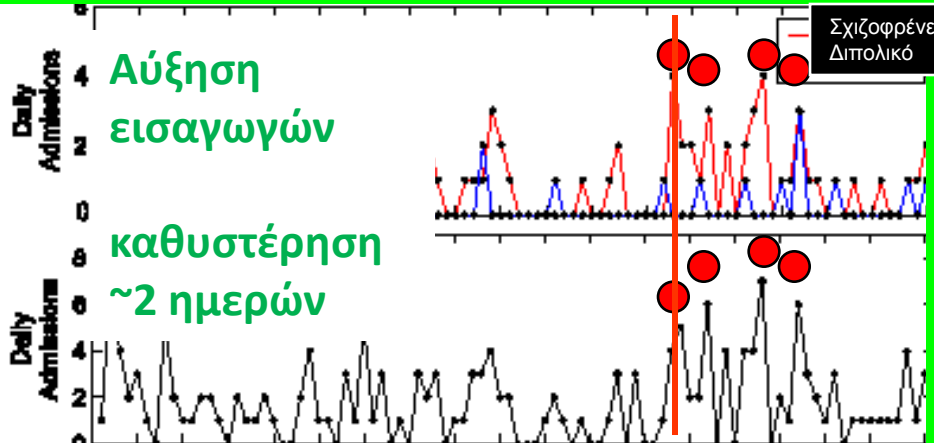
Strong correlation between the number of admissions N_A and the number of EQs N_E



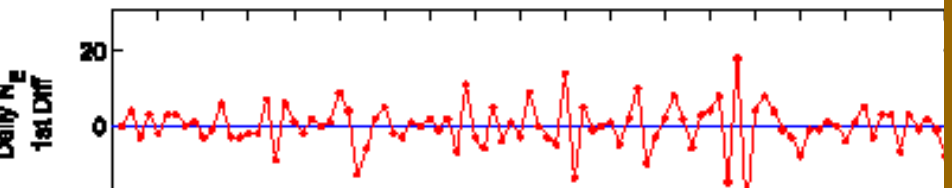
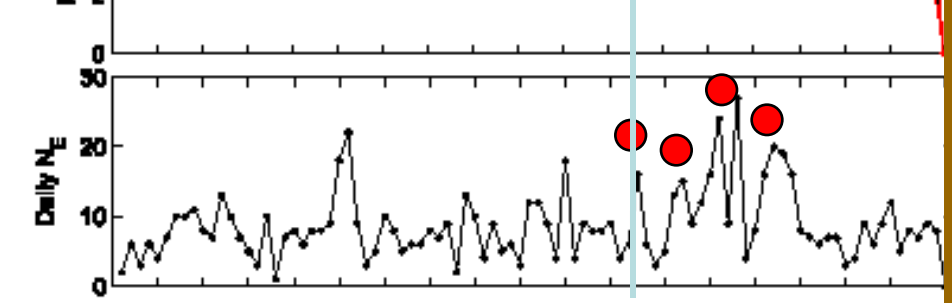
Δορυφόρος DEMETER



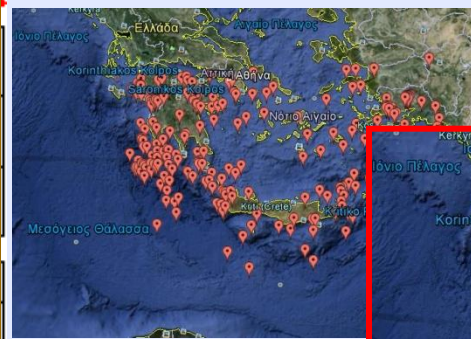
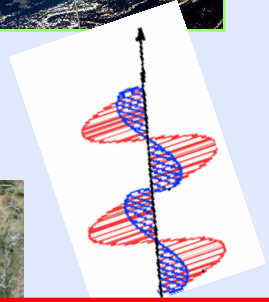
**Detection of Electro-Magnetic Emissions
Transmitted from Earthquake Regions**



