Geo-Space observation of atmospheric environmental effects associated with 2011 Fukushima nuclear accident

D. Ouzounov1, S. Pulinets2, M. Hernandez-Pajares3, K. Hattori4, A. Garcia-Rigo2

1. Center of Excellence in Earth Systems Modeling & Observations (CEESMO), Chapman University, One University Drive, Orange, CA 92866, USA
2. Space Research Institute, RAS, Space Geophysics, Moscow, Russia
3. Universitat Politècnica de Catalunya, Barcelona, Spain
4. University, Yayoi 1-33, Inage, Chiba, 263-8522, Japan

ouzounov@chapman.edu

Our approach of using multiple geo-space observation is based on the LAIC (Lithosphere-Astmosphere-Ionosphere-Coupling) model and the gained experience during similar analysis of Three-Mile Island and Chernobyl accidents. We do collect a unique dataset of geophysical data in a period around the time of the most active phase of Fukushima explosions (from 12 March 18 to 31 March, 71-90 DOY). We analyzed following data sets:

(i) ground temperature and relative humidity data from the JMA network of Japan,
(ii) satellite TEC measurements, and tomography reconstruction technique to obtain 3D distribution of electron concentration around the Fukushima power plant.
(iii) Anomalous fluxes of heat can be registered by satellite infrared sensor
(iv) Ionospheric anomaly

1. Radioactive components – products of NPP disaster ionize atmospheric gases
2. New formed ions undergo hydration. Hydration is equivalent to ionization, hence latent heat is exerted
3. Anomalous fluxes of heat can be registered by satellite infrared sensor
4. The technology developed to identify these signals onboard satellite
5. This technology gives opportunity to control the nuclear pollution

REFERENCES

CONCLUSIONS
1. LAIC concept works in case of radioactive pollution;
2. Multi-parameter satellite monitoring of thermal and ionospheric variations - effective tool;
3. We have tested independent means for remote control of radioactive pollution.

ACKNOWLEDGMENTS
We acknowledge Geographical Survey Institute, Japan for providing the GEONET data. We also acknowledge NOAA/ESR, IGS/GPS, and JMA for providing public access to the science data.

Thermal anomalies registered over NPP disaster areas from satellite


Time series of daytime anomalous OLR observed from NOAA/AVHRR of March 14-March 31, 2011 over Honshu, Japan. Tectonic plate boundaries are indicated with red lines) and major faults by brown. The location of FDNPP is indicated by a black star. The maximum value for OLR been seen over FDNPP

Geo-space observation of the thermal and ionospheric effects, March 11-31, 2011, Fukushima, Japan

dbES average (JST) Kokubunji station, Japan, Feb-March, 2011

1. Radioactive components – products of NPP disaster ionize atmospheric gases
2. Sharp ions production changes boundary layer conductivity
3. Changes of conductivity lead to local modification of the Global electric circuit parameters and change of ionospheric potential in relation to ground
4. Variations of ionospheric potential lead to variation of electron concentration over modified area

Ionospheric effects of radioactive pollution

1. 250 kV
2. Fair weather return current (E=100 V/m)
3. PG and Radiation Dose rate (March 14 March 31, 2011)

Geo-Space observation of thermal and ionospheric effects, March 11-31, 2011, Fukushima, Japan

Variations of conductivity lead to local modification of the Global electric circuit parameters and change of ionospheric potential in relation to ground

1. LAIC concept works in case of radioactive pollution;
2. Multi-parameter satellite monitoring of thermal and ionospheric variations - effective tool;
3. We have tested independent means for remote control of radioactive pollution.

REFERENCES

ACKNOWLEDGMENTS
We acknowledge Geographical Survey Institute, Japan for providing the GEONET data. We also acknowledge NOAA/ESR, IGS/GPS, and JMA for providing public access to the science data.