Atmospheric Electricity Group
Institute of Geophysics, Polish Academy of Sciences
Marek Kubicki, Piotr Baranski, Stanislaw Michnowski and Anna Odzimek

This document includes the initial analysis of selected atmospheric electricity parameters, measured at Polish station Swider, in connection with the radioactive incident in Fukushima, Japan, beginning 12 March 2011, following the 9.0 earthquake and tsunami.

We are looking at the variations of fair-weather electric field and (positive and negative) conductivity which are measured at the Geophysical Observatory in Swider, central Poland (52.12 N, 21.24 E). The electric field sensor is a radioactive collector and the conductivity is measured with a Gerdien aspiration condenser. In addition, concentrations of condensation nuclei (CN), are measured at Swider at 6, 12 and 18 UT using a photoelectric counter.

1. The fair-weather days in Swider in March 2011 were 1st , 2nd , 3rd , 4th, 7th , 9th , 11th , 12th, 21st, 22nd, 23rd (till 23 UT) 27th, 30th, and 31st (until 20 UT).

Diurnal variations of the fair-weather electric field and the electric positive and negative conductivity observed at Swider on selected fair-weather days: 3rd, 11th, 12th, 22nd, 23rd, 30th and 31st of March are shown in Figures 1-7. These values, recorded at 1-minute time resolution are averaged using a 15-min filter. In addition, the conductivity plots also show concentrations of condensation nuclei at 6, 12 and 18 UT. The daily averages of the field observed on the all fair-weather days in March 2011 are shown in Figure 8.

The large values of the electric field on 1-3 March seem to be related to high aerosol concentration during evening and night hours (after 18 UT and before 6 UT the next day, when the CN measurements are taken) as the electric conductivity over these periods is very low (see Fig. 1). This effect seems to be also present on 4,7 and 9 March but to the E field values are lower. Days 11, 12, 22, 23 and 27 March are days of relatively low aerosol concentration.

2. The Polish national Central Laboratory for Radiological Protection (CLOR) announced the radioactive material arrived over Poland on 23 March and the level of concentrations of some radioactive isotopes was increasing until 1st April and have been decreasing since. Compared with the effect of the Chernobyl disaster these concentrations over Poland have been lower tens of thousand times. A full text of the CLOR announcement in relation to the event can be found at http://www.clor.waw.pl/index_eng.htm. We also attach a copy of the website to this document.

Conclusions:

1. Local effects of increased radioactivity on the electric conductivity over Poland seems to be absent. This is evident from the conductivity measurements at Swider. The radioactivity increase was indeed very small (see CLOR data). In the case of the Chernobyl incident in 1986 the conductivity in Swider rose sharply as soon as the radioactive cloud arrived in Poland. This was observed in both raw and averaged data.

2. Electric field values on these days have been normal, i.e. characteristic for the levels observed normally in Swider on fair-weather days.

3. A comparison with an average Swider electric field variation in March (over many years) is required in order to look into possible global effects of the incident.

4. We consider the effect of the incident could potentially be modelled using the GEC EGATEC model (Odzimek et al., JGR, 2010).

Figures:

1) Diurnal variations on fair-weather days 3, 11, 12, 22, 23, 31, 31 March 2011.