Ταυτόχρονη αύξηση ULF ακτινοβολίας



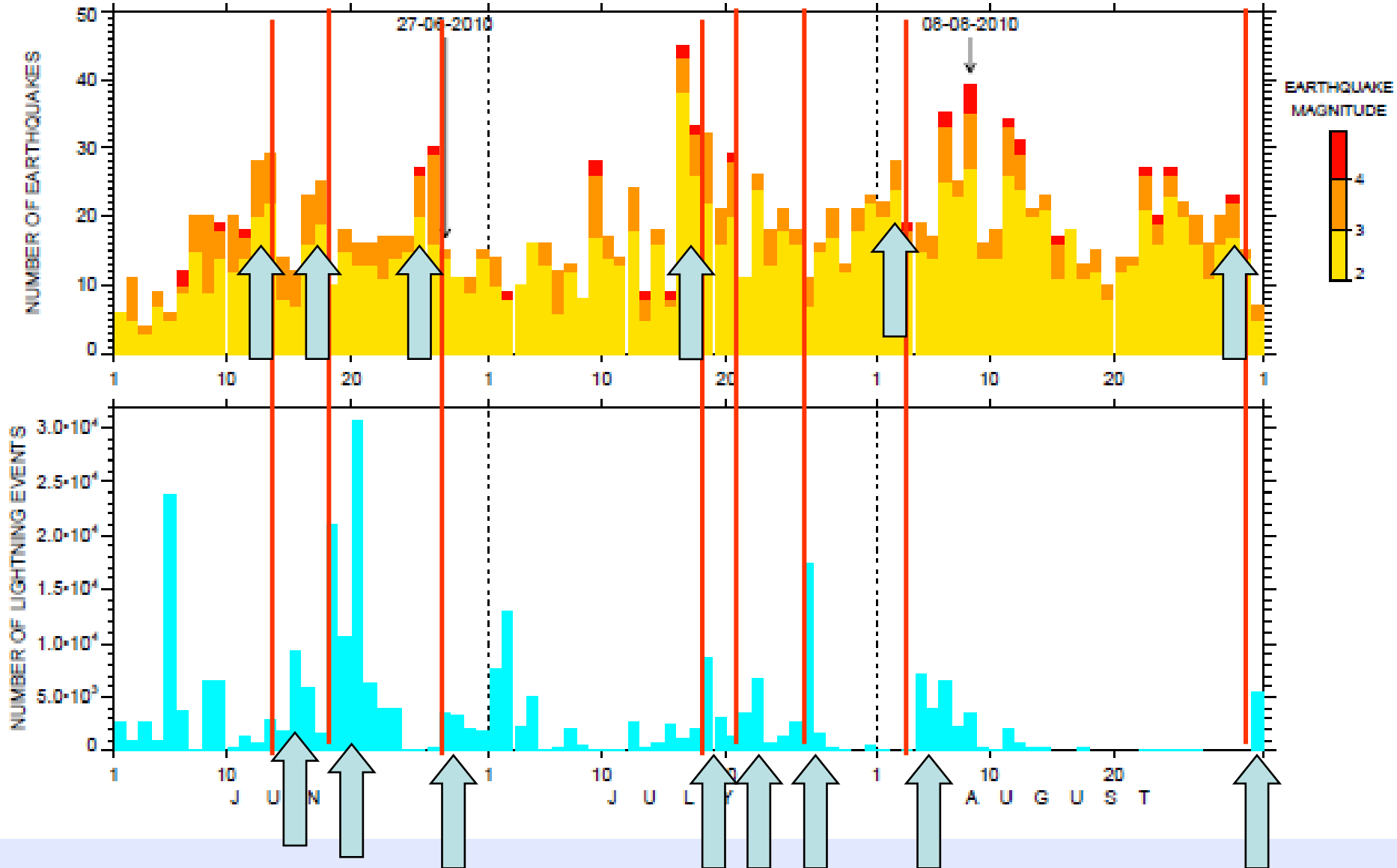
Αύξηση σεισμών



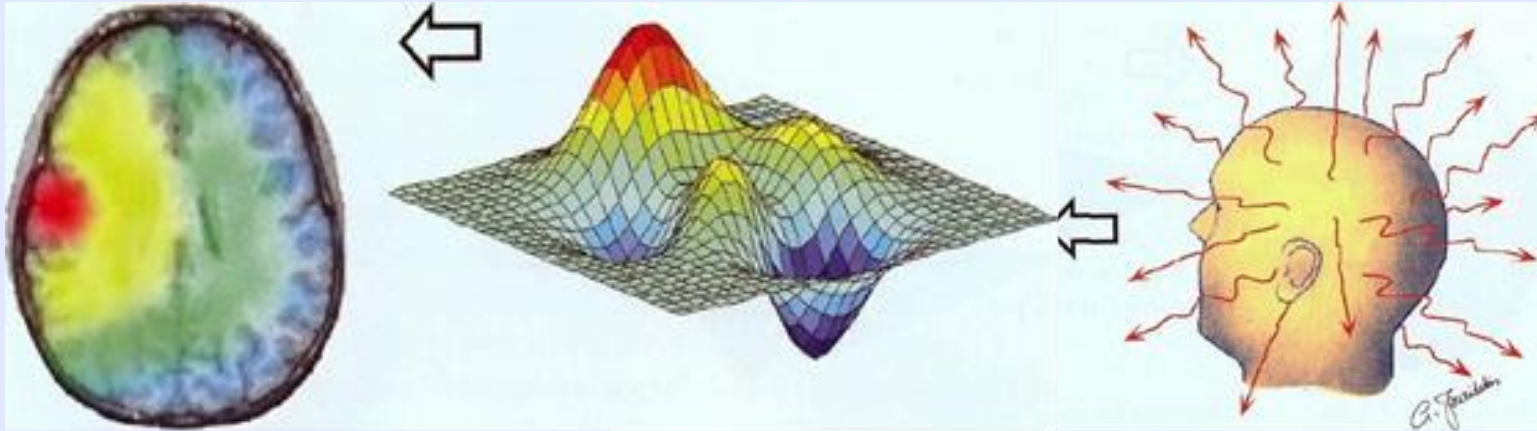
Lightning activity follows enhanced number or great EQs in most cases

SEISMICITY AND LIGHTNING IN THE GREATER AEGEAN REGION

SUMMER 2010



The neural network radiates and receives signals in the ELF / ULF (<100 Hz)



0.1-5 Hz / affect the sympathetic nerves

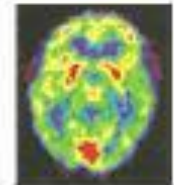
- **0.1-10 Hz / muscle**
- **10-150 Hz / parasympathetic nerves**
- **10-15 Hz / motor nerves**
- **90-110 Hz / sensory nerves,**



PET Scan
Red - active
Blue - inactive



BETA: 15 - 50 Hz
Alert / Working



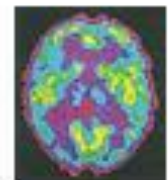
ALPHA: 9 - 14 Hz
Relaxed / Reflecting



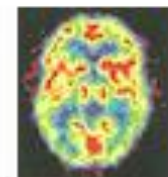
