

Fine-scale observations of artificial aurora at 777.4 nm

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We present observations of artificially generated auroral emissions using the High power Active Auroral Research Program (HAARP) ionospheric heating facility located in Gakona, Alaska. We operated an EMCCD imager at the HAARP facility which enabled high temporal and spatial resolution observations of the heater induced airglow emissions. The imager was equipped with a 777.4 nm narrowband filter to investigate this specific prompt emission. These observations were taken at 3 Hz frame rate using a 19 degree field of view lens, that produces spatial resolution of 100s of meters. The small-scale optical features observed will be quantified for different cycles of ionospheric heating, including on-off cycles of minutes to continuous heating for an hour. In addition to the imager at HAARP, we operated several other imagers at Poker Flat, Alaska in order to observe the artificial emissions from the side. This enabled an accurate measure of the altitude of the emissions and allowed us to follow the changes in altitude as the emissions developed in time. The imagers at Poker Flat included a 6300 nm imager with a 47 degree field of view and a 5577 nm imager with 15 degree field of view. This allowed us to image the lower energy and slower emissions, where the decay time of the emissions was observable when the heater was cycled off. The spatial scale, motion, lifetime and altitude of the emission features will be quantified for the different cycles, in order to gain insight into the strong plasma wave activity— generated by the heater—that is causing the local electron acceleration and heating.