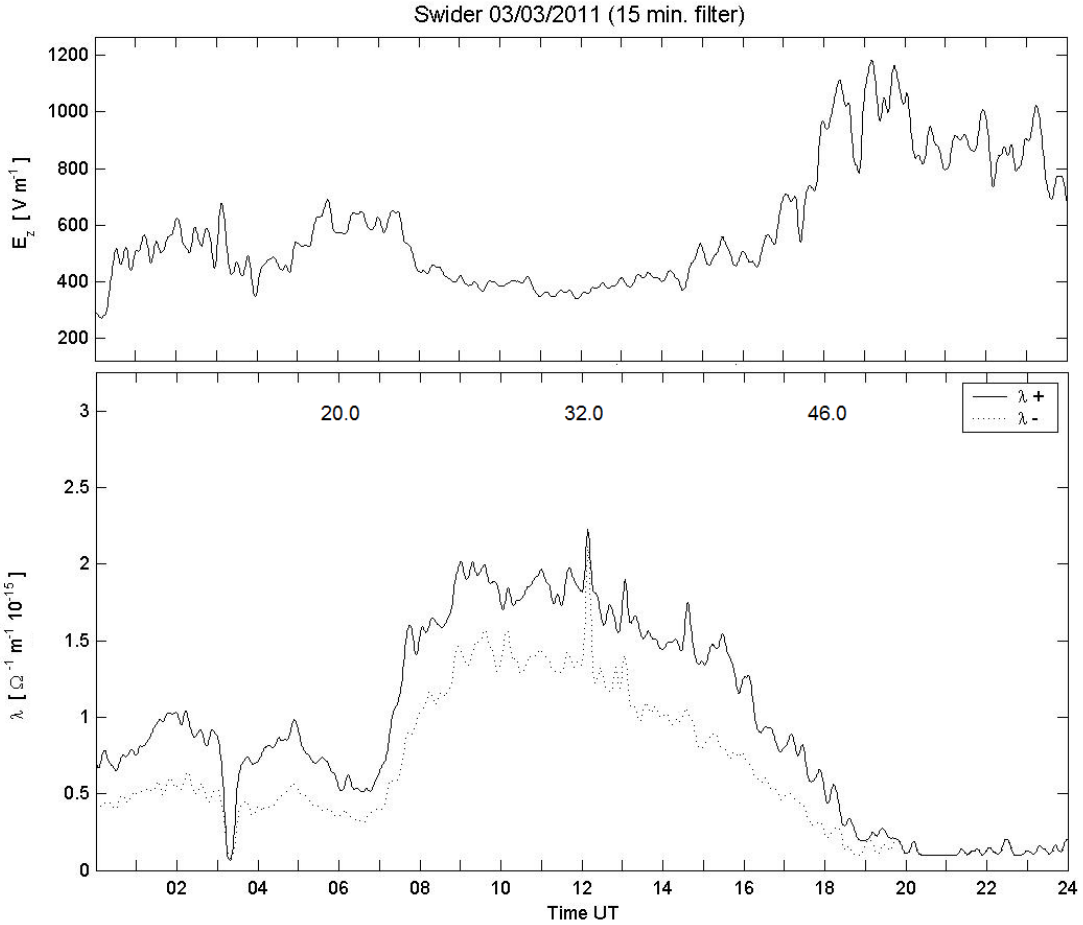


Figure 1. Diurnal variation of the electric field (upper panel) and positive and negative conductivity (bottom panel) measured at Swider station on **3 March 2011**. Concentration of cloud condensetion nuclei (in thousands of particles per cubic centimeter) measured at 6, 12 and 18 UT are displayed at the top of the bottom panel. The decrease of the conductivity between 3 and 4 UT is due to instrument calibration. The E field and conductivity values recorded at 1-min resolution have been smoothed using a 15-min running average.

