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Comment on angeo-2020-92

Anonymous Referee #1

Referee comment on "Ionospheric control of space weather" by Osuke Saka, Ann. Geophys. Discuss., https://doi.org/10.5194/angeo-2020-92-RC1, 2021

This paper describes a scenario for magnetosphere-ionosphere coupling during magnetotail dipolarisations. The scenario describes the anticipated ionospheric response to transient magnetospheric induction electric fields: differing horizontal ion and electron motions, charge accumulation, potential changes, and the acceleration of charges up and down field lines. The conclusion is that the ionosphere plays an active role in magnetosphere-ionosphere coupling.

My main criticism of the paper is that it does not place itself within the context of the relevant literature. It is well-known that the magnetosphere and ionosphere couple through electric fields, horizontal ionospheric Hall and Pedersen currents and vertical field-aligned currents. It is well-known that the ionospheric currents are a result of differing ion and electron mobility in the E region. It is also well-known that ionospheric plasma is a source of current-carriers for downwards FACs and that ionospheric outflow in response to M-I coupling is an important contributor to magnetospheric dynamics. However, none of the related literature is discussed in the paper, so it is not clear if the proposed model is consistent or inconsistent with well-established ideas, or whether it contributes anything new to our understanding of M-I coupling. Any revision of the paper would need to discuss the past literature in much more depth and explain what is new in the current paper.

I would also say that the title of the paper is rather too broad for its contents.