Original Research Article

The Faroe, Oerkney and Sardinia islands are pointing the dielectrophoretic force in the etiology of multiple sclerosis

Abstract

This study aims to explain the cause of prevalence of multiple sclerosis (MS) disease in the Faroe, Oerkney and Sardinia Islands, by pointing the dielectrophoretic force in the etiology of MS. Initially, the geographical and geophysical specifications of these places have been investigated and then, the results were interpreted by considering the effects of the dielectrophoretic force, which is the essential cause of MS disease in the human body. These islands have very suitable conditions in terms of the geographic environment and the constitutive relations to transmit the electromagnetic field lines, compared to the other places. As a result of this study, it has been found out that direct correlation between the electromagnetic fields on the islands and the prevalence of MS disease. In order to support these claims, It has been made use of several geographical and the geophysical data and the results that have been achieved before by the author.

Keywords: Causal factor, dielectrophoretic force, Faroe islands, multiple sclerosis, Oerkney islands, Sardinia island.

1. INTRODUCTION

The dielectrophoretic force has been found as the essential cause of MS disease, which is one of the most common neurological disorders (Canbay, 2010). In the study, the correlation between MS and the electromagnetic fields has been shown with the seven different ways and arguments (Canbay, 2013). In a recent study, it was explained that both the radiologically isolated syndrome (RIS) which occurs following the magnetic resonance imaging (MRI) examinations and highly suggestive Multiple Sclerosis disease occurs as a result of the dielectrophoretic force (Canbay, 2014). In fact, the study (Canbay, 2014) about RIS was evidence that the RIS can not be a correct concept. Frequent MRI applications, improper selection of the operating frequency of MRI scanners could lead to occur of MS-like syndromes in brain. In a study in 1999 (Westland K W, Pollard J D, Sander S, Bonner J G, Linington C and McLeod JG, 1999) has very interesting results about the demyelination. In that study, the researchers, systemically, injected reactive T cells to a non-neurol antigen (ovalbumin) of Lewis rats and caused them to accumulate in thoraic dorsal column by a prior injection of ovalbumin. According to their findings and interpretations, a more profound conduction block and more plaque-like region of demyelination were observed in the animals. However, they were not able to explain completely of the main cause of their findings(Canbay, 2015). If the researchers had taken the dielectrophoretic effect on the myelin into account, they would be able to explain both the main cause of occurred demyelination, plaque-like structure, and the motion of T cells in a dielectrophoretic force field, like in the studies [Canbay, 2014; Heida, 2001]. Moreover, when the stimulator had not been applied on the mouse, the plaque-like formations would not be observed.

In order to understand in detail of the contents of this work may be more appropriate to examine these four studies including the author's hypotheses are supported by scientific

evidences. Impartial any scientist can easily understand the correctness of the author's hypotheses on the etiology of MS.

This study proves the correctness of the author's hypotheses, showing the relationship between MS and the electromagnetic environment issues in the world. Especially, the Faroe, Orkney and Sardinia Islands, widely known as the places with higher prevalence probable of MS disease in the world, has been focused in terms of the relationship between the electromagnetic environment and MS disease (Canbay, 2010) (Canbay, 2013) (Canbay, 2014), (Canbay, 2015). The various causal factors, which possible to be related to the distinct increase in multiple sclerosis in the Faroe, Orkney, and Sardinia islands, have been studied on by the researchers. Some researchers underline of the effect of industrial changes and occupation on the islands. For some researchers, birthplace is considered as an indicator of MS disease (Lauer, 1986). The Sardinian cohort has been observed for a long time to find out the relation between the early multiple sclerosis and retrovirus (Sotgiu, et al., 2006). In the recent years, researchers and the national and international organizations have focused on the effect of the genetics (Ramagopalan, McMahon, Dyment, Sadovnick, Ebers, & Wittkowski, 2009) (Wang, et al., 2011), the immune system (Bates, Feix, Boggs, & Harauz, 2004), the environmental factors (Canbay, 2010) on MS disease. Some researchers have put forward that the high intake of vitamin D, which is proportional to the solar radiation, is associated with lower prevalence rates of the multiple sclerosis (Schwarz & Leweling, 2005). Some have the against view (Beebe, Kurtzke, Kurland, Auth, & Nagler, 1967). In a study, it is proposed that multiple sclerosis may be transmitted chiefly by sexual contact. Higher prevalence rate of multiple sclerosis on the Oerkney islands has been described by the increase in the number of troops on the island during the Second World War (Hawkes, 2002). Despite the fact that these results achieved by various studies by other researchers, they give the similar results with my approach and findings'. Yet, their studies should have been supported with more powerful arguments, as in my studies (Canbay, 2010) (Canbay, 2013) (Canbay, 2014).