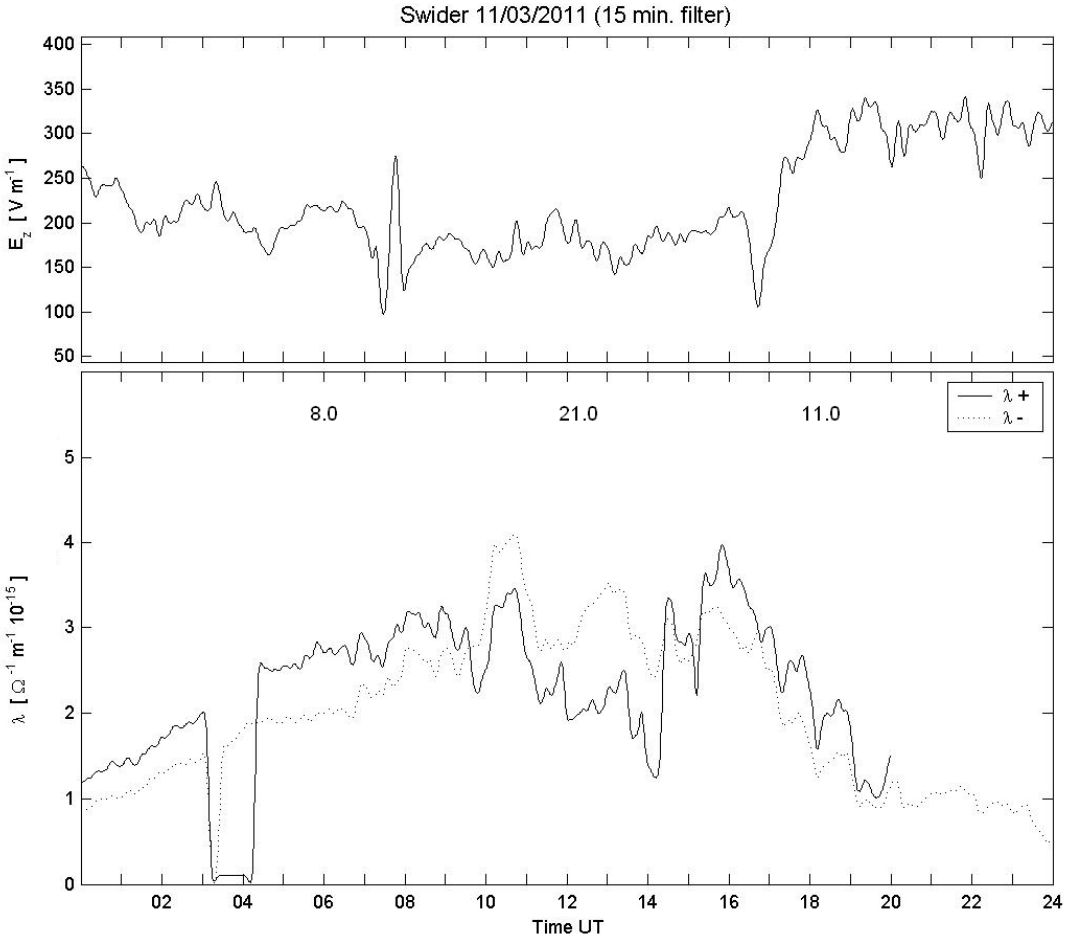


Figure 2. Diurnal variation of the electric field and positive and negative conductivity measured at Swider station on **11 March 2011**. Descprition as in Figure 1.

