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Dependence of Joule heating on the ICME parameters

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Ionospheric Joule heating occurs as a result of the geomagnetic storms which are driven by ICMEs in the solar wind. High speed ICMEs and the strong and enduring southward IMFs are the key parameters in occurrence of the geomagnetic storms. In this study, we investigate the dependence of the Joule heating on the ICME parameters. We obtained Joule heating using SWMF-BATSRUS MHD model for the selected geomagnetic storms. ICME magnetic field and plasma parameters that cause these storms were sorted and the threshold levels for each ICME parameter were determined in order to find the most influential parameter that controls the Joule heating. A clear separation exists in the Joule heating that corresponds to the sheath and magnetic cloud regions of the ICME. Our preliminary results indicate that the Joule heating higher than 600 GW occurs when the southward IMF Bz last more than a day within the magnetic cloud arrives at the Earth despite the corresponding speed and the density, thus the pressure, are lower. While the velocity is higher, the fact that the density is much lower within the cloud results in lower Joule heating. In this presentation, three cases will be compared and discussed in order to advance our understanding on the solar wind-magnetosphere-ionosphere coupling.