According to the author's comparative study between the keraunic map of the world prepared by IEEE and the common reports of the WHO (World Health Organization) with MSIF (Multiple Sclerosis International Federation) dated 2008 and 2013 (Canbay, 2010) (Canbay, 2014), it has been found the some clues as to the respond the question "why some places have higher risk with respect to the other places in terms of Multiple Sclerosis disease?".

In the Zamboni's hypothesis (Zamboni, et al., 2009), the chronic cerebro-spinal venous insufficiency (CCSVI) has been accepted as a multifactorial, only one aspect of MS. But, this hypothesis doesn't show us that why the myelin basic proteins (MBPs) separate from the nerves and accumulate in the shape of plaques in certain places of the white matter of all patients with MS. However, the balloon angioplasty application at the narrowing place of the jugular veins can provide transient easiness for MS patients having an operation in terms of narrow veins. A force or an effect is required to separate the MBPs from the nerves and a certain maximum gradient of square of electric field in order to accumulate the MBPs in the brain or the spinal cord. According to the hydrodynamic principle, if the speed of a liquid containing the particles which flowing in a pipe or vein, is lower, the more particles accumulate in it. If a patient suffers from a narrowing in the veins at the brain region and this narrowing has not occurred due to structural or external factors in the brain region, the gradient of square of the electric field at this region reaches its, approximately, peak value. Therefore, CCSVI is not one of the

consequences of MS disease but one of its causes. In the present study, my aim is to explain why Sardinian, Oerkney and Forea islands are the risky places from a multiple sclerosis point of view.

2. METHOD

If there are necessary and sufficient conditions in any place regarding the occurrence of MS disease, the prevalence of probable MS will be more with respect to the other places. For the study (Canbay, 2010), the necessary and sufficient conditions for MS disease to occur is directly related to the conditions of the place inhabited at growing ages, namely until the ages of 20. The necessary and sufficient conditions for MS can be investigated by the appraisal of the etiology of MS disease in the light of the impact of the dielectrophoretic force (Canbay, 2013) (Canbay, 2014). At any place, where the frequency of occurrence of MS disease is higher, the environmental conditions are as follows:

a- The year average of the number of lightning at that residential area is too small (except of deserts).

b- The average annual number of cloudy days at that residential area is too much.

c- The residential area is on the high mountains and hills.

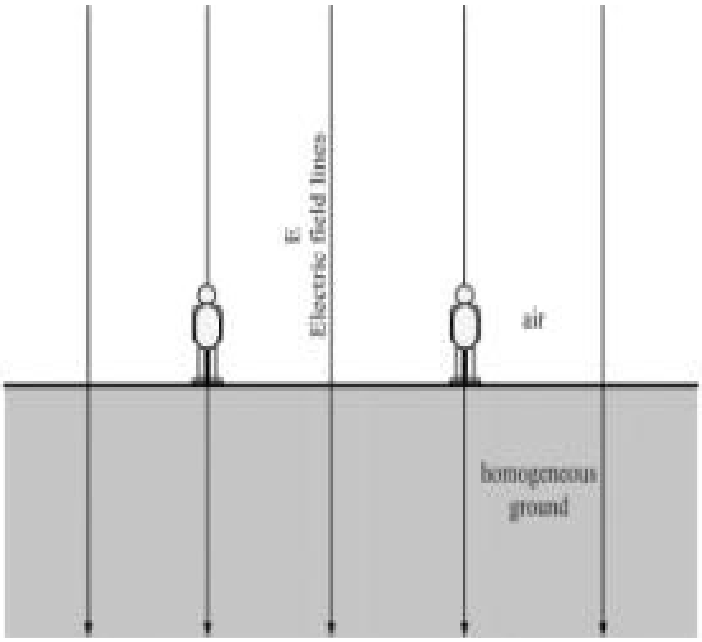
d- The residential area is located far from the large-scale conductive structures.