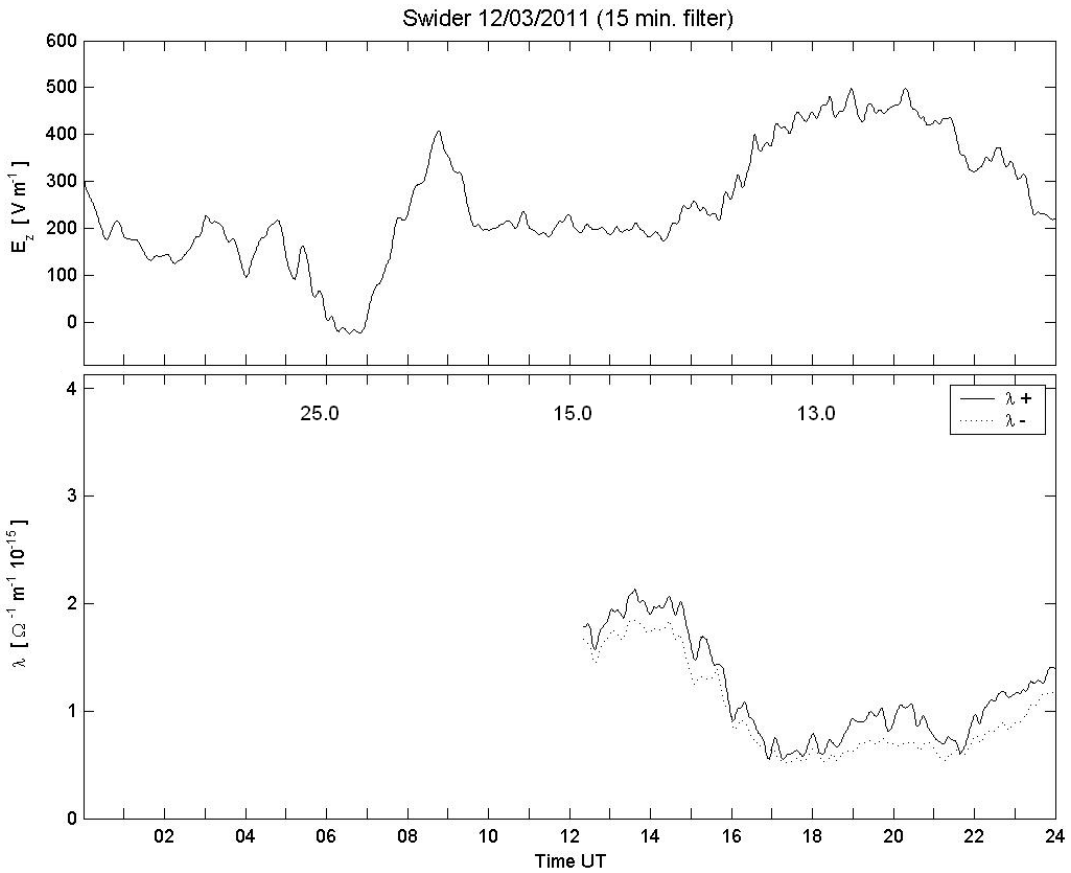


Figure 3. Diurnal variation of the electric field and positive and negative conductivity measured at Swider station on **12 March 2011**. Descprition as in Figure 1.

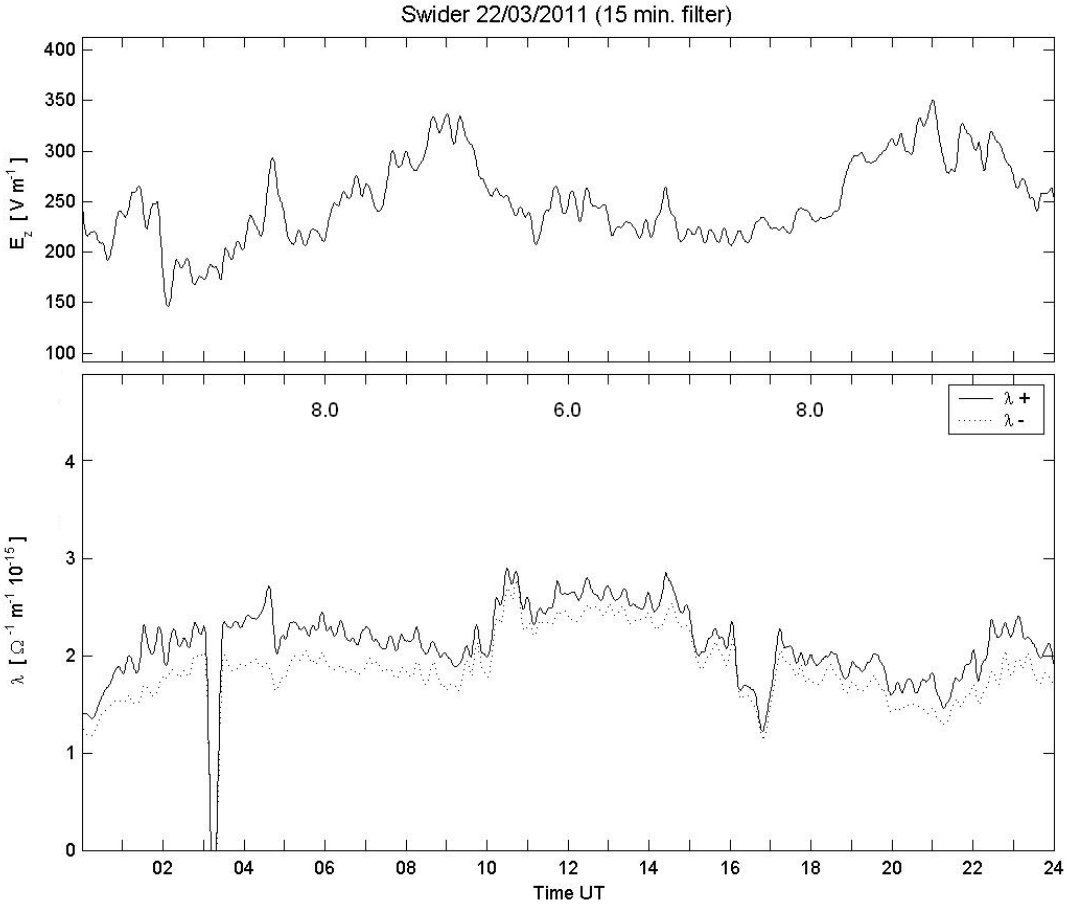


Figure 4. Diurnal variation of the electric field and positive and negative conductivity measured at Swider station on **22 March 2011**. Descprition as in Figure 1.

