

Nonlin. Processes Geophys. Discuss., community comment CC2  
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## Reply on RC2 -- what constitutes internal climate variability?

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Community comment on "A range of outcomes: the combined effects of internal variability and anthropogenic forcing on regional climate trends over Europe" by Clara Deser and Adam S. Phillips, Nonlin. Processes Geophys. Discuss.,  
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- "Many outstanding questions remain regarding the relative influences of internal climate variability and anthropogenic forcing on regional climate change in models and the real world. "

What I always can't get past on these discussions is what separates internal variability from forced change. There may in fact be no such thing as **"unforced variation"** in climate behavior. In reality, every single movement in climate is governed by an external forcing. The natural or general response (homogeneous solution) is certainly there but the characteristic or forced response (non-homogeneous solution) is what emerges most strongly from the differential equations. Not to be too pedantic, but the two obvious forcings are the annual/seasonal forcing and the daily forcing, which have well-known impacts on climate. The third lesser known forcing is lunisolar forcing on reduced effective gravity interfaces such as what occurs on the ocean's thermocline. Much as the lunisolar forcing generates a non-homogeneous solution to Laplace's tidal equations, leading to a straightforward interpretation or conventional tidal analysis, can do the same for large scale climate behaviors. This is as described in Mathematical Geoenergy (Wiley/AG, 2018). So I don't have to repeat the discussion here, I refer to a link describing how this approach is applied to model the AMO as a tidally forced response to a nonlinear solution of Laplace's equations:

<https://peakoilbarrel.com/explaining-natural-climate-variations/>

In short, I can't accept the premise of "unpredictable internal variability" until it is shown that a deterministic and potentially predictable forced response is ruled out as a source of internal variability.