e- As mentioned previously, the residential area contains some kinds of natural and artificial electromagnetic field sources or very close to them.

f- Stress and contraction of the muscles, as required the principle of piezoelectric effect, generates the internal electric field intensity in the human body. (This subject is related to the person's psychology and the person's social and physical environment.)

g- The increase of the dense and frequent use of the Magnetic Resonance Imaging (MRI) device, which plays a significant role in the diagnosis of Multiple Sclerosis disease, has brought along new concerns (Canbay, 2014) (Canbay, 2015). Additionally, increasing of stress has also an affect (as a factor of inner dynamic, stress is placebo equivalent of mechanic stress) that can be assumed as the source of dielectrophoretic field in the human body on MS. Yawning-Stretching movements are a behavioral syndrome associated with trans cranial application of electromagnetic fields for MS (Sandyk, 1998) because of eliminating polarized charges by the electromagnetic fields in the human body.

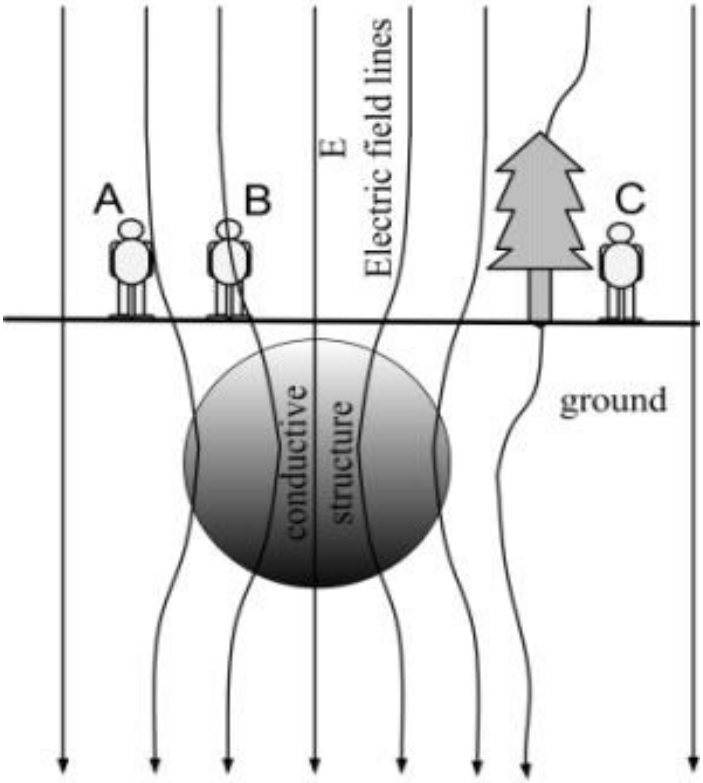
Fig. 1 denotes two persons standing on the homogeneous ground in the fair air condition. In this case, the electromagnetic field distribution in the ground and the air has the regular electrical field distribution. Therefore, two persons are under the same electromagnetic field effect. But still the induced electromagnetic fields in the bodies of the two persons may be different from each other.



131

132

133 **Fig 1.** Two persons in the regular electromagnetic field distribution.



134

135 **Fig 2.** Three persons in the irregular electromagnetic field distribution.

