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# Modeling D-Region Behavior After Sudden Ionospheric Disturbances

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The ionosphere responds rapidly on solar radiation, cosmic rays and precipitating charged particles. It is part of Earth's complex upper atmosphere and is a region where ionization and recombination processes form different layers namely D,E and F. During day-time the main source of ionization of the ionosphere is the Sun. It forms the most lowest layer: the D-layer. Even though investigations on the Earth's upper atmosphere and its conditions have had a tradition since the early 20ies century, the development and distribution of passive modern ground based instruments open a new view on especially D-region behavior after sudden ionospheric disturbances (SID). Some of these SIDs are caused by solar x-ray radiation and are known to be a very low frequency (VLF) radio propagation phenomena. During normal days, patterns of VLF signals depend on the regular daily and seasonal solar flux variations. However, during solar x-ray flares, enhanced energetic particles are released from the Sun. They cause a sudden perturbation of the VLF signal amplitude due to higher ionization rates at the D-layer.
Monitoring of Earth's lower ionosphere, utilizing low-cost software defined radio wave receivers (SDRs) as VLF monitors, allows a broadband VLF coverage. Only a small number of those SDRs at mid-latitudes are the core of the InFlaMo project (www.inflamo.org). Having data coverage for almost the entire solar cycle 24, one aim for this presentation is to utilize a derived solar x-ray flux from recorded SID cases around local noon, in order to model D-layer electron density variations. This will show the largest differences to solar quiet times, when electron densities and ionospheric absorption are generally largest due to lower solar zenith angle as well as in summer due to longer periods of daylight and ionization. Another aim is a study of the termination times of SIDs after the occurrence of a solar x-ray flare. Here a simple 1-D ionospheric model is used to compute ionospheric profiles of electron densities to show temporal variations.