# Review of JTECH-D-19-0087 “Smoothing and Interpolating Noisy GPS Data with Smoothing Splines”

This is a very well written, rigorous manuscript on the details of mathematical/statistical smoothing (i.e. removal) of some very large GPS errors. Having designed and built over 500 drifting GPS oceanographic wave buoys of the years, my first impression is that they just need to engineer a better GPS solution. We never see such large outlier errors, nor such large variance on our data (whether you model it as Gaussian or t). Ensuring a good antenna, above sea level to avoid splashing water, and a good sky view so as to see as many satellites as possible (8+), the GPS errors they experience would not be present. Hence the need for such a complicated and computationally costly algorithm would not be needed. The use of GPS position and (especially) altitude should not be used. We use GPS chips that produce 3-axis Doppler velocities, accurate to 0.05 m/s, producing outliers one in a million samples. Outlier detection is simple by removing points beyond some multiple of the standard deviation, and performing a simple linear interpolation to fill it back in. But then again, my Master’s Degree is in engineering, and my Bachelor’s degree is in Mathematics, so I favor a more robust engineering design.

That being said, this is certainly a publishable manuscript and I approve of it, I realize they may not have access to a better engineered system. Personally, I have no use for it, as my systems produce no such errors. It’s quite wordy (36 pages of text!), so I would challenge the authors to cut out about half of it, at their discretion, while keeping their message in tact. It’s so long I really lost interest about half way through, and certainly didn’t need to read the appendices. If JTECH wants to publish such as lengthy treatise, I’m all for it, as it’s well done, but I think it’s too long.

My only specific edit would be to define the variables in equation (9): A, . One can assume A is for amplitude,  for frequency, but this is the first mention of  (not T), it could be interpreted as wavelength.