THETA: 5 - 8 Hz
Drowsy / Idealing



DELTA: 2 - 3 Hz
Dreamless
Deep Sleep



BETA: 15 - 30 Hz
REM Sleep /
Dreaming





Electromagnetic effects – From cell biology to medicine

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Abstract

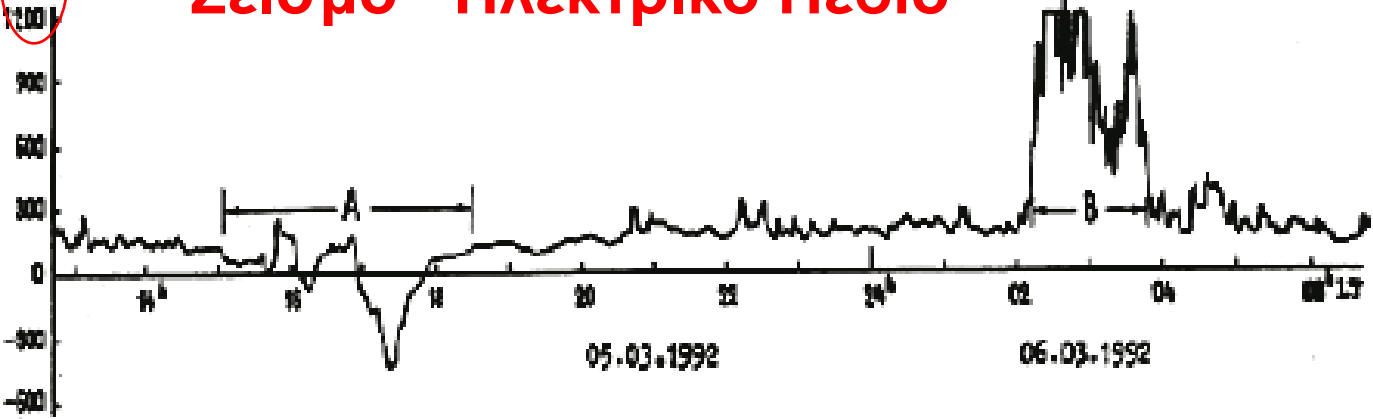
In this review we compile and discuss the published plethora of cell biological effects which are ascribed to electric fields (EF), magnetic fields (MF) and electromagnetic fields (EMF). In recent years, a change in paradigm took place concerning the endogenously produced static EF of cells and tissues. Here, modern molecular biology could link the action of ion transporters and ion channels to the “electric” action of cells and tissues. Also, sensing of these

