Rabble-Rousing Foreground Discussion

What can we expect at r < 0.001?
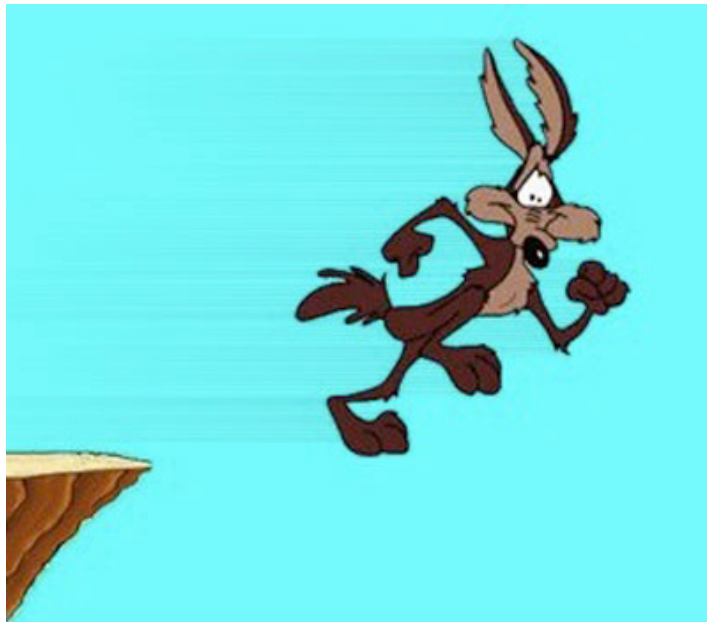
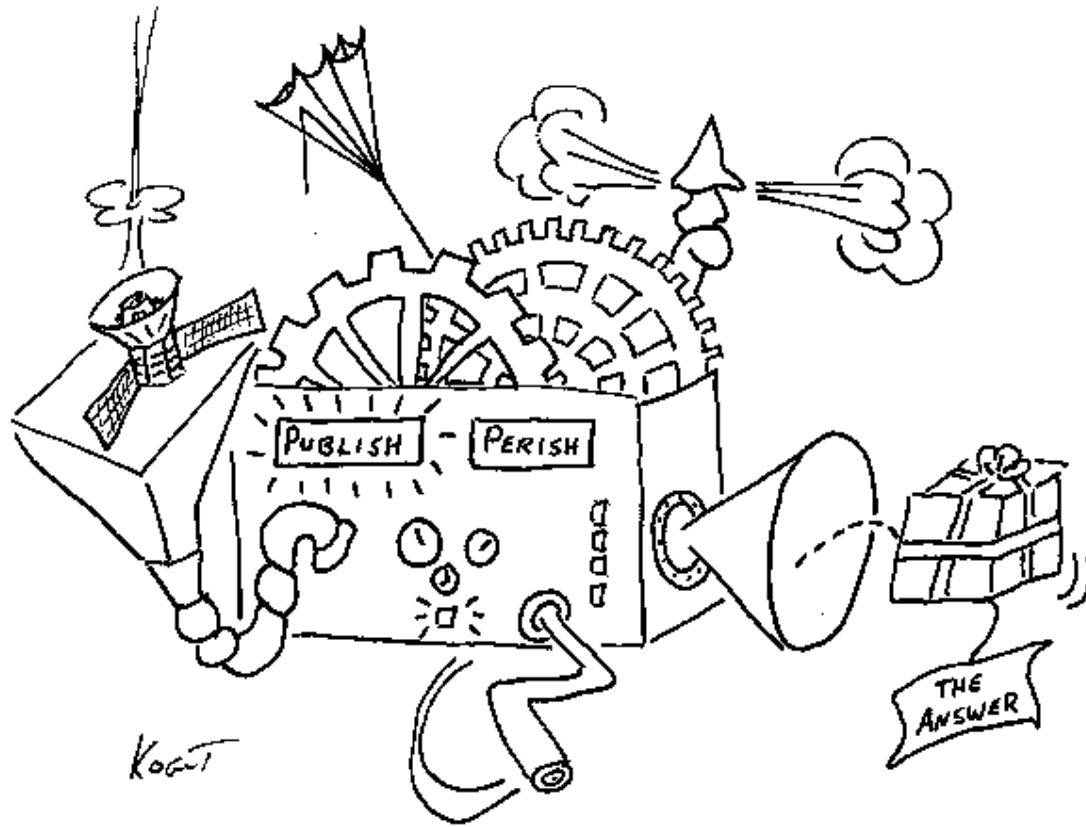"So Far, So Good"   "Here Be Dragons"

