

Interactive comment on “Extracting the time variable gravity field from satellite gravity data using a sawtooth filter” by E. Gurria and C. López

Anonymous Referee #3

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This paper deals with the "striping effect" inherent in GRACE spherical harmonic models of the temporal gravitational acceleration, usually the radial component. The striping effect is a set of pronounced north-south features in maps of radial gravitation, consequently an east-west error. Ostensibly it is due to the GRACE data having higher resolution (and consistency) in the along-track direction than in the cross-track direction, where the tracks are oriented in the north-south direction due to the near-polar orbit of the GRACE satellites. Typical remedies to remove the striping effect are to apply a filter to the harmonic spectrum of the GRACE solutions. The authors discover that the local east-west and radial errors in the gravitational acceleration are similar and phase shifted. Thus, they use a straightforward trick applying the phase shift to one of the components and subtracting that from the other. They interpret this difference as a signal without the striping error. From this they infer a filter whose frequency

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response depends on harmonic degree and order, and on latitude, which they apply to GRACE data over the eastern Atlantic, including west Africa and the Iberian peninsula, comparing their filtered data with the usual Gaussian cap-filtered data. They find that their "saw-tooth" performs better in many respects, but also filters some real east-west signals.

On the whole the paper is well written and should be published. A couple of comments should be considered by the authors.

1. They use the term "vertical" striping throughout the text. This is incorrect terminology and originates from looking at a map oriented with the north above the south. A correct terminology is "north-south" or "along-track" striping effect. "Vertical" can easily be confused with "radial" at the local level.
2. The authors call the errors noise, but noise is usually thought of as random. These errors are not random, but have a very systematic character. In fact, it is the reason the authors can so easily eliminate them. This brings forward also the question why these errors exist. Clearly they must be the result of some systematic flaw in the GRACE data modeling. I have not done GRACE data analysis myself, but these errors are strangely systematic and it is curious that no one has noticed this before. Do the authors have any insight as to the source of these errors? In any case something should be mentioned in the text on the possible source of these errors (which should not be called noise).
3. The authors should explain how they determined the phase shift which leads directly to the formula of the frequency response of the filter.

Interactive comment on Solid Earth Discuss., 5, 1871, 2013.