

Our responses to Referee #2 are shown in italics.

Review of “Heavy rainfall, floods, and flash floods in the context of solar wind coupling in the magnetosphere-ionosphere-atmosphere system: by Prikryl, Rusin, Prikryl, Stastny, Turna and Zelenakova

The paper contains interesting and new information on solar wind coupling to the Earth’s atmosphere. Although the authors have written other papers on this topic prior to this one, the broad range and thorough coverage of the present paper is the best yet and I suspect that this one will become a classic. I have only a few minor comments.

Minor Comments

Title: The title does not say specifically what the “solar wind feature” exactly is. I suggest that you change the title to “Heavy rainfall, floods and flash floods due to high speed solar wind (HSS) coupling to the”. The solar, solar wind and magnetospheric science community have basically ignored the Wilcox effect (even though Wilcox was a solar/interplanetary scientist) because it was obvious that there was no substantial energy transfer to the Earth due to sector boundary crossings. A reader of the present title might think “ho hum, probably another HCS crossing paper” and not read it. The connection of weather to high speed streams/HILDCAAs is far more plausible and should attract far more interest from the AG readership. I therefore suggest a modification of the present title.

Reply: We agree and changed the title: “Heavy rainfall, floods, and flash floods influenced by high-speed solar wind coupling to the magnetosphere-ionosphere-atmosphere system”

Lines 17 and 19, the “solar rotation period”. In perhaps the first line where you mention a 27 day periodicity, you could mention that that is the “solar rotation period”? There might be some people that might not know this.

Reply: Done

Now for the people that know solar physics, it is well known that the Sun is a differential rotator. ~27 days is the rotation period of surface features at the solar equator as view from the Earth. The rotation period at higher solar latitudes is larger, reaching ~31 days near the poles. Coronal holes are “rigid rotators” rotating at the equatorial rate (even though the coronal holes are not at the equator). None of this needs to be gone into here, but you should mention it somewhere within the text. I will point out one place to do it later.

Line 68. It would be helpful to the readership to let them know that the occurrence of HILDCAAs during HSSs indicate substantial energy input into the auroral zone ionosphere. This substantial energy input differentiates this mechanism from that of HCS crossings (without making a judgement as to which is a better mechanism). About the auroral zone, later in the paper you allude to auroral zone effects without tying it to HSSs and HILDCAAs. So in that line add “indicating substantial energy input into the auroral zone ionosphere”?

Reply: Done

Line 78. ... high speed solar wind streams?

Reply: Corrected – adding “streams”

Line 84. Can you give references to “moist instabilities”? That would help the readership.

Reply: References added.

Lines 95-96. The scale size of HSSs is much larger than the magnetosphere or the distance from Earth to the L1 libration point where the satellite is orbiting. So it is expected that what is detected at L1 is the same wind that impacts the Earth’s magnetosphere. So perhaps this sentence should be deleted?

Reply: Deleted

Line 105. Polar coronal holes are most prominent during solar minimum. So perhaps a more correct sentence would be “...most prominent during solar minimum in polar regions....” ?

Reply: Agree. Corrected.

Line 205. Perhaps you can put in the rigid rotators here? “Polar coronal holes and the HSSs have been known to persist for years and appear as “rigged rotators” at the Sun’s equatorial rotation period (27 days as observed from Earth)” The Pioneer observations of CIRs were noted to occur at ~25 day periods because it was not viewing the Sun from a rotating viewpoint.

Reply: Sentence is now amended: “Polar coronal holes and their HSSs have been known to persist for years (Tsurutani et al., 1982; Tsurutani et al., 1995) and appear as “rigid rotators” at the Sun’s equatorial rotation period (27 days as observed from Earth).”

Line 495. You may wish to again emphasize auroral zone energy deposition? “... known to cause HILDCAAs and substantial auroral zone energy deposition (....)”.

Reply: This is emphasized again in Section 7

Lines 520-21. I suggest that once the paper has been published, the authors circulate it to weather/atmospheric experts to get comments/criticisms. I am not knowledgeable enough to give you comments on that portion of the work. But this all seems very reasonable to me.

Reply: Thank you for the suggestion, corrections and all the comments.