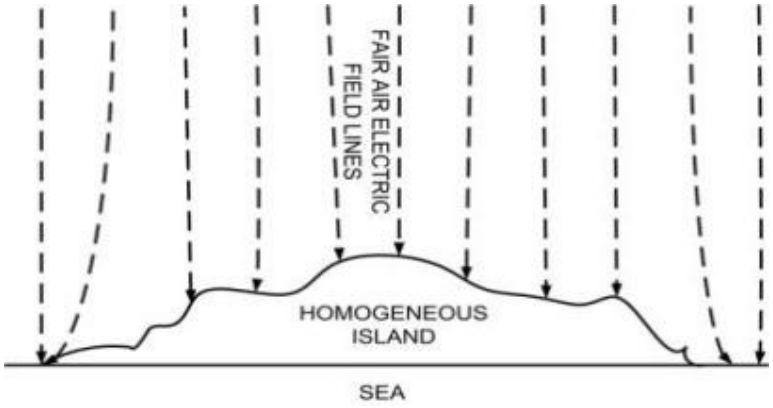
As shown in Fig. 2, if there are conductive structures, such as trees, the buried large metal materials, and the metal towers close to human body, the lines of natural and artificial electromagnetic fields flow on these conductive structures. As a result of this interpretation, the amount of electromagnetic field lines flowing on the human bodies varies spatially and so does the risk of MS for some individuals. Especially, as shown in Fig. 2, while the conductive structure provides advantageous for the persons located at point A and C, contrary disadvantageous for the person at point B. However, the tree provides an additional advantage for the person at point C in terms of the electromagnetic effect. This result shows us that everybody sharing the same environment can not be regarded as a nominate for MS. Absolutely, a person who nominate for MS disease should have stayed under the necessary and sufficient conditions from angle of MS disease for a long time in his/her growing era. In the literature, there are many studies expressing the genetic, the immunological reasons, and the correlation between the occurrence of relapses and the seasonal environmental factors, infections (Hawkes, 2002) and serum vitamin D levels, and speculated convincingly, regarding the people with MS disease living on these islands. In fact, it should have been assumed that their findings are the results of electromagnetic fields and the effect of dielectrophoretic force. The essential cause of maximum prevalence of MS disease is the existence of the suitable conditions because of the natural and the artificial electromagnetic field distribution on these islands. This study aims, both to give a new material support for the previous studies and to find the answer to the question, why these islands have risk factors from angle of multiple sclerosis disease and to prove that MS disease is not only an old disease but also a modern day disease. Moreover, MS disease has increased depending on the uncontrolled electromagnetic technologies and the sources.

3. GEOGRAPHICAL AND GEOPHYSICAL STRUCTURE OF THE ISLANDS

Faroe Islands (62º N, 7º W) have a total area of 1400 km^2, an average height of 300 m above sea level and formed a part of the North Atlantic Brito-Arctic Cenozoic Igneous Province that extends from the British Isles to Greenland. Faroe and Oerkney islands share geographic, ethnic (is not taken into account in the present study), and environmental similarities with other North Sea and Canadian countries of high MS incidence. The prevalence of MS per year in Faroe and Oerkney Islands are 66(1998) and 193 (1983), respectively (Pugliatti, Sotgiu, & Rosati, 2002). **Faroe Islands are the most sunless region in the World, having an entirely cloudless sky only, averagely, five days in a year. As a consequence of that, there is very little summer heat. At the same time, the number of days with lightning (keraunic level) on each island is lower, approximately equals 1** (Canbay, 2010)**.** Since the warm period is really short, the sprouts of the trees ripe really hard, and only a very few kinds of trees can survive the winter. The trees make little progress in their effort upwards. Faroe Islands lie on a continental fragment, which has a total thickness of about 10-15 km of igneous rock added as extrusive lavas at the top. In addition to the zeolites which have (0-2) S/m conductivity, native copper (at 20 Cº 2.4 $x10^6$ S/m) and pyrite deposits (1-10^5) S/m were found in different places on Faroe Islands (Larsen, Knudsen, Frei, Frei, Rasmussen, & Whitman, 2006) (White, 2008) (Jørgensen, 2006). Fig. 3, Fig. 4 and Fig. 5 show the representative distribution of electric fields on an island under the three different conditions. Fig. 3 denotes the distribution of electric fields on the island in the fair air condition. As shown in Fig. 3, the electric field line density over the island changes

184 depending on the topographical structure and electrical parameters of the island.
185 However, as shown in Fig. 4, the electric field line density over the mine deposits is
186 higher than the first situation. As shown in Fig. 5, the electric field intensities over some
187 places on the island are very higher compared to the situations Fig. 3 and Fig. 4.

