**Thunderstorm to ionosphere coupling: recent results and future direction**
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This paper will present a current perspective on the state of thunderstorm to ionosphere coupling research, and some ideas for possible future directions for this scientific community.

Recent studies have shown significant effects of lightning and thunderstorms on the ionosphere directly above, as well as propagating out to significant distances. Direct effects of lightning on the lower ionosphere (below ~95 km), such as elves and sprites, have been studied for nearly two decades. Optical cameras, VLF/LF remote sensing, and computational modeling have all been complementary tools to increase our knowledge of these phenomena. More recently, neutral wave effects produced by thunderstorms (and perhaps lightning itself) have been found to perturb the lower ionosphere and propagate into the denser E- and F-regions. These neutral wave induced effects can propagate globally, making them perhaps even more significant in the global picture of thunderstorm-ionosphere coupling. These waves have been detected experimentally using GPS L-band trans-ionospheric signals, VLF sub-ionospheric signals, ground optical imaging, and satellite imaging. Modeling work has also been useful to indicate expected propagation of gravity and acoustic waves.

These experimental studies verified by computational models have shown that, as a community, we understand the basic underlying physics for lightning electromagnetic pulse and quasi-electro static field coupling into the lower ionosphere. We also understand the general propagation of acoustic and gravity waves into the upper ionosphere. The next step we will promote in this talk is a more complete picture of the entire thunderstorm's effect on the whole ionosphere (D, E, F regions). This will require collaboration among experimentalists and modelers from the whole community. Finally, we would like to focus this community toward a more global understanding of these processes, particularly in light of the scheduled ICON/GOLD missions to be launched in 2017.