The truth is likely somewhere in between
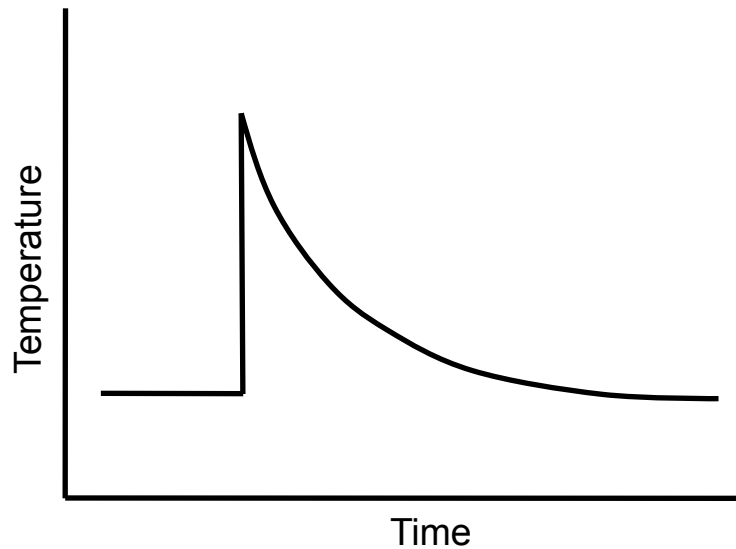**How best to constrain current uncertainty?**

Looking for Loopholes
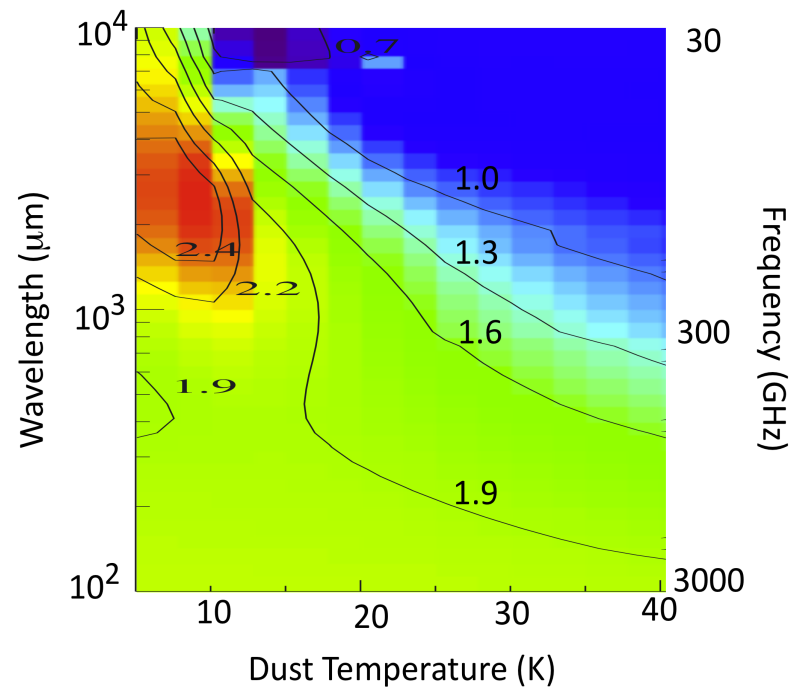## *Can Simple Models Fit Complicated Emission?*

Simple Models vs Complicated Physics

Dust is commonly fit as one or two modified blackbodies

This can't be right ...

