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Modeling horizontal currents and magnetic ground perturbations with the IPIM model

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The IRAP Plasmasphere Ionosphere Model (IPIM) is an ionospheric model which describes the transport equations of ionospheric plasma species along magnetic closed field lines. The development of a new operational version of IPIM as part of the EUHFORIA project to monitor and forecast space weather conditions and hazards includes using in-situ solar wind observations from the OMNI data set, ionospheric radar data of plasma motions from the Super Dual Auroral Radar Network (SuperDARN), and precipitation data from the Ovation model, as inputs to the model. A new conductivity module has also been developed for help in the simulation of geomagnetically induced currents based on a simplified version of IPIM. This model uses the photochemical module of IPIM in place of the fluid module and the full kinetic module, so that inter-hemispheric transport of suprathermal electrons is accounted for in the ion production term. As the main contribution to the conductivities comes from the lower ionosphere (typically below 150km) where the chemistry dominates, neglecting the field-aligned transport contribution in the fluid module does not alter significantly the conductivities. Based on the conductivities, the neutral wind and the electric field, ionospheric horizontal currents are computed. The ionospheric currents are used as an input for the Biot and Savart module to compute the resulting magnetic perturbations at the ground. We present the first results from this version which explores the ionosphere's response to different conditions in different regions in mid and high latitudes.