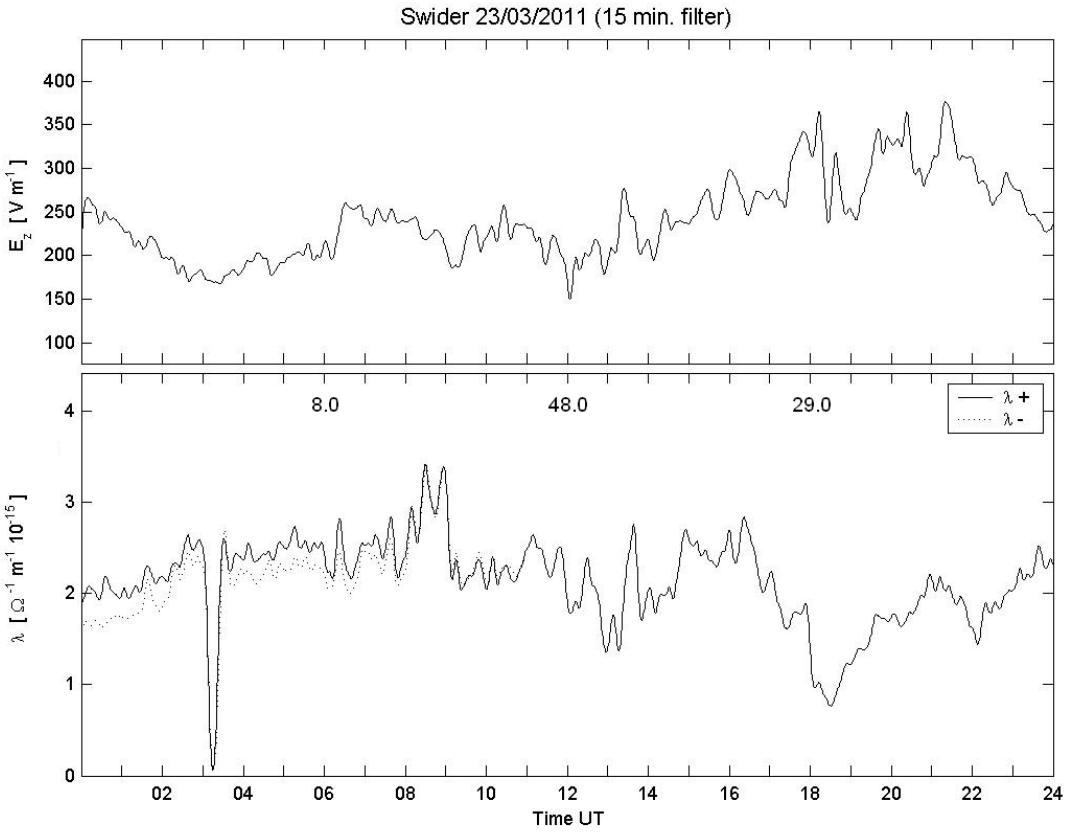


Figure 5. Diurnal variation of the electric field and positive and negative conductivity measured at Swider station on **23 March 2011**. Descprition as in Figure 1.