Multiple far-IR photons emitted
for each UV photon absorbed

"Running" of spectral index from
two-level system emission

Meny et al. 2007, A&A, 468, 171
Paradis et al. 2011, A&A, 534, A118
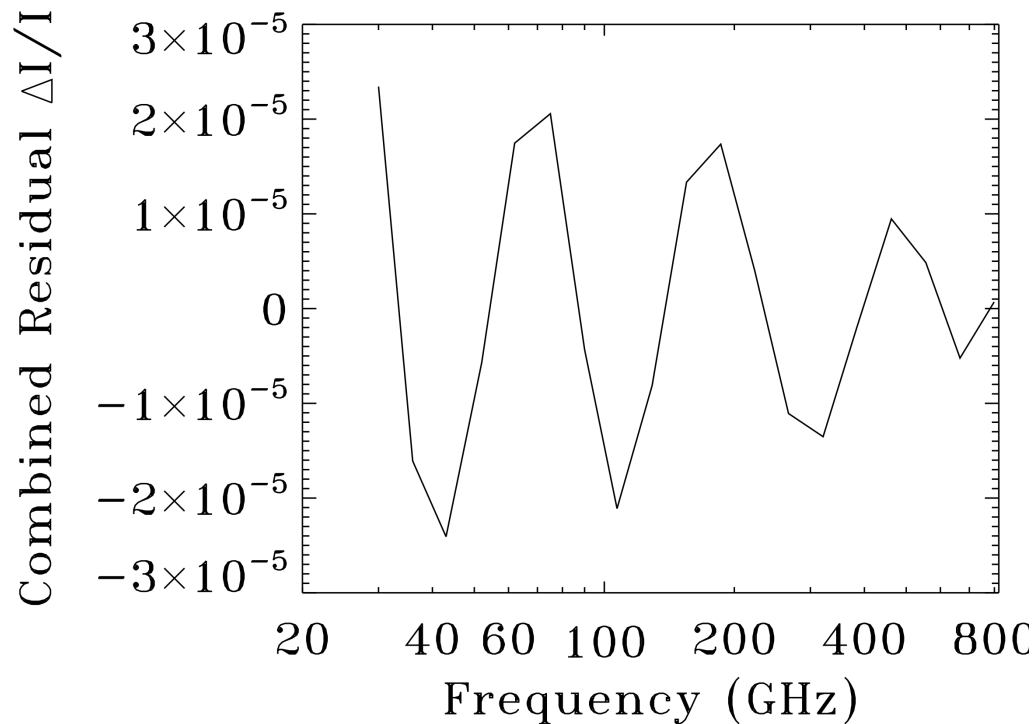Paradis et al. 2012, A&A, 537, A113

Precision vs Accuracy

Run simulation where ...
   Input dust is "complicated" model
   Output fit assumes modified blackbody

Fit sky to few part-per-million *precision*

Input = Power-law synch + TLS dust
Fit   = Power-law synch + 2 MBB dust

CMB bias: $\Delta(r) = 3 \times 10^{-3}$
χ^2: Almost perfect

But CMB component is biased at $r \sim$ few x 10^{-3}

Kogut & Fixsen 2016, ApJ, 826, 101
Hensley & Bull 2017, arxiv:1709.07897

Open Questions

What is the actual SED along individual lines of sight?
How much of this is more or less constant across the sky?
How much cross-talk is there between fitted synchrotron and dust SED?

Spatial information clearly helps (e.g. SMICA). How much?

What surprises might lurk at $\sigma(r) << 10^{-3}$
    Polarized AME
    Polarized line emission