

A plethora of observational data was obtained during the months of December 2013 - January 2014 for the Ontario Winter Lake-effect Systems (OWLeS) Project. This research is focused on lightning associated with lake-effect snow storms that occurred during the field project. Two events that have been analyzed extensively are Intensive Observation Periods (IOPs) 5 (18 Dec 2013) and 7 (7 Jan 2014). According to the Earth Networks Total Lightning Network (ENTLN), IOP 7 featured 24 lightning flashes [17 cloud-to-ground (CG), 7 intracloud (IC)] over a time period of about 5 hours. Out of these 24 lightning flashes, only one CG and two IC flashes had positive polarity, with the rest being negative polarity. This event is of significant interest due to the extremely cold conditions (surface temperatures around -10°C) and the scarcity of supercooled water droplets/graupel within the lake-effect clouds, which is thought to be essential for sufficient charge separation to occur. In addition, nearly all of the lightning occurred well inland over the Tug Hill Plateau region, with none occurring over Lake Ontario, the source of instability for these storms. IOP 5 serves as an excellent case to compare with IOP 7 due to the warmer conditions (surface temperatures around -1°C) and greater amounts of supercooled water droplets/graupel. Although IOP 5 only featured 5 ENTLN lightning flashes (3 CG, 2 IC) that all had negative polarity, these flashes also occurred well inland over the Tug Hill Plateau region, specifically over the Maple Ridge Wind Farm. Due to significant statistical evidence, we believe the wind turbines at this farm played a role in lightning production for both IOP 7 and IOP 5. In addition, the microphysics and dynamics of the two lake-effect snow storms were analyzed to provide further information. For example, the use of a Microwave Profiling Radiometer (MPR) within the snow bands revealed maximum integrated liquid water values of only 0.24 mm during IOP 7, whereas IOP 5 reached a maximum value of 1.95 mm. With regards to updraft speed data obtained using an X-band Profiling Radar (XPR), both IOP 7 and 5 featured a maximum updraft speed of approximately 8 ms^{-1} .