188

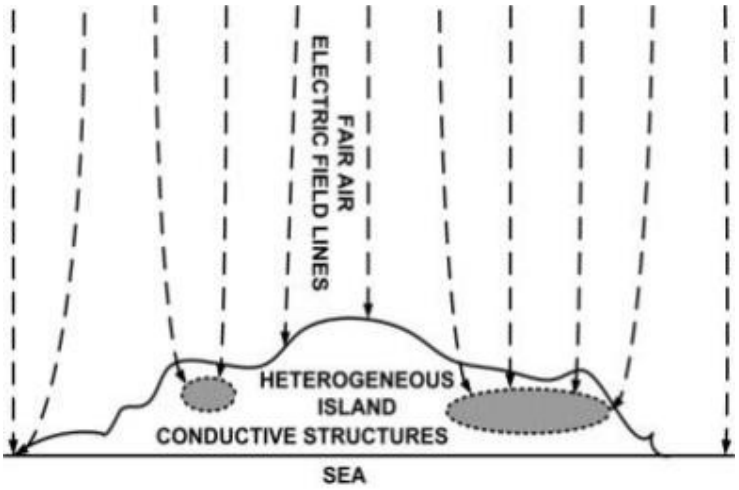


189

190

191 **Fig 3.** Schematic representation of the distribution of electromagnetic field on an island in
192 case of fair air and homogeneous island.

193



194

195

196 **Fig 4.** Schematic representation of the distribution of the electromagnetic field on an
197 island in case of the fair air and heterogene island.

198

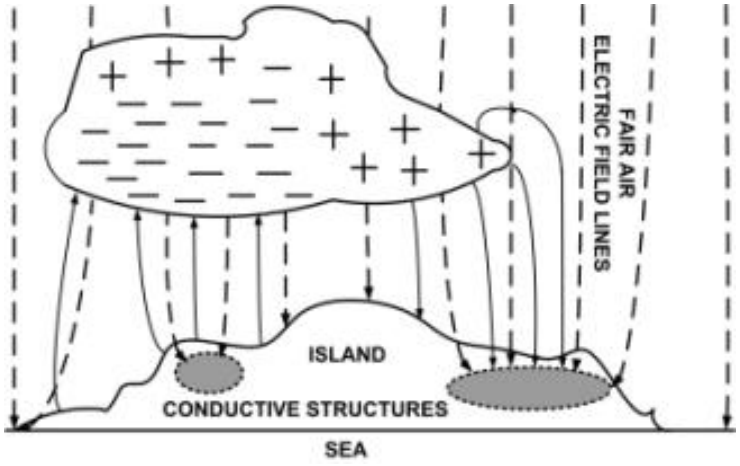


Fig 5. Schematic representation of the distribution of electromagnetic field on an island in case of the cloudy day and heterogene island.

The causes of the variations of the electric field line densities over the island are; the effect of electrically charged cloud over the island and the properties of electrical parameters of the underground of the island.

The explanation of the causes of higher prevalence of MS disease on the islands is interesting. I was thinking about the accumulation of the dielectric particles in the form of the plaques in the human brain due to the irregular electromagnetic field distribution. As known, Eyjafjallajökull volcano in Iceland erupted in March of 2010. Suddenly, I wanted to expect dual relations between the brain and our globe. As I expected, the tiny particles spread into the atmosphere due to Eyjafjallajökull volcano eruption should be collected onto Faroe Islands.

