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Interactive comment on "Multi-approach gravity field models from Swarm GPS data" *by* João Teixeira Encarnaco et al.

Anonymous Referee #1

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Summary: The paper assesses the utility of gravity fields derived from Swarm to bridge the gap between GRACE and GRACE-FO, as well as potentially fill in missing months from the GRACE and GRACE-FO timeseries. The authors describe the approach to combine four independent gravity field solutions using VCE methods, and assess the utility of including accelerometer data (rather than relying on models of non-gravitational accelerations), as well as kinematic baselines in their processing.

General Review: The paper is well written and comprehensive. It covers important topics, in particular the use of the accelerometer data as well as kinematic baselines in the data processing. I recommend publication with only very minor revisions. One general comment is that the figures are not of high quality – the legends and axes are all very difficult to read. Further, there are many places where multiple figures could be

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Discussion paper

combined into a single figure with subpanels. This would likely increase readability.

Minor comments:

Section 2.6.1 – It is unclear to me why the authors decided to use this approach for C20. They state that the C20 coefficient available from CSR is only available at the GRACE epochs. However, the same group at CSR produces a monthly 5x5 gravity field solution from SLR, which includes as estimate of C20. These estimates are produced in even calendar month intervals. Why not use this?

Line 323: Typo: “if” should be “to”

Line 328: It is unclear what the authors mean by “These periods drive the orbital inclination of the GRACE satellites. . .”. Perhaps you mean the other way around, i.e., that the orbital inclination drives the tidal aliasing periods? This would be more appropriate.

Line 389: Typo – “which is less straightforward”

Line 511: The authors state it is a mystery as to why the oceans have larger errors than over land. Is this really true? A comparison between Figure 14 and Figure 16 reveals that the error over the ocean is only about $\sim$25% higher than that over land. It is true that the signal to noise ratio is much lower over the ocean – this is why larger smoothing radii are required – but that seems mostly due to the lower signal amplitudes rather than the higher noise values. Have you tried assessing errors as a function of latitude rather than over different geophysical domains? I wonder if errors actually scale with latitude (Figure 28 would support this), and errors are slightly larger over the ocean simply because of sampling bias as a function of latitude?

Line 652: typo – “out” should be “our”

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