

## ***Interactive comment on “Polar substorm on 7 December 2015: pre-onset phenomena and features of auroral breakup” by Vladimir V. Safargaleev et al.***

### **Anonymous Referee #1**

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In this manuscript, a comprehensive analysis of a moderate "polar substorm" utilising ground-based observations combined with multi-spacecraft data, is presented. Their analysis of the substorm signatures are thoroughly described and easy to follow.

Except for the excellent description of the event, the authors also suggest that "oscillations" in the IMF Bz observed prior to the event might play a role in the substorm evolution. The oscillations in the IMF Bz are separated by approximately 15 minutes. The authors observe deflection on ground-based magnetometers, tailward flow in the polar cap (SuperDARN), and optical signatures matching the periodicity. This enhancement is also observed by ESR as a convecting density patch, which also signifies dayside

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reconnection. It is also referred to earlier works by the author, where they suggested that such quasi-sinusoidal variations in IMF Bz could trigger substorms. It is then speculated that the periodicity of 15 minutes in the dayside reconnection will excite global oscillations with the same period in the magnetosphere, which in turn could trigger reconnection through some instabilities. While it is not discussed why such instabilities would be susceptible to oscillations with this specific periodicity, or how these oscillations are transmitted from polar regions into the plasma sheet, one can not argue with the author' speculations.

Below are some comments and suggestion that the authors may chose to include or exclude: L15: "Some later" -> "Later, " L27: "The question is solving on the base of satellite observations" , rewrite L53: Define WTS L66: Check reference (missing L) L119: per second L151: relative to L157: "Thus, by the moment .." -> "At T0, BJN ...." L207: "IMF deflections through 15 minutes" - rewrite L218: "suppose" -> "speculate" L253: "With taking" -> "Taking"

Also suggest to export figure 2 to a scalable format, also some of the labels are too small.

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Interactive comment on Ann. Geophys. Discuss., https://doi.org/10.5194/angeo-2019-118, 2019.

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