Validation of Lithosphere-Atmosphere-Ionosphere Coupling Concept by Geo Space Observation of Natural and Anthropogenic Processes

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Abstract

The coupling processes within the system Atmosphere-Thermosphere-Ionosphere attract more and more attention from the scientific community. One of the most discussed recently topics is the coupling mechanism which generates anomalies in different near-Earth shells starting from boundary layer of atmosphere up to magnetosphere of our planet, which was generalized in the form of the Lithosphere-Atmosphere-Ionosphere Coupling (LAIC) model. We study the impact and effects of different natural and anthropogenic events on atmosphere and ionosphere by using multi-instrument space-borne observations.

1. Introduction

Simultaneously EM phenomena (variations of atmospheric electric field, variations in different layers in the ionosphere) imply the coupling between the atmospheric thermal and atmospheric and ionospheric EM phenomena. Different groups of scientists proposed the physical mechanisms of coupling. One of such attempts was generalized in the form of the LAIC model. But many parts of the model have the qualitative character and do not permit to make the quantitative modeling in different geophysical conditions. This situation clearly demonstrates the distinct lack of knowledge on the atmosphere-ionosphere coupling especially when we consider the effects on the ionosphere from below. Existing conception of the Global Electric Circuit only claims the existence of potential difference between the ground and ionosphere but do not provide any instruments to estimate how the changes of electric properties of the near ground layer of atmosphere will reflect in the ionosphere. It was also established recently that many of different natural and anthropogenic phenomena contain similarity of their behavior and effects on atmosphere and ionosphere. Experimental analyses of several cases have shown the synergy in behavior of different atmospheric and ionospheric parameters related to: (1) approaching the main shock in major earthquake (Wenchuan, China, 2008; L’Aquila, Italy 2009; Tohoku, Japan, 2011), (2) effects associated with major hurricanes (Katrina 2005) and (3) radioactive pollution during technological disaster on atomic power plants (Chernobyl 1986, Fukushima 2011)

2. Satellite Measurements

We use multi-instrument space-borne observations and detail analysis of key processes in atmosphere, which modify the Earth plasma environment system under various geophysical conditions including natural and anthropogenic disasters. As input for analysis we use the data products about atmosphere, ionosphere and magnetosphere from different satellites, including NASA EOS (TERRA, AQUA), NOAA/POES, and ESA/ EUMETSAT (METEOSAT, ENVISAT, SWARM), DEMETER/CNES, FORMOSAT-3/COSMIC, as well as ground observations of GPS/TEC and meteorological monitoring data.
3. Acknowledgments

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4. References


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