Weather Clim. Dynam. Discuss., community comment CC1
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Non-linearity comment

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Community comment on "Revisiting conceptual oscillator models for the quasi-periodic component of the El Niño Southern Oscillation" by Lina Boljka et al., Weather Clim. Dynam. Discuss., https://doi.org/10.5194/wcd-2022-51-CC1, 2022

"the method presented below can generally extract nonlinear trends by itself"

Another way to detect nonlinearity is to map a linear response forcing *kF(t)* into a generalized non-linear response *g(F(t))*. A straightforward way to do this is to apply a Fourier transform to the mapping *F(t)* ☐ *g(F(t)).* If one makes a educated guess as to the forcing, such as by a semi-annual triggered modulation of tidal forces, then the non-linear transfer function can be extracted. It turns out that this non-linearity is also found as a solution to Laplace's Tidal Equations along the equator, which are applied to describe the fluid dynamics of the ENSO thermocline. Consider citing the reference Pukite, Coyne, Challou, "Mathematical Geoenergy" (Wiley/AGU,2018), Chapter 12.

A commentary to a recent paper sunmitted to EGUsphere "The modelled climatic response to the 18.6-year lunar nodal cycle and its role in decadal temperature trends" (https://egusphere.copernicus.org/preprints/2022/egusphere-2022-151/) can be used as a guide to how the non-linear model is applied. see https://editor.copernicus.org/index.php?_mdl=msover_md&_jrl=778&_lcm=oc108lcm109w&_acm=get_comm_sup_file&_ms=102400&c=224494&salt=6355259321777718430