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This presentation gives an overview of selected studies in the area of ionospheric electrodynamics and magnetosphere-ionosphere coupling carried out at the Finnish Meteorological Institute (FMI). From the experimental point of view, an important backbone of these studies is the MIRACLE network of ground-based ionospheric observations, consisting of the IMAGE magnetometer network, the STARE radar, and an array of all-sky cameras. An example is presented how MIRACLE data can be used to derive the detailed electrodynamics of auroral forms, such as omega bands or auroral streamers, also in combination with space-based observations. For such studies, advanced data analysis techniques (as also devised at FMI) are required, a few of which will be briefly introduced, with a focus on spherical elementary current systems (SECS). A new addition to the experimental side is the TomoScand network of ground-based Beacon and GPS receivers, that is used for a regional, high-resolution tomography of the ionospheric electron density distribution. As an example of a theoretical study, we will have a look at the polarization electric field or Cowling effect in the ionosphere, and how this mechanism may affect the overall ionospheric electrodynamics of auroral forms. Finally, an outlook to the future with science opportunities using the upcoming Swarm satellites and the EISCAT 3D radar is presented.