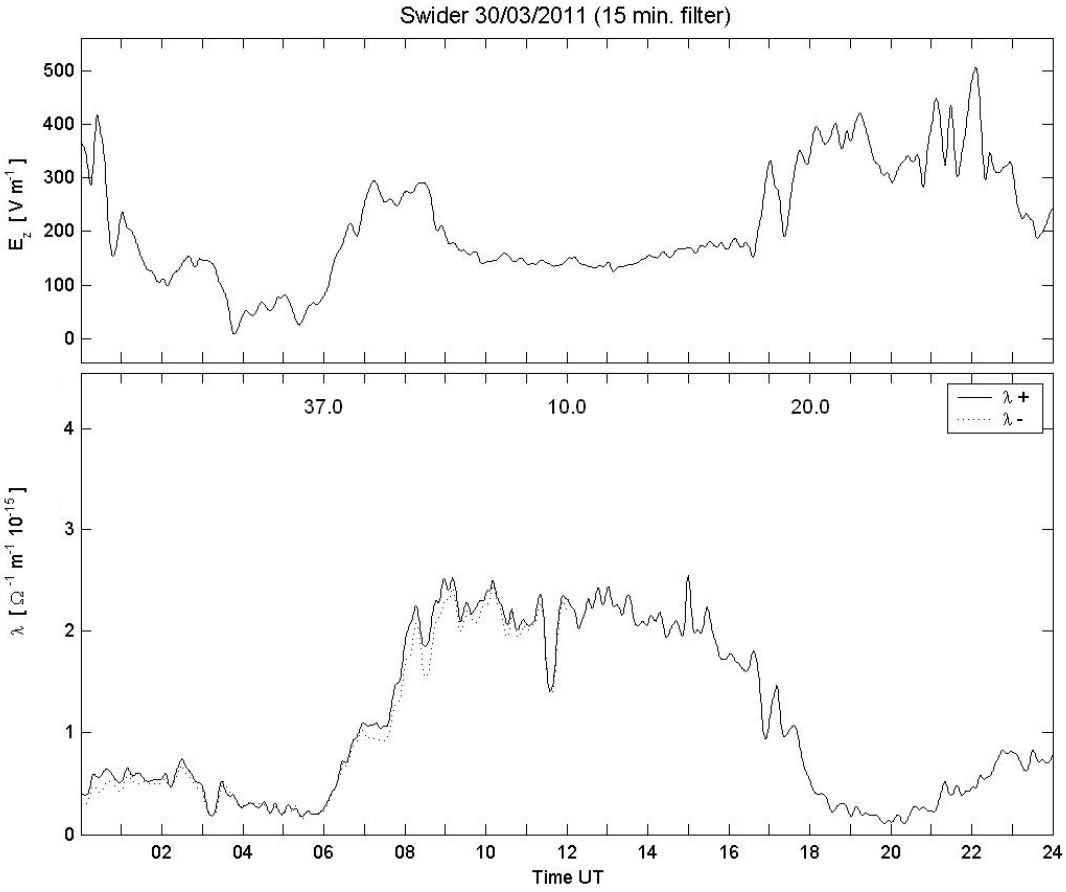


Figure 6. Diurnal variation of the electric field and positive and negative conductivity measured at Swider station on **30 March 2011**. Descprition as in Figure 1.

