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Interactive comment on "Multisatellite observations of the magnetosphere response to changes in the solar wind and interplanetary magnetic field" *by* Galina Korotova et al.

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Dear Dr. Foster, Thank you very much for your comments. Here is my response.

Foster:lines 255-258: Two techniques for calculating the normal vector of the shock (n) are described. How well do these two techniques agree with each other?

The Finnish data base gives the coordinates of the normal vector to shocks as calculated from the magnetic field data and velocities using the mixed mode method of Abraham-Shrauner and Yun [1976]. When there is data gap in the velocity components, the normal is calculated using magnetic field coplanarity [Colburn and Sonett,

1966]. Abraham-Shrauner [1972] suggested the "mixed mode method as an alternative to other methods when the accuracy of the magnetic field used in the calculations is uncertain. She noted that, for example, if the magnetic field is exactly normal or tangential to the shock front, magnetic coplanarity fails to give an expression for the shock normal. Our list of interplanetary shocks contains events for which the determination of the values of the magnetic field ahead and behind the shock was not complicated (no strong oscillations), so we always use magnetic field coplanarity to calculate the shock orientations. We found that the sense of our shock orientations (spiral or orthospiral) agrees well with the shock parameters in the Finnish database. For the fast mode propagation velocities, it would be good to describe the theoretical parametric dependence of the fast mode velocity (e.g. its dependence on radial distance). How well do the observed pulse velocities agree with theory for the Feb 2014 event (e.g. lines 310-312) and others?

Foster: For the fast mode propagation velocities, it would be good to describe the theoretical parametric dependence of the fast mode velocity (e.g. its dependence on radial distance). How well do the observed pulse velocities agree with theory for the Feb 2014 event (e.g. lines 310-312) and others?

To calculate VA we used the Carpenter and Anderson density profile obtained from a least squares linear fit to 25 ISEE dayside saturated plasmasphere profiles [J. Geophys. Res., 97, A2, 1097-1109, 1992]. Figure 1a shows their reference density profile given by ne =10(-0.3145L+3.9043) for L increments of 0.5. Figure 1b and Figure 1c show the values of the magnetic field obtained from a CCMC run for the Tsyganenko geomagnetic field model for the solar wind conditions on February 27, 2014 and the corresponding Alfven velocity, respectively. Then we set the plasmapause at L = 6 and took the density ne as 4 cm-3 beyond this distance to obtain the corresponding Alfven velocity presented in Figure 1d. The values for the Alfven velocity at the locations of Van Allen Probes A (L=5.1) and B (L=5.5) are about 284 km/s whereas at the GOES location it is 1240 km/s. Because the temperature is very low, the fast mode velocity is the same as the Alfven velocity in the plasmasphere [Takahashi et al., J. Geophys. Res. 115, 2010] and is only ∼100 km/s greater in the outer magnetosphere. These model values for the fast mode velocities are in good agreement with the values obtained in our paper.

Foster: A useful addition to the paper would be to present some detail on how those parameters have important effects on plasma acceleration in interactions involving the initial fast-mode pulse or with subsequent ULF oscillations

Addition to the text (and to the Conclusions) : line 197: The most prominent increase in the electron intensities (by factors of 21 and 14) was observed for energies of 53.8 keV at Van Allen Probes B and A, respectively. Note that the impact of the shock on the relativistic electron populations observed by REPT was not significant and was characterized by a weak increase followed by a decrease. Line 226: Interaction with the initial fast mode pulse and subsequent ULF electrical field oscillations can have an important effect on particle acceleration. In considering the energization of electrons on February 27, 2014, an encounter with the observed electric field for a period of 240 s will transport the electrons earthward by ïĄd'Re = 1.3 to 1.6 RE from their original position at L= 6.4 for Van Allen Probe A and at L = 7.1 for Van Allen Probe B. Conservation of the first adiabatic invariant implies that such particles will be energized by a factor of about 1.9 - 2.3 in only one cycle of the electric field pulsations. The studies of Wygant et al. [1994] using CRRES data and Foster et al., [2015] using Van Allen Probes data, and others have demonstrated that the tailward propagation of the strong shock-induced electric field impulse and subsequent ULF processes can result in the extremely fast acceleration of relativistic electron populations inside the plasmasphere.

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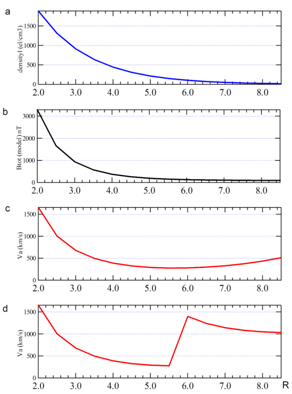

Fig. 1. . Radial profiles: (a) reference density profile given by ne =10(-0.3145L+3.9043) for L increments of 0.5, (b) values of the magnetic field obtained from a CCMC run for the Tsyganenko geomagnetic fie