All systems in an organism from the molecular to the organ level are more or less in motion. Thus, in living tissue we mostly find alternating fields as well as combination of EF and MF normally in the range of extremely low-frequency EMF. Because a bewildering array of model systems and clinical devices exists in the EMF field we concentrate on cell biological findings and look for basic principles in the EF, MF and EMF action.

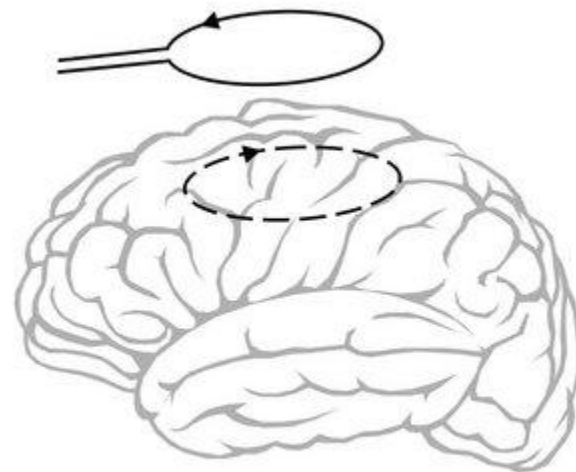
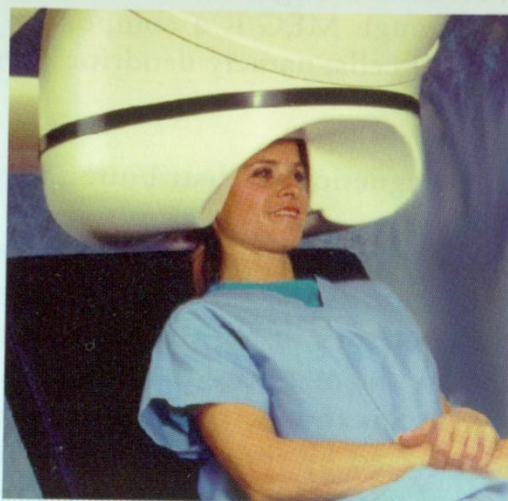
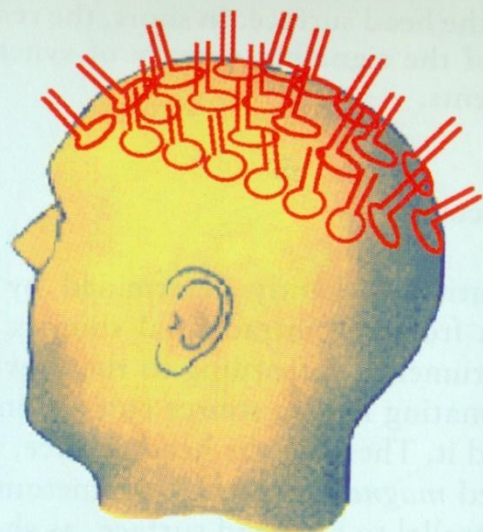
$E, \text{V/m}$

Σεισμό - Ηλεκτρικό Πεδίο

$M = 6,1; \delta = 130 \text{ km}$



Vershinin et al. 1999



A. Javidanis

Παρασκευάζονται οι σχέσεις της ΝΔ για να Βουραλάει - 212 «όχι» για Κίλιτς

ΜΑΘΟΥΜ ΠΕΣ ΤΥΤΕ ΜΕΙΩΝΤΕ
Περνούν με νόμο για τρία χρόνια τις κατώτατες αποδοχές

ΤΟ ΒΗΜΑ

ΕΙΔΙΚΟ ΕΝΘΕΤΟ 25 ερωτήσεις για τις νέες ρυθμίσεις από τον Ανδρέα

Παράθυρο 35ετίας για τους προ του 1983

■ Νέα απεργιακά κατά για την κυβέρνηση ■ Σκηνικό έντασης στο Άρσεντ του Περού ■ Έξοικιστική σκέψη με Χρυσόπαιδη