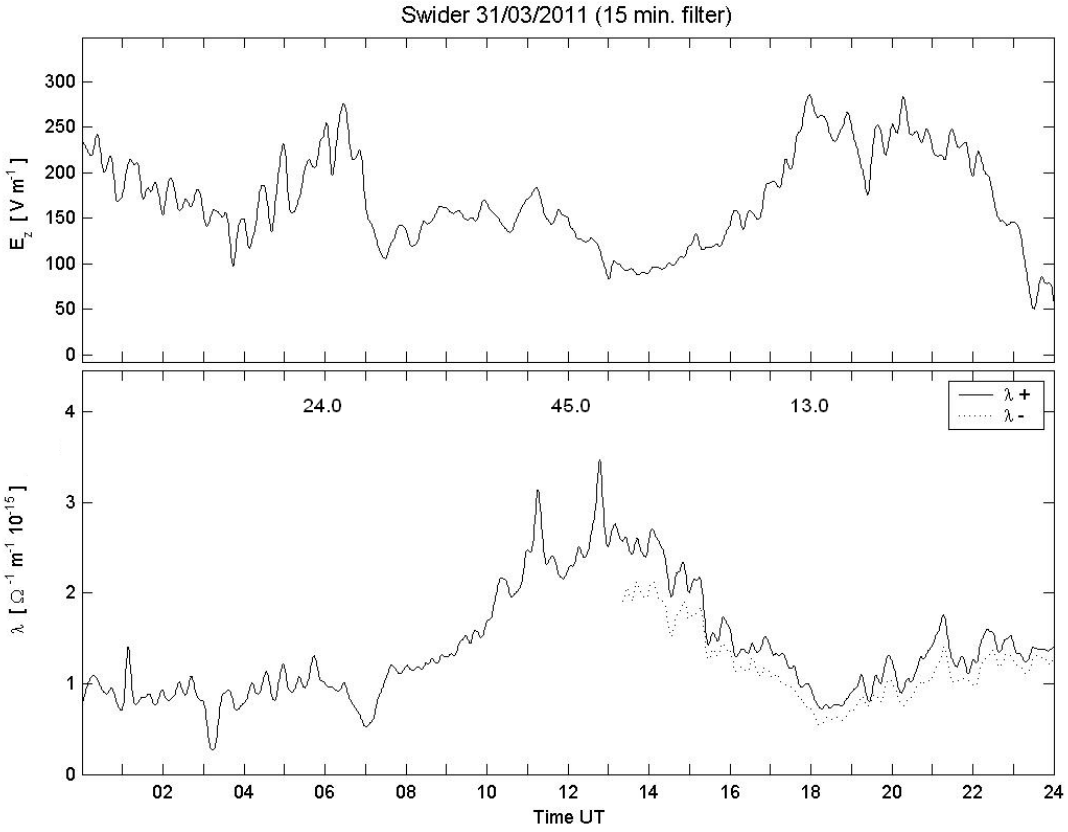


Figure 7. Diurnal variation of the electric field and positive and negative conductivity measured at Swider station on **31 March 2011**. Descprition as in Figure 1.

2) Daily average mean values of the electric field and measured values of the CN concentrations (at 6, 12, 18 UT) on fair-weather days in March 2011.

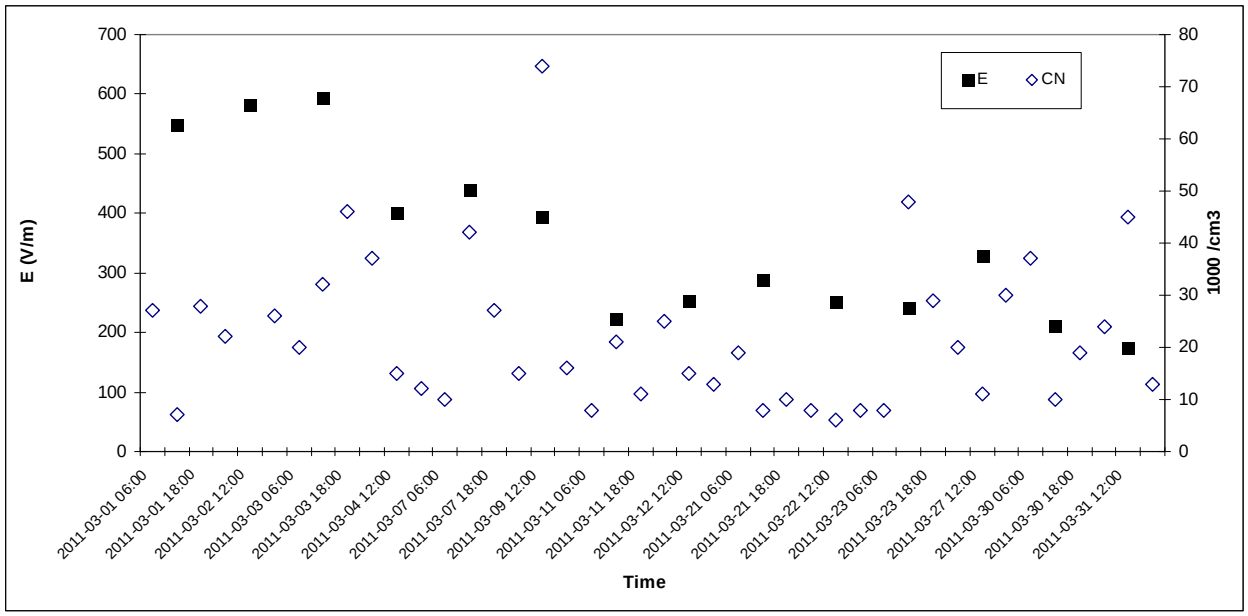


Figure 8. Measured CN concentrations and daily E field averages. According to Polish national Central Laboratory for Radiological Protection (only) slightly increased radioactivity was observed in Poland from 23 March and it started to decrease to normal levels from 1 April 2011.

