We present a new scheme for solving the ionospheric boundary conditions required in magnetospheric MHD simulations. In contrast to the electrostatic ionospheric solvers currently in use, the new solver takes ionospheric induction into account by solving Faraday's law simultaneously with Ohm's law and current continuity. From the viewpoint of an MHD simulation, the new inductive solver is similar to the electrostatic solvers, as the same input data is used (field-aligned current [FAC] and ionospheric conductances) and similar output is produced (ionospheric electric field).

The inductive solver is tested using realistic, data-based models of an omega-band and westward traveling surge. Although the tests were performed with local models and MHD simulations require a global ionospheric solution, we may nevertheless conclude that the new solution scheme is feasible also in practice. In the test cases the difference between static and electrodynamic solutions is up to about 10 V/km in certain locations, or up to 20-40% of the total electric field. This is in agreement with previous estimates. Development of a global solver to be used in the GUMICS MHD simulation is under way.

It should also be noted that if FAC is replaced by the ground magnetic field (or ionospheric equivalent current) in the input data set, exactly the same formalism can be used to construct an inductive version of the KRM method originally developed by Kamide et al. (1981).