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Solid Earth
Discussions

Interactive comment on "Geomagnetic jerks characterization via spectral analysis" *by* B. Duka et al.

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This paper presents new methods for the identification of Geomagnetic jerks. The subject is timely, the methodology interesting, and the results new. I find the analysis methods attractive, as they are based firmly in conventional signal processing rather than more esoteric branches of maths. The paper hints at the growing realisation that what we know as jerks are probably the top of the iceberg - there are a whole continuum of sharp SV changes, and the harder you look, the more that you find.

There are a couple of recent papers that are missed by the authors. One by Pinheiro et al in G cubed should at least be referenced. The other I have in mind has me as a co-author, which puts me in a weaker position to demand anyone pays attention! However, the Wardinski and Holme (2011) paper addresses the issue of ring current

signal in observatory SV timescales. My argument would be that no matter how many exciting new mathematical methods can be developed to process time series, a method that is physically based is always preferable. What happens to the series if corrected for ring current and induction signals, either as in Wardinski and Holme, or just using Dst or equivalent? I don't suggest that this paper needs rewriting to deal with this, but it might be a fruitful next stage in pushing the research forward.

The third derivative of the field is a sensible thing to look at for jerks. However, the model construction has definite effects on this. I am particularly unclear that degree 9 components of this quantity are anything other than numerical artefacts, particularly early on in the model, when SV spectrum shows strong effects of damping (or rather lack of data constraining the secular variation) at degrees 4 and above. See for example the spectra in Holme, Olsen and Bairstow (2011).

Minor corrections: Abstract - spectrum, not spectra. Introduction - you need to be clearer about what you mean by "short term". In the context that you have introduced, you mean "intermediate term" (longer than a day, shorter than a decade) p2, line 20 As a first approximation - delete "very" p2 Line 30 - almost should be generally p6 - STFT - I'm not an expert in this sort of thing by any means, and find this much more transparent than eg wavelets, but even so, what is the relationship between the STFC and wavelets? They seem to have a similar purpose. p6, line 24 leave out "to say some" (you haev already said e.g.) p8 line 18 - emphasise that 12 month running averages reduce annual variation. p15 line 12 - delete "cutting" p16 line 2 - that the spectra behave similarly at the surface and CMB must be a damping effect - physically they should be strongly separated by the geomagnetic attenuation factor. p17 Line 25. Discussion (there is only one!) Appendices - I can't help feeling that there is far too much detail here - the information for most of this would be in any numerical textbook (or indeed in the matlab help pages). I note that any discussion of the FFT is meaningless - for geophysical time series, the time of computation is trivial, and you are far better off using a DFT (or a least-squares fit if data are uneven) than resampling to allow an FFT to be used.

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