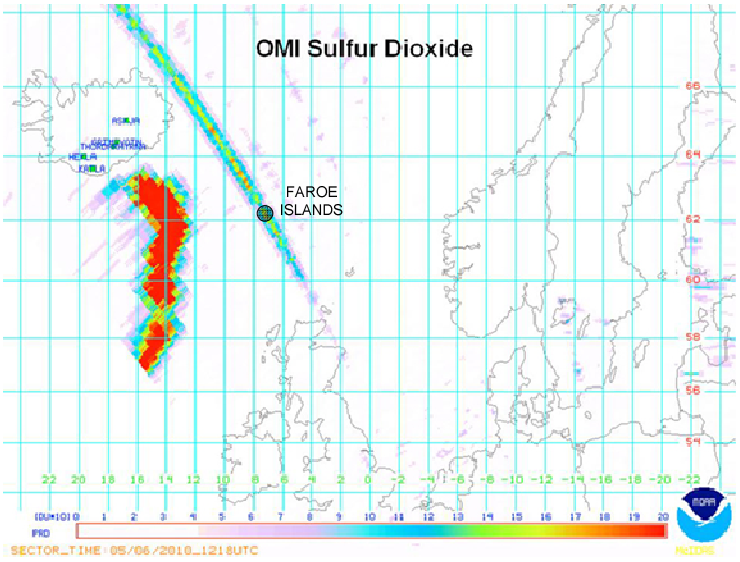


Fig 6. Distribution of the sulfur dioxide plumes in the electrosphere (NOAA Office of Satellite and Product Operations)

I have investigated the behavior of the sulfur dioxide plumes (very tiny airborne particles compare to volcanic ash) from Eyjafjallajökull volcano eruption in black southeast of Iceland. The lavas, volcanic ash plumes and the highest concentration of aerosols (tiny airborne particles, sulfur dioxide) in the ash plume spread into the atmosphere. NASA's Goddard Space Flight Centre, Greenbelt, Md. has used data from the Ozone Monitoring Instrument (OMI) to create satellite image updated on volcanic ash and sulfur dioxide plumes. The image in Fig. 6 from the Washington Volcanic Ash Advisory Center on May 6 (NOAA Office of Satellite and Product Operations), shows the highest concentration of tiny airborne particles in the ash plume from the Eyjafjallajökull volcano in black southeast of Iceland. As shown in Fig. 6**,** the sulfur dioxide plumes located at higher altitudes are less affected by winds and concentrate on a strip over the Faroe and Oerkney Islands. The cause of higher concentration of aerosols on this strip over the Faroe and Oerkney Islands is dielectrophoretic force over this region, just as in the brain, as conceptually expected to be by the author.

Sardinia is the second greatest island of the Mediterranean: it measures 24.090 km^2, it is located between 38° 51' 52 " and 41° 15' 42" of latitude North and 8° 8' and 9° 50' of East longitude. The coasts of Sardinia (1.849 km long) are generally high and rocky, rectilinear for kilometers with vast and deep bays and fjords surrounded by smaller atolls. **The number of lightning days per year (keraunic level), is relatively lower compared to other places in the same latitude, is between about 1-5. This situation is unexpected for Sardinia Island and very crucial.** The reasons for decreasing of the lightning occurrence over Sardinia island has been explained in a study (Dietrich, Casella, Paola, Formenton, Mugnai, & Sano, 2011). The main deposits among the ore deposits of the Cenozoic volcanics under the Sardinia Island are kaolinite, bentonite, and pyrite which have electrical conductivities (0.4-1) S/m, (2-5) S/m, and average conductivity (10^3) S/m, respectively (Palomba, Padalino, & Marchin, 2006) (Stewart, 1937) (Cita, Santambrogio, Melillo, & Rogate, 1990) (Carozzo, et al., 1997) (Shuey, 1976). These constitutive relations vary depending on dispersive properties from their water and NaCl content, temperature, pressure, and frequency point of view. People living on the Sardinia Island can be considered to be living very close to the conductive ground due to the sea water and also due to the existence of the ore deposits under the ground. As a result, the electric field lines over the islands are especially concentrated on mine deposits. Therefore, this concentrated electric field lines on the Sardinia Island triggers MS disease in this region.

