Where do we go now?

Waveform modeling:

- Adiabatic waveforms well underway (slow code covers a lot of parameter space; fast code [FEW] soon(?) to cover range of parameter space, time and freq. domain)
- Post adiabatic: Large pieces of the key physics (e.g., 1st-order self force, secondary spin) understood; expensive to compute, but labor is underway. Other parts (contribution from 2nd order self force) not as mature, but excellent recent progress.
- Should not be difficult to augment fast adiabatic waveforms to make fast post-adiabatic waveforms.
- **Challenge for very large eccentricity!**

EMRI waveforms doing OK, outlook for near-term progress very good (modulo e > 0.8)

Where do we go now?

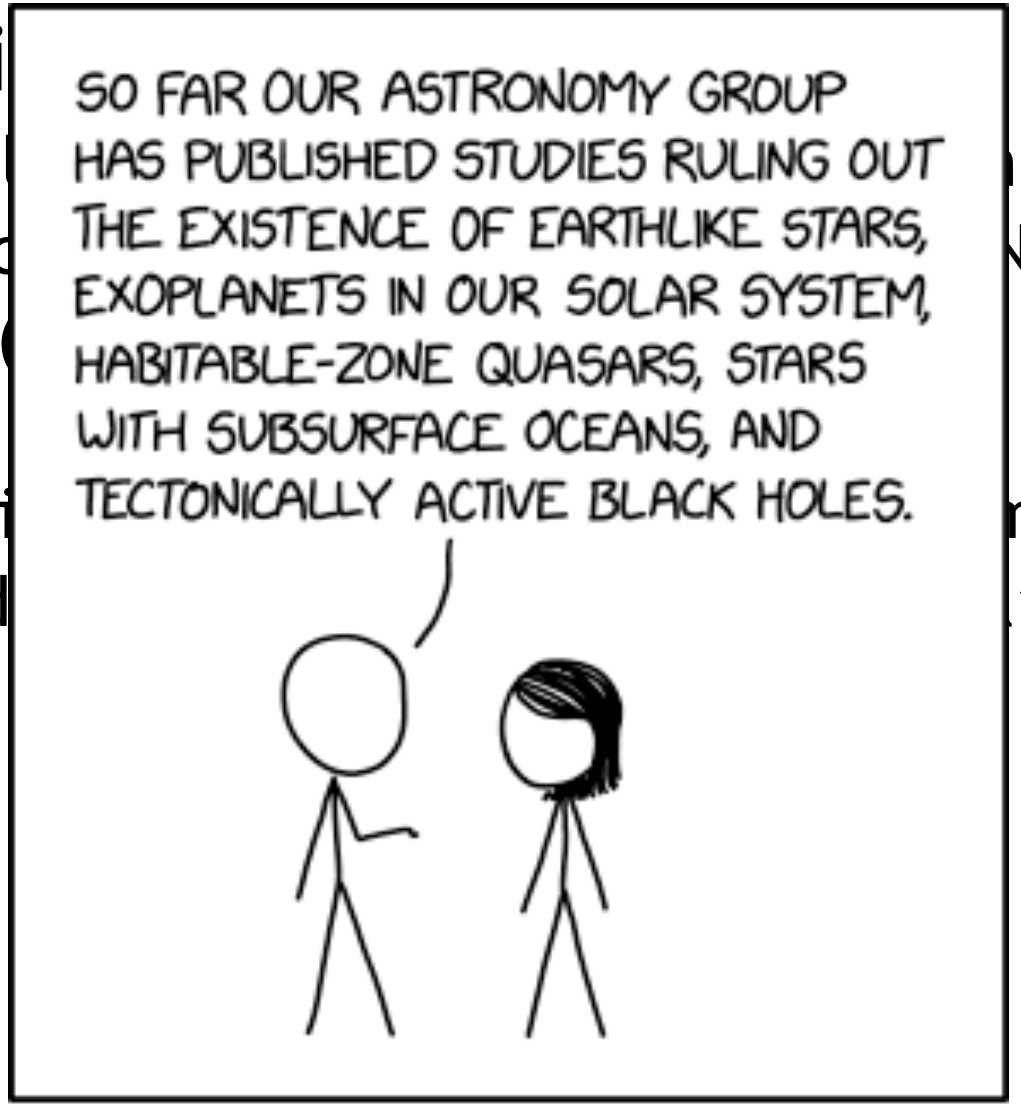
Data analysis:

- EMRIs have long been the “problem children” of LISA data analysis discussion, getting under control. Need more fast waveforms (Kerr, inclination) but near-term prospects look good. **We finally have the tools to do the studies.**
- How well will be able to measure what we measure? What can we “hide” in the systematics of “vanilla” waveforms?

Where do we go now?

Data analysi

- EMRIs have l ” of LISA data analysis disc Need more fast waveforms (prospects look good.
- How well wi neasure? What can we “hid ” waveforms?



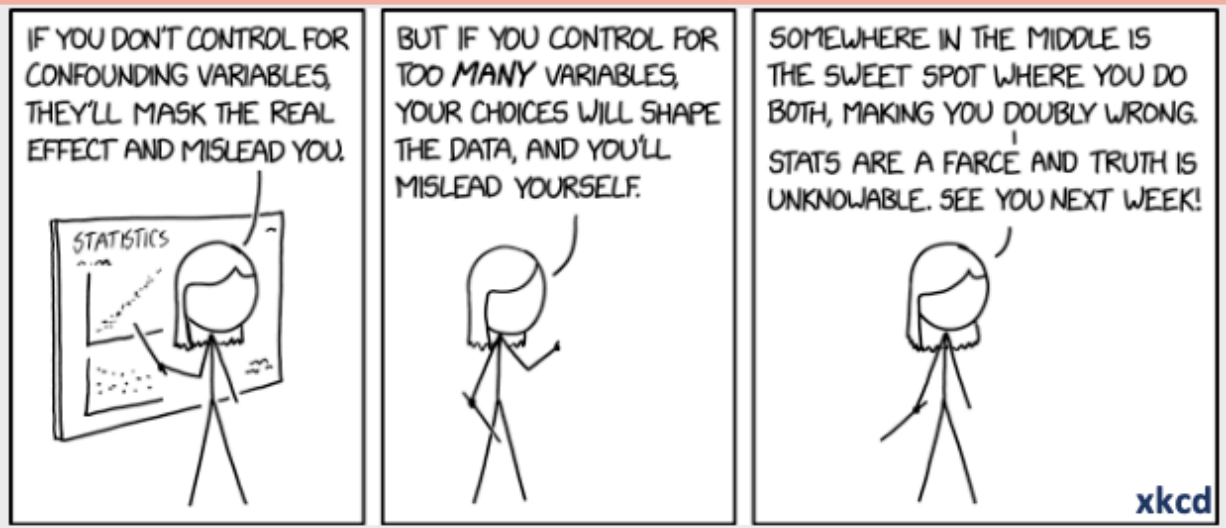
https://xkcd.com/2783

Where do we go now?

Models with environment: Steal from Kejriwal!

Challenges and Caveats

- Consistency between independently developed environmental effect models non-trivial
- Choosing realistic but sufficient environmental effect models out of a swarm of options requires expertise
- Curse of dimensionality: Bayesian inference of (14 + N)-dimensional source expensive
- Systematics at all levels: EMRI model, environmental effect model, EMRI population studies – identify and check significance



A lot of environmental astrophysics and “beyond vanilla GR” encoded as subtle waveform effects …

Do we trust waveforms / pipelines / understanding of the instrument well enough that we can confidently claim to have measured such subtle effects?