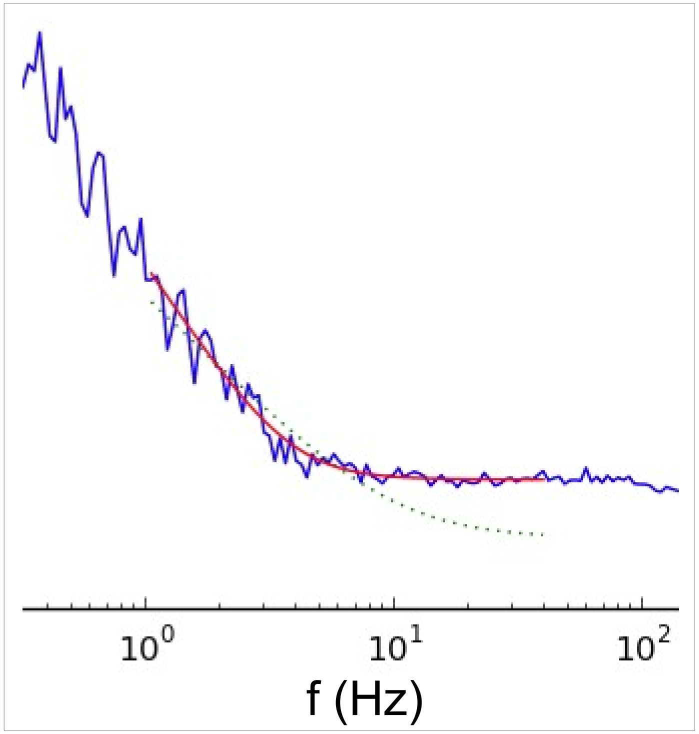
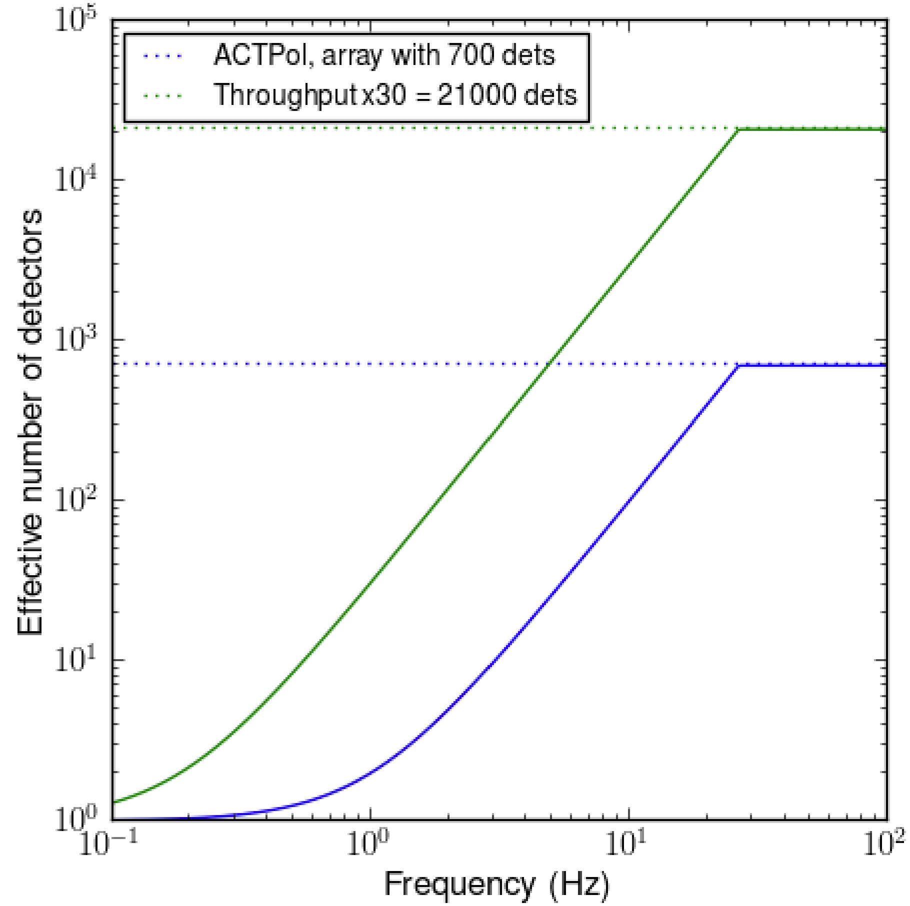
Modelling N(ell) with atmosphere + white noise (1)



Bunch of typical N(f) spectra from good weather ACTPol observations.

Realistic knee positions for modern detectors and Atacama atmosphere.