4-RESULT

The dielectrophoretic force has been found as the essential environmental cause of the most common neurological disorder Multiple Sclerosis (MS) (Canbay, 2010). Moreover, the locations of the maximum gradient of squared electrical field in the parts of human body have been determined as possible places where the MS symptoms can be seen. Faroe, Sardinia and Oerkney islands have the special properties in terms of to provide of the background the gradient electromagnetic fields in/on/over their environmental conditions, compared to the other places. The places, such as sea, lake and river shores may be suitable locations for MS patients. In this study, it has been shown that the prevalence of MS disease on the Faroe, Oerkney and Sardinia Islands related to the

dielectrophoretic force, by taking into account all the findings and the results of author's the previous studies. The RIS-MRI-MS connections are the most important quasi experimental evidences confirming the close connection between MS and the dielectrophoretic force. The dielectrophoretic force is the crucial factor for the etiology of MS disease (Canbay, 2015). Considering the author's hypotheses, it can be understood why the prevalence of MS is higher over these islands.

CONCLUSION

In any living environment, the necessary and sufficient conditions to cause MS disease are as follows:

a- The residential area in the region has too much of number of cloudy days, too low number of lightning days, in a year.

b- The ground surface and/or underground structure are conductive compared to adjacent places.

c- To live a long time in a higher place, which has too much of number of cloudy days, too low of number of lightning days in a year.

d- To live far from the conductive structures on the ground surface, such as trees, the large metal materials etc.

e- To live close to the electromagnetic field sources, which operating at the aforementioned conditions.

a'- The Faroe Islands are the most sunless region in the world, having an entirely cloudless sky only, averagely, five days a year. The electric field intensity increases and remains approximately constant at high level during the cloudy days. The Oerkney islands have the geographical and environmental similarities with the Faroe Islands. The annual number of days with lightning (keraunic level) on each island is lower, approximately equals 1 (Canbay, 2010).

b'- As mentioned before, these islands have a quite better electrical conductive ground surface or underground structure.

c'- The islands have higher altitude with respect to the sea level.

d'- There are no large trees on Faroe and Oerkney islands.

e'- The Faroe, Oerkney and Sardinia islands are situated far away from the mainland. Therefore, all electromagnetic sources such as the base stations, the TV transmitters, the high voltage transmission lines have to be place around the residential area on the islands. In addition, the natural electromagnetic features of the islands in terms of the appropriateness of MS disease were tested. Also, the stress of a living person in a region like the Faroe, Oerkney islands which has sunshine only five days in a year, can be compared with others.

Not only for these islands, learning of the electromagnetic properties of anywhere in the world is as vital as determining the weather reports in the world we live on it. Therefore, the maps, showing the distribution of electromagnetic field, covering the entire

electromagnetic spectrum, will be important for the protection of the health of the living things and the environment. After this approach, MS disease will not remain as an unsolved mystery for the Faroe, Oerkney and Sardinia Islands anymore.

REFERENCES

(n.d.). Retrieved June 09, 2011, from NOAA Office of Satellite and Product Operations: www.ssd.noaa.gov/VAAC

Bates, I. R., Feix, J. B., Boggs, J. M., & Harauz, G. (2004). An immunodominant epitope of myelin basic protein is an amphipathic α-helix. *J Biol Chem, 279*(7), 5757-5764.

Beebe, G. W., Kurtzke, J. F., Kurland, L. T., Auth, T. L., & Nagler, B. (1967). Studies on the natural history of multiple sclerosis 3. Epidemiologic analysis of the army experience in world war II. *Neurol, 17*, 1-17.

Canbay, C. (2010). The essential environmental cause of multiple sclerosis disease. *Prog Electromagn Res, PIER, 101*, 375-391.

Canbay, C. (2013, April 11-14). The appraisal of the etiology of the multiple sclerosis disease in the light of the impact of the dielectrophoretic force. *7th World Congress on Controversies in Neurology (CONy)*.

Canbay, C. (2014, July). The radiologically isolated syndrome is the last link of the chain for understanding the etiology of Multiple Sclerosis disease. *Eur Sci J, 10*(21), 20-35 (ISSN: 1857-7881(print) e-1857-7431).

Canbay, C. (2015). Multiple Sclerosis is not a disease of the genetic and immune system origin. *SYLWAN, 159*(3), 1-8.

Carozzo, M. T., Balia, R., Loddo, M., Luzio, D., Marqiotto, C., Quarta, T., et al. (1997). Gravity modelling of the lower crust in Sardinia(Italy). *Ann Geofis, 40*(5), 1083-1094.

