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Interplanetary Alfvénic Tubulence: The Need for Verification and Modeling

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Most theoretical models of interplanetary Alfvénic turbulence start with the decay instability where an outwardly propagating (away from the Sun) wave decays into a backward propagating Alfvén wave plus an ion acoustic wave. The evidence presented for this is typically through Elsässer variable analyses. However if there are static structures in the solar wind, Elsässer variable analyses will give results that are consistent with equal amounts of wave propagation in the two directions. On the other hand, there is no direct evidence for Sunward propagating Alfvén waves in interplanetary space.

We propose a new and different cause of interplanetary plasma turbulence which needs both verification and also a new type of computer simulation work. Single large amplitude Alfvén wave cycles apparently phase-steepen leading to wave breaking and period doubling. Examples will be shown. Hybrid code application will be necessary to understand the eventual effects of this different type of nonlinear wave evolution process.