Atmosphere has spatially correlated structure. So detectors are not effective unless they're separated by ~1 wavelength of the scale you're interested in. Instead of *n* detectors, you have at most:

$$n_{eff} = 1 + \frac{L^2}{\lambda^2}$$

Field of view

Angular scale of interest

Slide by Matthew Hasselfield

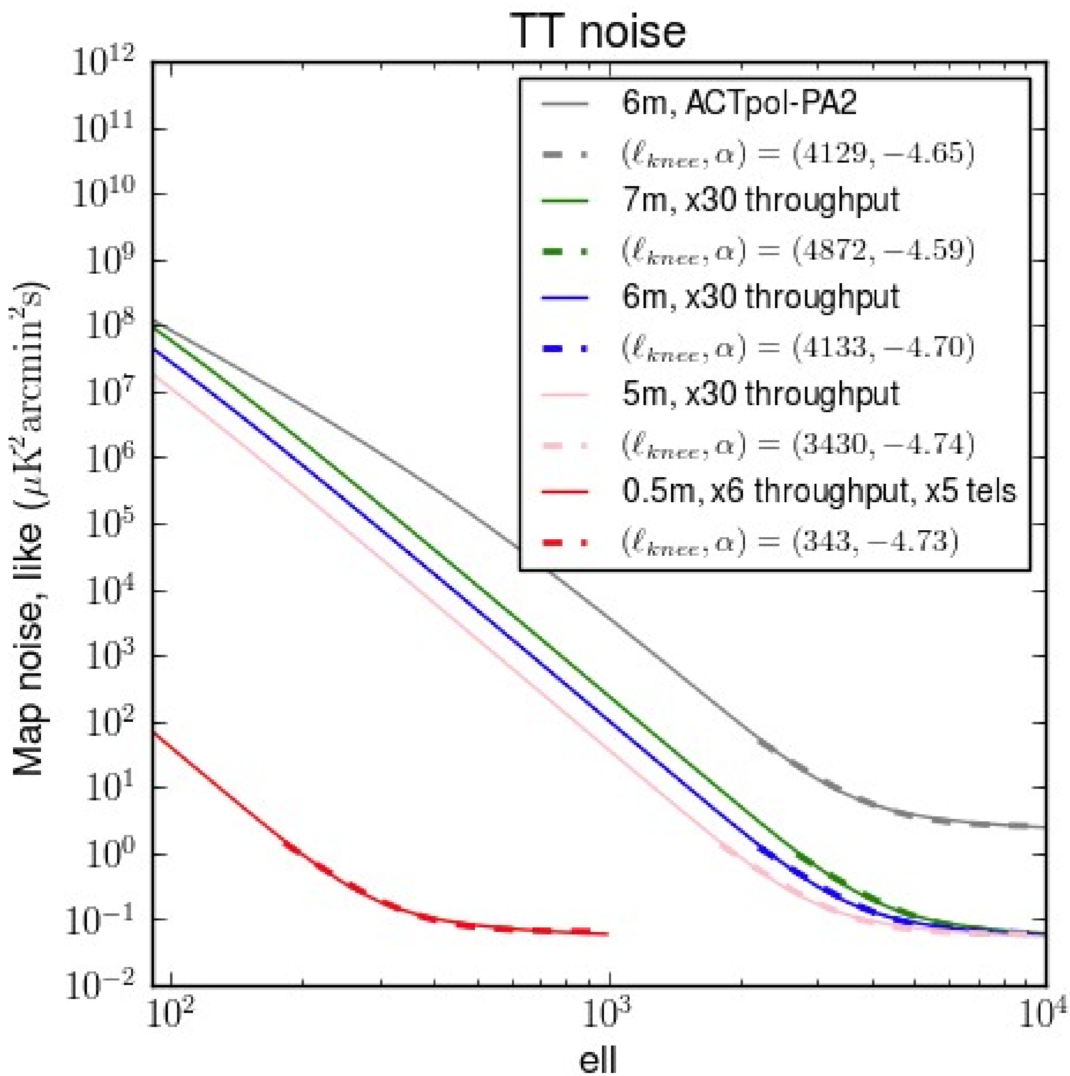
Modelling N(ell) with atmosphere + white noise (2)

- Populate
  $N_\ell = N(f = \ell \times v_{scan})$
  and integrate in annuli of ℓ space.
  Fit function of form:

$$N_\ell = N_0 \left(1 + \left(\frac{\ell}{\ell_{knee}}\right)^{\alpha}\right)$$

- This gives an N_ℓ that is based on measurements (of detector vs. atmospheric power) but with a simple extrapolation to other focal plane designs (based on number of effective detectors).

- Note we're working in a limit where:
  - We scan faster than the "wind" moves the atmosphere
  - We don't scan back over the same sky until that sky has changed.
  - Multiple telescopes will have totally independent noise, because they can look in totally different places at any given time.



Polarization? Assume that polarized contamination is ~T*0.001. (Many observers have pointed out that this is not likely to be the dominant polarized noise source.) This moves the knees to lower ell by factor of ~10.

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