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Novel natural and anthropogenic physical mechanisms of weather and climate changes

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A unified approach is suggested to the problem of impact of both space and several anthropogenic sources on the weather and climate changes. The united agent of this impact is examined i.e. microwave emission of the ionosphere, which resulted from ionospheric atoms and molecules excitation into highly excited (Rydberg) states by fast ionospheric electrons. Fast electrons with the energies more than 15 eV are formed with the photoionization of the upper atmosphere under the effect of X-ray/EUV solar radiation and with the ionization of the corpuscular precipitations from the radiation belts and magnetosphere both during of geomagnetic storms and under the anthropogenic influences. The latter (the work of powerful navigation and communication radio stations (because the most of them induce very low frequency (VLF) range: from few to few tens kilo Hertz.), electric power lines, starting space rockets, industrial activity) determines the locality of precipitations and accordingly the local action of the microwave radiation of the ionosphere on the weather characteristics. Surface transmitters with such frequency have power up to 1 Mw that cause precipitations and result in optical emission (the aurora of the class IBC II or more) above the transmitter.

Indeed results of measurements performed by the satellites Intercosmos-Bulgaria 1300 at 1982 and DEMETER at 2005 confirm very high extent of disturbance of radiation belts and night ionosphere above the zone of work of VLF transmitters both in Northern Hemisphere (transmitters NLK, NAA in USA and UMS, RPS in Russia), and in Southern Hemisphere (transmitter NWC) especially during geomagnetic disturbances. Areas of stimulated electron precipitations and areas of perturbed ionosphere are linked either with the magnetic force line at which the surface VHL transmitter is situated or with the magnetic line at which effect of radio wave on the pitch angle of electron, captured in radiation belt, takes place. This area of stimulated perturbations reaches a half of million of square kilometers. Every time perturbations of lesser scale are observed in magnetic conjugate area. In accordance with our calculations the rate of ionization and excitation of ionosphere in the conjugate point and hence, generation of microwave radiation from Rydberg states reaches 10 % of the effect in the point of the transmitter work.

We suggest three-stage radio-optical trigger mechanism for the ionospheric microwaves influence on the weather and climate. The first stage is an increase in generation of the microwave radiation which penetrates from the ionosphere to the earth surface. The second stage is a change in the proportion of water vapour to water clusters caused by increased microwave radiation. The third stage is a change of the atmosphere transparence in the absorption bands of water vapour and clusters. The atmosphere transparence due to cloudiness (usually optically thin (warming) clouds from solar flares and corpuscular of both natural and technological precipitations) determines fluxes of solar irradiance coming down as well as fluxes of the thermal radiation coming out from the underlying surface.

The maximum of secular cycles of solar activity was observed in eighties of last century. Since 1985 the total solar irradiance and ionizing radiation fluxes have been decreasing but geomagnetic activity (aa - index) has been going up till 2003. Only during the last few years geomagnetic activity also started decreasing. This means that negative trends have begun both for solar and geomagnetic activities, and also there is a positive trend of GCR since 1998 which participate in generation of optically thick (cooling) clouds. We suppose that according to our mechanism the natural global warming will go down to lower levels.