3) CLOR announcement

Central Laboratory for Radiological Protection

What's new

24/08/2009	New edition of English-Polish radiation protection glossary
24/08/2009	Film about CLOR
24/08/2009	Read our publications

Welcome to CLOR

Central Laboratory for Radiological Protection (CLOR) was created in 1957 by a decree of Prime Minister with functions concerning the protection of state from radiation hazards. We are research center with almost 50 years tradition and our activity is focused on protection of general population and occupationally exposed persons against the hazards of ionizing radiation.

THE 'JAPANESE' CLOUD OVER POLAND (polish ver.)

On Friday, the 11th of March 2011, an earthquake of force 9 on the Richter scale occurred in the Japanese power station Fukushima I (Fukushima Dai-ichi), equipped with 6 Boiling Water Reactors (BWR).

Approximately on Wednesday (the 23rd of March 2011) the first cloud of the air from the Fukushima power plant reached Poland. It seams that it contained small quantities of fission products (mainly radioactive iodine I-131). Because of the distance from the damaged nuclear power plant to our country boarders (about 8500 km), radionuclides found in the ground-level air over our country, are 'dilluted'.

Since the air clouds from power plant Fukushima appeared over Poland, concentrations of artificial isotopes in the atmosphere were steadily growing (from one measurement to another increasing value was registered). Measurements from Friday (the 1st of April 2011) showed a breakthrough. That day, for the first time, we registered a lower concentration of radioactive iodine I-131 over Poland in relation to measurements made two days earlier. Since that time (the 1st of April 2011), concentration of this radioisotope in the air masses over the territory of Poland are systematically declining, from measurement to measurement, and are now at the level below 400 microbecquerel per cubic meter of air. These are very low concentrations.

For comparison, we would remain that during the clouds movement over the territory of our country after the accident of the Chernobyl nuclear power plant, the recorded concentrations of iodine I-131 were reached of 200 Bq/m^3 (becquerel per cubic meter of air). At present, the recorded concentrations are tens of thousands times lower and do not affect, in any way, the Polish people or the environment of our country.

Below, you will find a document showing the concentration of iodine I-131 and other radioactive isotopes that are present in the air at several locations in Poland. These are data from a network of highsensitive air monitoring stations type ASS-500*, working in the network of early warning radioactive contaminations of the President of NAEA (the nominal air flow through the filter station is 500 m^3/h). The data are continuously added to the document, which contains the results from the first air masses which arrived in Poland from Fukushima NPP. The new results are added from the centers, which measure the filters immediately after removing from the station ASS-500. Unfortunatelly, several centers in the country do not have the highsensitive spectrometry devices, therefore the filters of these stations will be measured successively (as soon as possible) at the Central Laboratory for Radiological Protection in Warsaw and the results of these stations may appear in a file with some delay.

*** Patent, the production of the air monitoring stations type ASS-500 and the supervision of the network operation - Central Laboratory for Radiological Protection**

On behalf of the Management
Krzysztof Isajenko
(Deputy Director)

Results (22 June 2011; 14.15 CEST) - english version

Archive: Results 21 April - 30 May 2011 - english version
Archive: Results 28 March - 21 April 2011 - english version
Archive: Results 14 - 28 March 2011 - english version

Publications

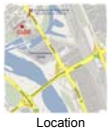
- Comments on "Quality assurance of nuclear analytical techniques based on Bayesian characteristic limits"
  - prof. Sławomir Sterliński
- Use of the Bayesian Concept for the Calculation of Characteristic Limits in Radioanalytical Methods
  - prof. Sławomir Sterliński
- Radiation Risk and Ethics
  - prof. dr hab. Zbigniew Jaworowski

Multimedia: ***Film about CLOR*** (polish ver.)

bip biuletyn informacji publicznej

ENGLISH-POLISH
Radiation Protection Glossary

Comprehensive glossary and a Polish dictionary of English terminology used in nuclear physics, nuclear safety, safeguards, radiobiology and transport of radioactive materials.
>>> download (word) <<<



Location

Contact

Central Laboratory for Radiological Protection
ul. Konwaliowa 7
03-194 Warszawa

tel. + 48 22 811 00 11
fax. +48 22 811 16 16