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Numerical simulations VLF signal perturbations due to red sprites

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In this paper we perform 3D finite-difference time-domain (FDTD) method to compute the subionospheric VLF signal perturbations due to the ionization from mesospheric transient event such as red sprites. Spatial scales of columns are determined by the sprite images obtained from our optical observations during winter lightning activities over the sea of Japan. Numerical results indicate that the multiple sprites generate the complicated scattering pattern of the VLF transmitter waves depending on special orientation and extent of sprite ionization columns. Spatial dependence of the scattered amplitude are compared with those from the experimental results of VLF observation network.