Η μεγάλη νίκη των Κεραυνών

Είναι τα κεραυνάκια για το Αιγαίο και τον Εγναίο

Επίσης: ■ Σχίσμα στο κόμμα των Βλάχων ■ Σχίσμα στο κόμμα των Βλάχων ■ Σχίσμα στο κόμμα των Βλάχων

Σύμφωνο με κεραυνό και κεραυνό

Τρεις Έλληνες πήρα από τα άρσα

Το πιο ακριβό γάλα στην Ευρώπη

ΤΙΜΕΡΙΚΕ

25 εκατομμύρια κεραυνοί σημειώνονται κάθε χρόνο στις ΗΠΑ

20.000 - 30.000 κεραυνοί καταγράφονται πανελλαδικά στη διάρκεια μιας καταιγίδας τεσσάρων-πέντε ωρών

Το ημερήσιο ρεκόρ κεραυνών στην Ελλάδα ήταν **70.000** κεραυνοί στις 2 Ιουλίου 2006

Προχές παρατηρήθηκε μεγάλος αριθμός αστραπών, οι οποίες ξεπερνούσαν τις **20** ανά ώρα και ανά **10** χιλιόμετρα εδάφους (σε ευθεία)

Οι 4 τύποι κεραυνού

- 1 Αρνητικοί κεραυνοί που ξεκινούν από το κάτω μέρος του σύννεφου προς τη γη. Αυτοί είναι και οι συνθέστεροι.
- 2 Θετικοί κεραυνοί που ξεκινούν από τη γη προς το κάτω μέρος του σύννεφου. Και αυτοί είναι συνθησιμένοι αλλά λιγότερο από τους προηγούμενους.
- 3 Θετικοί κεραυνοί που ξεκινούν από το πάνω μέρος του σύννεφου προς τη γη. Αυτοί οι κεραυνοί είναι σπάνιοι και παρατηρούνται σε ψυχρά κλίματα.
- 4 Αρνητικοί κεραυνοί που ξεκινούν από τη γη προς το πάνω μέρος του σύννεφου. Οι κεραυνοί αυτοί είναι σπάνιοι.

⊕ Θετικά ηλεκτρικά φορτία ⊖ Αρνητικά ηλεκτρικά φορτία

Τι να κάνουμε όταν βρεθούμε στη μέση μιας καταιγίδας με κεραυνούς

Σε εξωτερικό χώρο

- Βγαίνουμε από τη θάλασσα και απομακρυνόμαστε από άλλες μάζες νερού (ποτάμια, λίμνες κτλ.).
- Απομακρυνόμαστε από ψηλά δέντρα, πρόχειρα στέγαστρα, μεταλλικά αντικείμενα (π.χ. κεραίες).
- Δεν ανοίγουμε ομπρέλα.
- Δεν κρατάμε μεταλλικά αντικείμενα (π.χ. καλύμψι ψαρέματος).
- Αναζητούμε καταφύγιο.
- Αν δεν υπάρχουν τα προηγούμενα, μπαίνουμε σε αυτοκίνητο, αρκεί να μην πειράζουμε τα κομπιά του ραδιοφώνου, να μη βγάζουμε τα χέρια εκτός οχήματος και να μην ακουμπάμε τις μεταλλικές επιφάνειες.
- Αν είμαστε σε ανοιχτό μέρος, όσο μικρότερη επιφάνεια του σώματος ακουμπά στο βρεγμένο έδαφος τόσο το καλύτερο.
- Δεν πρέπει να ξαπλώσουμε, γιατί υπάρχει κίνδυνος ηλεκτρικά φορτία να διαπεράσουν όλο το σώμα και να επηρεάσουν σοβαρές βλάβες σε ζωτικά όργανα.

Στο σπίτι

- Δεν κάνουμε μπάνιο.
- Αποφεύγουμε τον χώρο της τουαλέτας.
- Δεν ακουμπάμε βρύσες.
- Δεν πλησιάζουμε το σταθερό τηλέφωνο.
- Δεν ακουμπάμε ηλεκτρικές συσκευές. Κλείνουμε το ραδιόφωνο, την τηλεόραση και τα βγάζουμε από τις prises τους.