Cita, M. B., Santambrogio, S., Melillo, B., & Rogate, F. (1990). 14. Messinian paleoenvironments: New evidence from the Tyrrhenian sea (ODP LEG 107). *Proc Ocean Drill Program, Sci Results, 107*, 211-227.

Dietrich, S., Casella, D., Paola, F. D., Formenton, M., Mugnai, A., & Sano, P. (2011). Lightning-based propagation of convective rain fields. *Nat Hazards Earth Syst Sci, 11*, 1571–1581.

Hawkes, C. H. (2002). Is multiple sclerosis a sexually transmitted infection? *J Neurol, Neurosurg Psychiatry, 73*, 439–443.

Jørgensen, O. (2006). The regional distribution of zeolites in the basalts of the Faroe islands and the significance of zeolites as palaeotemperature indicators. *Geol Surv Den Greenl Bull, GEUS, 9*, 123–156.

Larsen, M., Knudsen, C., Frei, D., Frei, M., Rasmussen, T., & Whitman, A. G. (2006). East Greenland and Faroe–Shetland sediment Provenance and Palaeogenen Sand Dispersal Systems. *Geol Surv Den Greenl Bull, GEUS, 10*, 29–32.

Lauer, K. (1986). Some comments on the occurrence of multiple sclerosis in the Faroe islands. *J Neurol, 233*, 171-173.

Palomba, M., Padalino, G., & Marchin, M. (2006). Industrial mineral occurrences associated with cenozoic volcanic rocks of Sardinia (Italy): Geological, mineralogical, geochemical features and genetic implications. *Ore Geol Rev J, 29*, 118–145.

Pugliatti, M., Sotgiu, S., & Rosati, G. (2002). The worldwide prevalence of multiple sclerosis. *Clinical Neurology & Neurosurgery, 104*, 182-191.

Ramagopalan, S. V., McMahon, R., Dyment, D. A., Sadovnick, A. D., Ebers, G. C., & Wittkowski, K. M. (2009). An extension to a statistical approach for family based association studies provides insights into genetic risk factors for multiple sclerosis in the HLA-DRBI gene. *BMC Med Gen, 10*.

Sandyk, R. (1998). Yawning and stretching- A behavioural syndrome associated with transcranial application of electromagnetic fields in multiple sclerosis. *Int J Neurosci, 95*, 107-113.

Schwarz, S., & Leweling, H. (2005). Multiple sclerosis and nutrition. *Mult Scler, 11*(1), 24-32.

Shuey, R. T. (1976). The electrical resistivity of galena, pyrite, and chalcopyrite. *Am Min, 61*, 248-259.

Sotgiu, S., Arru, G., Mameli, G., Serra, C., Pugliatti, M., Rosati, G., et al. (2006). Multiple sclerosis-associated retrovirus in early multiple sclerosis: a six-year follow-up of a Sardinian cohort. *Mult Scler, 12*, 698-703.

Stewart, D. (1937). Petrography of some rocks from the south Orkney islands and the antarctic archipelago. *Am Min, 22*, 178-194.

Wang, J. H., Pappas, D., Jager, P. L., Pelletier, D., Bakker, P. I., Kappos, L., et al. (2011). Modelling the cumulative genetic risk factors for Multiple Sclerosis from Genome-Wide association data. *Gen Med, 3*(1/3), 1-11.

Westland K W, Pollard J D, Sander S, Bonner J G, Linington C and McLeod JG. (1999). Activated non-neurol specific T cells open the blood-brain barrier tocirculating antibodies. *brain, 122*, 1283-1291.

White, R. S. (2008). Lower-crustal intrusion on the north atlantic continental margin. *Nature, 452*, 460-464.

Zamboni, P., Galeotti, R., Menegatti, E., Malagoni, A. M., Tacconi, G., Dall'Ara, S., et al. (2009). Chronic cerebrospinal venous insufficiency in patients with multiple sclerosis. *J Neurol, Neurosurg Psychiatry, 80*, 392-399.