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Interactive comment on "Plasma density gradients at the edge of polar ionospheric holes: the presence and absence of phase scintillation" *by* Luke A. Jenner et al.

Anonymous Referee #1

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Comments on Plasma density gradients at the edge of polar ionospheric holes: The presence and absence of phase scintillation By Jenner et al.

The paper presents a study about 3 cases (2 reported) of polar holes and discusses their role in acting as scintillation driver for GNSS signals. The paper is clear and well written and worth to be published after minor revisions.

Major issues. âĂć The authors seem to ignore all the recent work made to better clarify the meaning and definition of phase scintillation at high latitude. In particular, it has been recently addressed that is more appropriate to distinguish between "phase fluctuations", due to refractive effects on the signals and of deterministic nature, and "phase

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scintillation", due to diffractive effects, of stochastic nature and ruled by the Fresnel's filtering mechanism. This follows also discussion about the not appropriateness of 0.1 Hz as fixed cutoff frequency for phase dentrending in SigmaPhi calculation. This has been introduced in the early 2000 in the works by Forte (2002, 2005), by Forte and Radicella (2002) and Beach (2005). Then, in the last decade, it has been deeply investigated and discussed on case studies (Mushini et al., 2012; Wang et al., 2018; McCaffrey and Jayachandran, 2019) and at a statistical level (De Franceschi et al., 2019). The authors are encouraged to revise the text and results to take into consideration the recent achievements in that sense. âĂć The title of the paper is misleading, as more emphasis is given to the fact that polar holes doesn't results into meaningful phase fluctuations. âĂć In addition, my personal guess is that the effect of the polar holes can be seen in the scintillation indices if they are calculated by considering not 1-minute value, but lower time windows (say 10 seconds). Of some inspiration can be the work by Smith et al. (2008).

Minor issues âĂć In the abstract I would "measurements from GNSS receivers" and not "measurements from GNSS satellites" âĂć Figure 5 is cited before figure 2,3 and 4. âĂć The IMF data provided by ACE and available in CDAWEB are also provided time-shifted to the Nose of the Earth's Bow Shock. I encourage to report this. âĂć Figure 3, bottom panel. The adopted color code is not suitable to catch positive/negative variations. I would suggest to use a blue/white/red for a better reading of the figure. âĂć The threshold 0.2 radians for SigmaPhi is commonly used (0.25/0.3 too) as able to identify moderate to strong scintillation regimes. I would suggest to cite this.

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